Gait Coordination:

Controlling Footwear and Lower Limb Dimensions in Clinical Gait Study

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Abstract

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This three-article dissertation investigate the relation between gait coordination and footwear and lower limb dimensions. The studies in this dissertation are united by two motivations: 1) improve the rigor of clinical gait study that estimates gait coordination of patients, and 2) bridge the knowledge gap between evolutionary anthropologists and motor control scientists. The first article in this dissertation, "Walking Speed Alters Barefoot Gait Coordination and Variability," addressed whether walking speed would interact with footwear to affect gait coordination. We examined the pattern and variability of gait coordination in barefoot and shod walking in 20 women at three speeds: SLOW (SWS), FAST (FWS), and comfortable walking speed (CWS). We found that the walking speed interacted with footwear conditions to affect the gait coordination and suggested that barefoot and shod walking used different coordination strategies

to cope with increasing walking speed. The second and third articles were designed as secondary analyses of existing data collected by the Primate Evolutionary Biomechanics Lab at the University of Washington. The second article, “Pelvic Breadth, Limb Length and Proportion Associate with Gait Coordination,” examined the association between lower limb dimensions and gait coordination at CWS. We found pelvic breadth, lower limb length, and crural index were associated with thigh-shank and hip-ankle coordination. This association was also dependent on the methods to obtain gait coordination. The adjusted r^2 ranged from 0.28-0.78 with an average of 0.50. Therefore, we recommend researchers take into account lower limb dimensions when designing and reporting clinical gait study. The third article, “Can Lower Limb Dimensions Modulate Motor Stress in Non-optimal Walking Speed?”, built on the second article and strived to understand the relation among lower limb dimensions, walking speeds, and gait coordination. We hypothesize that lower limb dimensions can modulate the motor stress in non-optimal walking speed (SWS and FWS). Our result partially supported this hypothesis. However, the influence of the lower limb dimensions is small and less dominant than other factors.

Plain Language Summary

Gait analysis plays a critical role in assisting the diagnosis of numerous movement disorders, informing the selection of intervention(s), and evaluating the effectiveness of treatment. Aspects of gait that are commonly assessed include spatiotemporal parameters (e.g., walking speed and stride length), kinematics (e.g., knee joint posture), and kinetics (e.g., ankle moment). Underlying these aspects, different joints and limb segments are coordinated through the mechanism of the motor system. Gait coordination, thus, is a sensitive indicator for motor system deficiency. More research effort, nevertheless, is necessary to understand the mechanism of gait coordination and to improve the reliability of current gait coordination methods.

We first investigated the influence of footwear on gait coordination at different walking speeds and found that barefoot and shod walking used different coordination strategies to cope with increasing walking speed. This finding emphasized the importance of controlling footwear in the clinic gait studies. Varying footwear and walking speed during gait retraining may also bring additional benefits to patients; nevertheless, long-term practice of barefoot walking may have a negative impact on the lower extremity joint health. This insight, however, remains speculative and warrants future research effort.

The second and third articles investigated the relationship between lower limb dimensions and gait coordination. We found that lower limb dimensions, such as pelvic breadth and crural index, were strongly associated with gait coordination. The influence of lower limb dimensions on gait coordination is usually overlooked. Our result indicated that lower limb dimensions played a role in the neural circuits of gait control. This insight was derived based on the observation of gait coordination in healthy subjects, patients with motor system deficiency

may not demonstrate this characteristic. Nevertheless, it is nearly impossible to separate the influences of lower limb dimensions and of medical conditions on gait coordination in practice. We, therefore, recommend clinician researchers take into account lower limb dimensions when designing and reporting clinical gait studies. Although lower limb dimensions are associated with gait coordination and motor control, lower limb dimensions play a more important role in the regulation of movement coordination at comfortable walking speed instead of at slow and fast walking speed.

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Firstly, I would like to thank my advisor, Dr. Patricia Kramer, for her training, support, and guidance. My interest in biomechanics and movement science started during my undergraduate time. Patricia taught me every component that is required for conducting a biomechanics study, from experimental design to manuscript writing. Scientific writing using English is a challenge for me, so I am grateful for her proofreading and correcting my grammar in many of my articles. Knowing my interest in data science, she supported my pursuit of a concurrent master's degree in applied mathematics and allowed me to leverage my skill when analyzing biomechanics research data. This training granted me the knowledge and skills to independently conduct biomechanics research and will have a tremendous impact on my future research career. This dissertation would not be possible without her support, and my transformation into a biomechanics researcher would not be possible without her support.

I would also like to acknowledge the contribution of my other committee members, Drs. Tracy Jirikowic, Cristine Agresta, and Sarah Stroup, who graciously agreed to serve on my committee and provided timely feedback.

Chapter 1. INTRODUCTION

One of the basic types of activities of daily living is walking. An average person walks approximately between 5,000 to 15,000 steps per day (Chris Kirtley, 2006b). Walking has a positive effect on cardiovascular disease (Murtagh et al., 2010), bone density (Krall & Dawson-Hughes, 1994), diabetes (Paula et al., 2015), and even emotional health (Zhu et al., 2020). The loss of walking abilities, thus, has a significant impact on the quality of living. Furthermore, the quality of gait, or walking pattern, is also critical for health. A pathological gait that is caused by a variety of medical conditions can increase the risk of comorbidities in orthopedics (Boyer & Hafer, 2019; Naili et al., 2017; Paterno & Hewett, 2008) and the energy expenditure of walking (Brown et al., 1980; Kamp et al., 2014; Waters et al., 1987; Waters et al., 1982). As such, restoring walking performance is one of the primary outcomes in physical rehabilitation. As is claimed by the American Physical Therapy Association (2001), gait analysis plays a critical role in assisting the diagnosis of numerous movement disorders, informing the selection of intervention(s), and evaluating the effectiveness of treatment.

Aspects of gait that are commonly assessed include spatiotemporal parameters (e.g., walking speed and stride length), kinematics (e.g., knee joint posture), and kinetics (e.g., ankle moment) of lower extremities (Chris Kirtley, 2006a). Underlying these aspects, human gait is an outcome of the motor system: a complex motor skill that requires coordination among different joints and limb segments that must be integrated into functional units (Robertson et al., 2013). Coordination is the ability to execute controlled movements and relies on somatosensory input and an intact neuromuscular system (Kandel, 2013). Movement coordination is a higher-order property and can explain failures of the motor system under pathological conditions (Krasovsky

& Levin, 2010). For example, patients with brain lesions demonstrate poor movement coordination during walking (Schmitz et al., 2014). Gait coordination in clinic, however, is often examined subjectively. Coordination is characterized by appropriate sequencing, direction, and timing of multiple gait parameters (Woollacott & Shumway-Cook, 2012), so it is questionable whether the characteristics of gait coordination can be fully captured based on subjective evaluation alone. Computational methods based on motion capture systems have been developed to assess gait coordination. These methods improve the ease and reliability of gait coordination analyses and the number of research articles that estimate gait coordination has increased quadratically in the last 50 years (Figure 1.1).

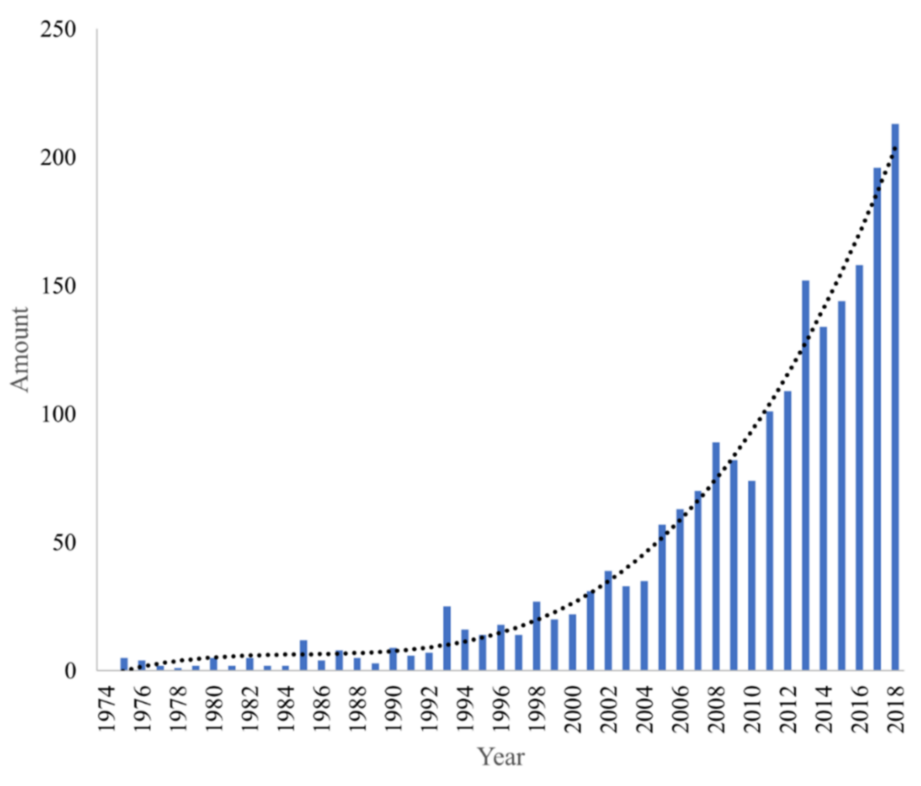

Figure 1.1. Amount of Gait Coordination Research Article by Year (1974-2018). This figure is recreated from Medline Trend: Automated Yearly Statistics of Pubmed Results (Corlan, 2004)

Despite this growth, more research effort is necessary to understand the mechanism of gait coordination and to improve the reliability of current gait coordination measuring methods. For instance, a relationship between footwear and gait coordination is suggested by several studies (Gruber et al., 2011; Kurz & Stergiou, 2004; Romer et al., 2019). Gait coordination during walking differs between the conditions of walking in athletic shoes or barefoot (Romer et al., 2019). The interaction effect between footwear and walking speed on gait coordination remains unclear with peak knee stress exhibiting quadratic growth as walking speed increases linearly when barefoot (Wang et al., 2017). Varying footwear and walking speed and observing the change of coordination pattern allow us to gain insight into how the motor system handles the stress due to increased walking speed.

Another factor whose impact on gait coordination has not been formally examined is lower limb dimensions. Although the effect of lower limb dimensions on gait coordination has been implied in the previous work (Dominici et al., 2009; Ivanenko et al., 2007; Ivanenko et al., 2008), no studies have rigorously examined the association between lower limb dimensions and gait coordination. The lack of this knowledge may compromise the result of clinical gait studies, as lower limb dimensions is infrequently controlled in the clinical gait studies. Consequently, I will explore gait coordination in walking to inform clinical gait research.

The line of research documented herein aims to understand the effect of footwear and lower limb dimensions on gait coordination and includes three separate research papers. The first research paper addresses the question of how the walking speed alters barefoot gait coordination by observing the gait coordination of 20 young female subjects in two footwear conditions (athletic shoes and barefoot) and three walking speeds (slow, normal, and fast walking speed). The first research paper was published in the Journal of Motor Behavior (DOI:

10.1080/00222895.2021.1990005). The second research paper aims to understand the association between gait coordination and lower limb dimensions, such as pelvic breadth, limb length and proportion, and to determine whether this association depends on the gait coordination method used in the evaluation. The third research paper builds on the second one and aims to understand the relation among walking speed, lower limb dimension, and gait coordination by testing a theoretical frame model proposed by motor control scientists (Sparrow & Newell, 1998).

Notably, both motor control scientists and evolutionary anthropologists are interested in the influence of footwear and lower limb dimensions on gait but examine this influence from different perspectives. Humans started to wear shoes around 40,000 years ago (Trinkaus & Shang, 2008). However, the history of footwear is short compared to that of the approximately 6 million years bipedalism (Ruse & Travis, 2009), so modern footwear is theorized to be mismatched with the functional environment from which human foot evolved (Lieberman, 2013). Although many primates and mammals can perform bipedalism, humans are the only kind who are habitual terrestrial bipeds in daily life. The postcranial skeleton, including lower limb dimensions, have undergone a series of changes to walk bipedally (Lovejoy, 2005a, 2005b). By observing the gait of modern humans, evolutionary anthropologists develop insights on the evolution of bipedalism. Although bipedalism is adapted during the evolutionary timescale over million years, walking performance is also influenced by the nervous system. Based on the motor control theory, both footwear and lower limb dimensions are the constraint to locomotion (Sparrow & Newell, 1998). Individuals have better proprioception barefoot compared to wearing athletic shoes (Robbins et al., 1995; Robbins et al., 1988). The neuromuscular control of gait also takes into account limb dimensions (Gandevia et al., 2002; Pearson & Gramlich, 2010). An interdisciplinary perspective, thus, is adopted when discuss the implications of the results.

Chapter 2. WALKING SPEED ALTERS BAREFOOT GAIT COORDINATION AND VARIABILITY

2.1 ABSTRACT

Using the dynamic system approach, we examined the pattern and variability of inter-joint coordination in barefoot and shod walking in 20 women at three speeds: SLOW, FAST, and comfortable walking speed (CWS). We found that barefoot and shod walking used different coordination strategies to cope with increasing walking speed. As walking speed increased, ankle-knee coordination patterns between shod and barefoot became less different ($p<0.00001$), and ankle-hip coordination patterns became more different ($p<0.001$). Compared to shod, barefoot walking had significantly lower coordination variability in mid-stance of knee-hip at CWS and FAST and late-swing of ankle-hip at SLOW and CWS with medium effect (effect size 0.61−0.74). Future research should investigate the connection between the decreased coordination variability and joint tissue stress to understand the impact of barefoot walking on the lower extremity joints.

2.2 INTRODUCTION

Many features of modern footwear, especially athletic shoes, are designed to provide comfort and protection during walking and running. For instance, a cushioned sole of athletic shoes absorbs the impact of heel strike, a force that is a possible cause of musculoskeletal injury (Collins & Whittle, 1989; Lafortune & Hennig, 1992; Whittle, 1999). It is not clear, however, if shoes have a protective effect throughout stance. A systematic review article (Franklin et al., 2015) reported that, while barefoot walking produced significantly lower ground reaction force

(GRF) at heel strike and significantly lower ankle moment at early stance compared to shod walking, ankle and knee moments and GRF at late stance were significantly higher in the barefoot condition. What does seem clear is that walking barefoot produces a different pattern of GRF and joint moments compared to shod walking. Barefoot walking also changes the lower limb kinematics (Morio et al., 2009; Zhang et al., 2013).

The change of joint moment and adjustment of kinematics in the lower extremity can also impact neuromuscular control and movement dynamics of locomotion (Biewener & Daley, 2007). From the dynamic system view of human movement, walking and running requires coordination among different joints that must be integrated into functional units rather than acting alone (Robertson et al., 2013). Kurz & Stergiou (2004) estimated the shank-foot coordination pattern and found that it was more out-of-phase in barefoot than shod running in the sagittal and frontal planes. Gruber et al.(2011) found no significant difference, however, in shank-foot coordination between barefoot and shod running. Walking and running have their own distinct neuromuscular control characteristics, especially during the stance phase (Cappellini et al., 2006), so the coordination pattern observed in barefoot running should not be utilized to infer barefoot walking. Recently, Romer et al.(2019) examined the thigh-shank and shank-foot coordination during barefoot walking and found that the shank-foot coordination was more out-of-phase in some regions of the stride cycle compared to shod walking, but no quantitative test of the effect of footwear on coordination pattern was performed. More importantly, most related studies examined the coordination pattern of barefoot walking in a self-selected comfortable walking speed (CWS) only. People, however, often walk in a non-CWS. The ability to walk fast is considered a functional vital sign (Middleton et al., 2015). A recent meta-analysis study (Fukuchi et al., 2019) showed that walking speed had a strong effect on spatiotemporal(e.g., stride length), kinematic(e.g., joint range of motion) and kinetics(e.g., GRF) parameters of gait, but neither barefoot walking nor gait coordination were examined. Walking speed influenced inter-joint coordination differently in young and old participants, indicating that different neuromuscular control strategies to cope with the increasing walking speed were used (Chiu & Chou, 2012). Slower than CWS changed the inter-joint coordination pattern during the swing phase for shod walking (Little et al., 2019), while Wang et al.(2017) found that the peak knee stress exhibited a quadratic growth as walking speed increased when barefoot. Both footwear and walking speed constrains locomotion (Sparrow & Newell, 1998), but it remains unknown whether or not one constraint (walking speed) interacts with the other constraint (footwear) in the neuromuscular control of gait. By varying footwear and walking speed and observing the change of coordination pattern, better insight into the neuromuscular control of barefoot walking is possible.

Of note, Romer et al.(2019) also found lower thigh-shank coordination variability but higher shank-foot coordination variability in barefoot walking than in shod walking. Coordination variability has been examined extensively to assess the neuromuscular control of locomotion in orthopedic (Bonacci et al., 2020; Cunningham et al., 2014; Desai & Gruber, 2021; Hamill et al., 2012) and neurological (Socie & Sosnoff, 2013) disorders. The movement variability is considered an intrinsic property of any biological system (Bernshteĭn, 1967) and reflects the ability of the motor system to reliably perform a motor task under different locomotion conditions (Stergiou & Decker, 2011), such as different footwear. Compared to shod walking, barefoot walking significantly increase the variability of impact GRF (Broscheid & Zech, 2016). Although minimalist shoes are designed to mimic the effect of bare feet, barefoot walking has significantly higher stride length variability than walking with minimalist shoes

(Petersen et al., 2020). If minimalist shoes are an intermediate type between normal athletic shoes and bare feet in terms of the thickness and hardness of the sole of shoes, barefoot walking may also have higher movement variability than normal athletic shoes. Such an inference, however, should not be made without empirical assessment. Also, the variability of gait parameters such as stride length or single joint kinematics are not equivalent to coordination variability. Because coordination variability in Romer et al.'s study (2019) was estimated across the entire stride cycle, it is also unclear whether or not coordination variability changes if it is estimated within each phase of the stride cycle.

The alteration of movement dynamics has often been associated with health conditions (Stergiou & Decker, 2011). It has been suggested that modern footwear is mismatched with the functional environment from which human's foot evolved, thus may lead to various pathological conditions (Lieberman, 2013; Sichting et al., 2020). Although there is limited evidence to support the health-related outcomes of barefoot walking over shod walking (Hollander et al., 2017), the examination of coordination pattern and coordination variability can provide insight into the neuromuscular control in relation to footwear change.

This study builds on the previous work by examining the pattern and variability of coordination of ankle-knee, knee-hip, and ankle-hip in barefoot and shod walking at three self-selected walking speed categories (SLOW, CWS, FAST). While previous studies estimated gait coordination using continuous relative phase (CRP) (Kurz & Stergiou, 2004; Romer et al., 2019), CRP can only estimate segmental coordination (Lamb & Stöckl, 2014). Consequently, CRP is difficult to associate with previous insights, as segmental kinematics in barefoot are infrequently reported in the literature. Gait coordination in our study, thus, is estimated between joints using the vector coding method. We characterize the difference of coordination patterns between shod and barefoot at each speed category within the same the subject and examine the change in the coordination pattern as walking speed varies. Coordination variability is estimated for early stance, mid stance, late stance, and late swing gait phases. We hypothesize that 1) walking speed changes the difference of coordination patterns between barefoot and shod walking, and 2) coordination variability estimated in early stance, mid stance, late stance, and late swing phase is significantly different between barefoot and shod condition in the three speed-categories.

2.3 METHODS

2.3.1 *Subjects*

Twenty college-aged female subjects (height: 167.3 ± 6.3 centimeter; weight: 62.4 ± 8.6 kilogram; leg length: 79.8 ± 3.8 centimeter) volunteered to participate in this study. All were habitually shod and free from lower limb injury and signed an informed consent form approved by the Institution Review Board of the University of Washington (IRB No.: HS#40172).

2.3.2 *Instrument and Experimental Protocol*

The experiment was conducted in the Human Motion Analysis Lab (HMAL) at the University of Washington. Reflective markers were placed on both left and right sides, as appropriate, on anatomical landmarks (greater trochanter of femur, lateral femoral condyle, medial femoral condyle, tibial tuberosity, lateral malleolus and medial malleolus of the ankle, Achilles tendon insertion on the calcaneus, and between the 2nd and 3rd metatarsal heads). The 3D trajectories of the markers were captured with six high-speed cameras (Qualisys, Inc, Sweden) with a sampling frequency of 100 Hz. The floor surface in the lab was industrial grade, uncushioned vinyl tile.

Subjects were instructed to walk straight on an 8-meter walkway while shod and barefoot at three speed categories: SLOW, CWS, and FAST. Subjects wore their own athletic shoes in shod conditions. Since our primary purpose is to study gait coordination in barefoot walking and compare it with gait coordination in preferred daily-wearing athletic shoes, no restriction on the specific type of athletic shoes was enforced. Speed-category was not randomized, and the sequence was SLOW-CWS-FAST. Subject completed all the shod trials for three speed-categories first and then completed barefoot trials. Subjects completed trials under verbal instruction of each speed category. The verbal instruction for SLOW was “walk at a stroll. You have nowhere to be and are enjoying yourself. It is a pleasant day, and you have good companionship.” For CWS: “walk at your normal pace. You have somewhere to go, but you are not in a hurry.” For FAST: “You are in a hurry—like you are late for your bus— but you have to maintain your speed for 5 minutes. You are walking as fast as you can, but not running, and not so fast that you cannot stop within a stride.” The verbal instruction was delivered to subjects consistently. The subjects were given sufficient time to familiarize themselves with the protocol before any change of footwear or speed category. Walking speed was calculated based on each extracted stride cycle.

2.3.3 *Single Joint Kinematics*

Each subject performed ten successful trials for each footwear condition and each speed category, so each subject completed 60 walking trials in total (two footwear conditions × three speed categories × ten trials = 60 trials in total). A trial was considered “successful” for this analysis if at least one stride cycle of the left and of the right limb was fully captured. Due to the limited capture volume, the number of fully captured stride cycles in one successful trial varied from 1 to 3. To maintain consistency in the analysis, only the first fully captured stride cycle of the left and right limb was extracted. The first-fully captured stride cycle was approximately in the middle of the capture volume and there were approximately 1-2 strides before and 2-3 strides after the first-fully captured stride cycle, depending on each subject's walking speed and stride length. A stride cycle was defined using the two consecutive lowest positions of the ipsilateral heel markers (the point of Achilles tendon insertion on the calcaneus) in the vertical axis as initiation and termination points of the stride. Marker positions were utilized to estimate ankle, knee, and hip joint angles. The knee angle was determined as the relative angle between the thigh and shank segment using markers on the greater trochanter, lateral femoral condyle, and lateral malleolus of the ankle. The ankle angle was determined as the relative angle between the shank and foot segment using markers on tibial tuberosity, Achilles tendon insertion at the calcaneus, and 2nd/3rd metatarsals head. The hip angle was defined as the absolute angle with respect to the bottom vertical axis (270° in 2D cartesian coordinate system) originating from the greater trochanter (Robertson et al., 2013). Joint angles were calibrated using the measurements obtained from a quiet standing trial, which was performed before the walking trials. A 0° was considered as the neutral position for the ankle joint and hip joint, and the full extension for the knee joint. The data was smoothed with a second-order low-pass Butterworth filter with a cutoff frequency determined as six times the stride frequency (number of strides per second) of the corresponding stride cycle (C. Kirtley, 2006). For instance, the average stride frequency in this analysis was approximately 0.8, 1, and 1.1 strides per second for SLOW, CWS, and FAST, respectively, so the corresponding cutoff frequency was 4.8Hz, 6Hz, and 6.6Hz. Each stride cycle was then interpolated from the original time domain to the 100% stride cycle with a cubic spline. Initial contact and maximal ankle dorsiflexion/plantarflexion, hip flexion/extension, and knee flexion/extension were extracted from the full stride cycle.

2.3.4 *Inter-Joint Coordination*

Ankle, knee, and hip joint angles in the sagittal plane were utilized to estimate inter-joint coordination. Three couples were selected: ankle-knee, knee-hip, and ankle-hip. Inter-joint coordination was calculated using the vector coding method (Sparrow et al., 1987). First, a phase plane, in which two joint angles were plotted against each other, was constructed. The distal joint was placed on the horizontal axis and the proximal joint was placed on the vertical axis. The coordination pattern was indicated by the coupling angle (unit: degree), which was calculated between the directional vector of the trajectory and the right horizontal axis in the counterclockwise direction for all time increments.

The difference of inter-joint coordination pattern between shod and barefoot conditions at each speed category was calculated with the cross-correlation coefficient (CCC) and root-mean-square-difference (RMSD). The CCC measures the difference in the spatiotemporal evolution of coordination patterns, whereas RMSD measures the magnitude differences between the coordination patterns(Chiu & Chou, 2012). A CCC value that is close to 1 and RMSD that is close to 0 suggests a less different coordination pattern between shod and barefoot walking. A more different coordination pattern is indicated when CCC is lower and RMSD is higher. The two-sided permutation test for symmetry was utilized for hypothesis testing ($\alpha = 0.05$). When a global effect of walking speed was detected, a follow-up pairwise permutation test was conducted with Bonferroni adjustment to identify effects between speed categories (i.e., SLOW vs. CWS, CWS vs. FAST).

To understand what specific coordination patterns were responsible for any change between the two footwear conditions due to walking speed, we further categorized the coordination pattern of the inter-joint couple(s) with a global effect of walking speed. The method of categorization was based on the work of Chang and colleagues (2008). First, we averaged the coupling angle time series across all walking trials and all subjects in the same speed category and each footwear condition with a circular mean (Freedman Silvernail et al., 2018) and then categorized the coupling angle time series into four distinct regions: 1) in-phase, 2) anti-phase, 3) phase of the proximal joint and 4) phase of the distal joint. Taking the ankle-knee couple as an example, in-phase indicates that the ankle dorsiflexes while the knee flexes or the ankle plantarflexes while the knee extends; anti-phase indicates that the ankle dorsiflexes while the knee extends, or the ankle plantarflexes while the knee flexes; ankle phase indicates that the ankle rotates in the sagittal plane while the knee stays relatively motionless; knee phase indicates that the knee rotates while ankle stays relatively motionless. The detailed definition of each categorized region and the criteria for categorization have been described by Chang and colleagues (2008) and other (Robertson et al., 2013).

2.3.5 *Coordination Variability*

To determine the coordination variability within each subject, we first established cycle-to-cycle variability for each time step across all stride cycles (for the same footwear condition and speed category). Because the coupling angle was circular, angular deviation (AD), which was equivalent to the standard deviation in linear statistics, was utilized to estimate coordination variability (Miller et al., 2010). The arithmetic mean was then used to average the AD data in early stance (initial heel strike + loading response: 1-12%), mid stance (12-31%), late stance (31-50%), and late swing phases (87-100%) of the stride cycle (Perry et al., 2010). We used the permutation test for symmetry to test the difference in mean between shod and barefoot walking in each walking speed category. For the comparisons that were significantly different, we determined Cohen's *d* effect size (ES) (small effect = 0.2; medium effect = 0.5; large effect = 0.8). Because AD data in this study was asymmetrically distributed (right-skewed), the data was log-transformed before the ES calculation (Botta-Dukát, 2018). No significant difference in CCC, RMSD, and AD was detected between the left and right sides based on the permutation test for symmetry, so the data were pooled, and the average value was used for hypothesis testing. All data analyses, including joint kinematics and vector coding, were conducted in MATLAB Version R2020a (The MathWorks Inc., Natick, MA, USA) with custom programs. Statistical analysis was performed in R (Version 3.6.0).

2.4 RESULTS

2.4.1 *Walking Speed and Single Joint Kinematics*

The average walking speed was 0.91 ± 0.18 m/s (shod) vs. 0.94 ± 0.17 m/s (barefoot) for SLOW, 1.35 ± 0.20 m/s (shod) vs. 1.38 ± 0.20 m/s (barefoot) for CWS, and 1.74 ± 0.17 m/s (shod) vs. 1.70 ± 0.20 m/s (barefoot) for FAST. The full description of walking speed at each test condition was summarized in Figure 2.1. All subjects attained significantly different speeds for each walking speed category ($p < 0.00001$). No significant difference between shod and barefoot walking speed was identified at any speed category nor were the walking speeds of left and right strides different (all p's > 0.05). Initial contact and maximum of ankle, knee, and hip angle were summarized in Table 2.1.

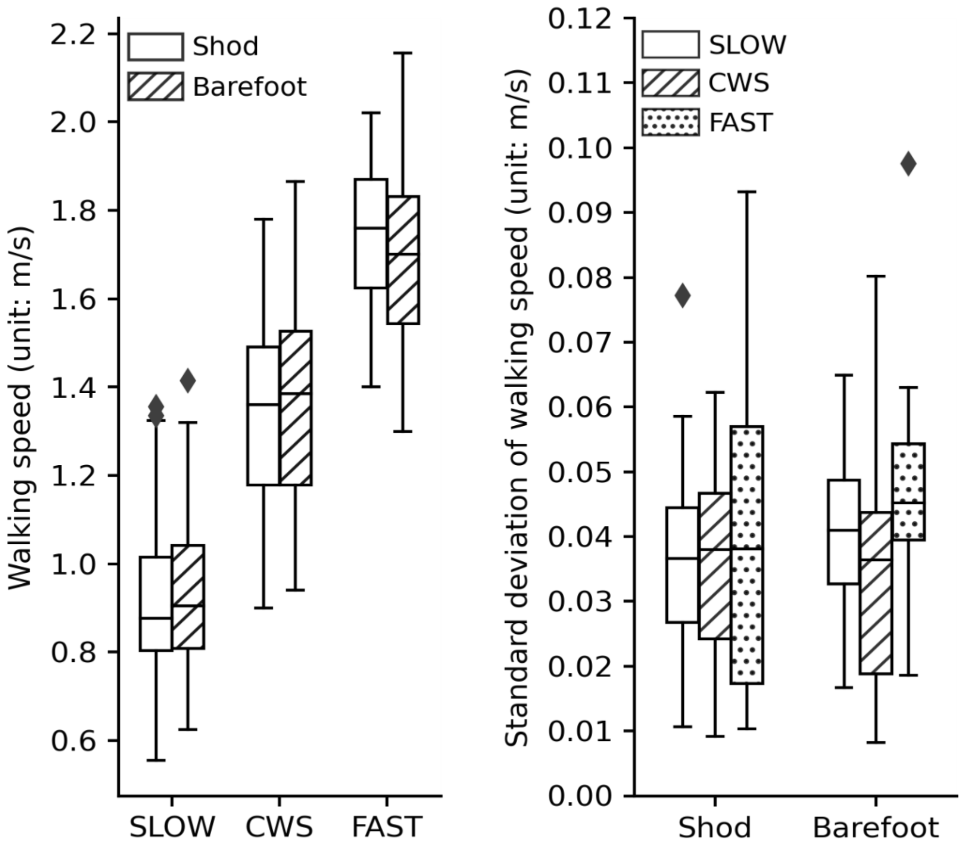

Figure 2.1: Summary of walking speed. Left: walking speed at each test condition; Right: standard deviation of walking speed at each test condition within the same subject; ♦: outlier.

Table 2.1: Initial contact and maximal value extracted from single joint kinematics.

	Shod			Barefoot		
	SLOW	CWS	FAST	SLOW	CWS	FAST
Init. cont.[1]						
Ankle	-0.8°	2.5°	7.4°	-9.7°	-7.9°	-5.8°
Knee	-0.6°	-0.7°	0.3°	0.1°	1.7°	3.4°
Hip	31.4°	37.5°	43.1°	32.4°	39.5°	44.1°
Maximum						
Dorsiflex.[2]	11.3°	11.1°	10.1°	9.1°	8.3°	8.1°
Plantarflex.[3]	-13.1°	-18.7°	-22.1°	-16.9°	-21.8°	-22.1°
Knee flex.[4]	52.4°	55.6°	55.9°	49.9°	52.9°	55.9°
Knee ext.[5]	-2.6°	-2.7°	-2.5°	-2.9°	-3°	-2.9°
Hip flex.[6]	19°	21.8°	23.8°	19.1°	21.7°	23.8°
Hip ext.[7]	-17.2°	-20°	-23.6°	-17.3°	-20.2°	-23.6°

[1]Initial contact. [2]Dorsiflexion. [3]Plantarflexion. [4]Knee flexion. [5]Knee extension. [6]Hip flexion. [7]Hip extension. °: degree

2.4.2 *The Difference of Coordination Patterns between Shod and Barefoot*

A global effect of walking speed on the difference of inter-joint coordination pattern between two footwear conditions was detected in the ankle-knee ($p < 0.00001$) and the ankle-hip ($p < 0.001$) but not in the knee-hip couple (Figure 2.2). We, therefore, categorized the coordination pattern of ankle-knee (Figure 2.3) and ankle-hip (Figure 2.4). Knee-hip coordination plot is not shown, as there was no global effect of walking speed on knee-hip coordination. For the ankle-knee couple, pairwise comparison indicated that a significant effect was detected in the comparison between SLOW and CWS (CCC & RMSD: $P < 0.001$) and between CWS and FAST (CCC & RMSD: $P < 0.001$). For the ankle-hip couple, the pairwise comparison indicated that a significant effect was detected in the comparison between SLOW and CWS (CCC & RMSD: $P < 0.001$) but not in the comparison between CWS and FAST.

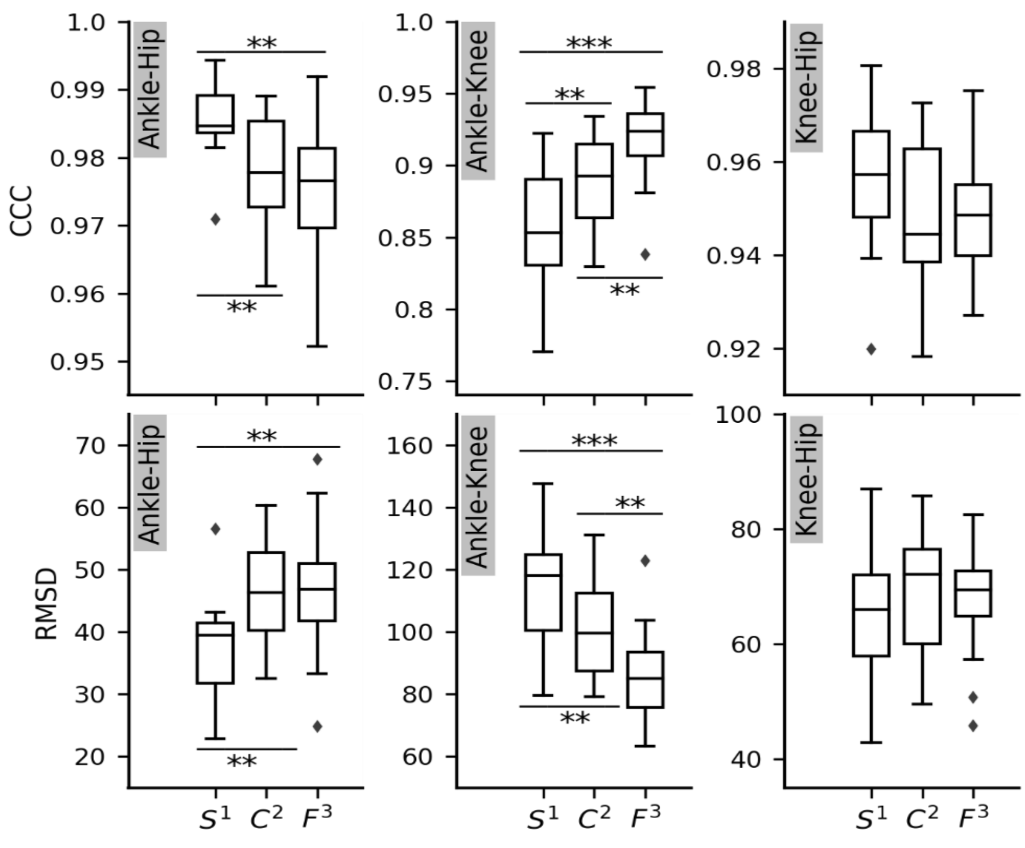

Figure 2.2: differences of coordination pattern at three speed categories. [1]S: SLOW; [2]C:CWS; [3]F: FAST. The top row is the plots of CCC, the bottom row is the plots of RMSD. ***: $P < 0.00001$; **: $p < 0.001$; ♦: outlier

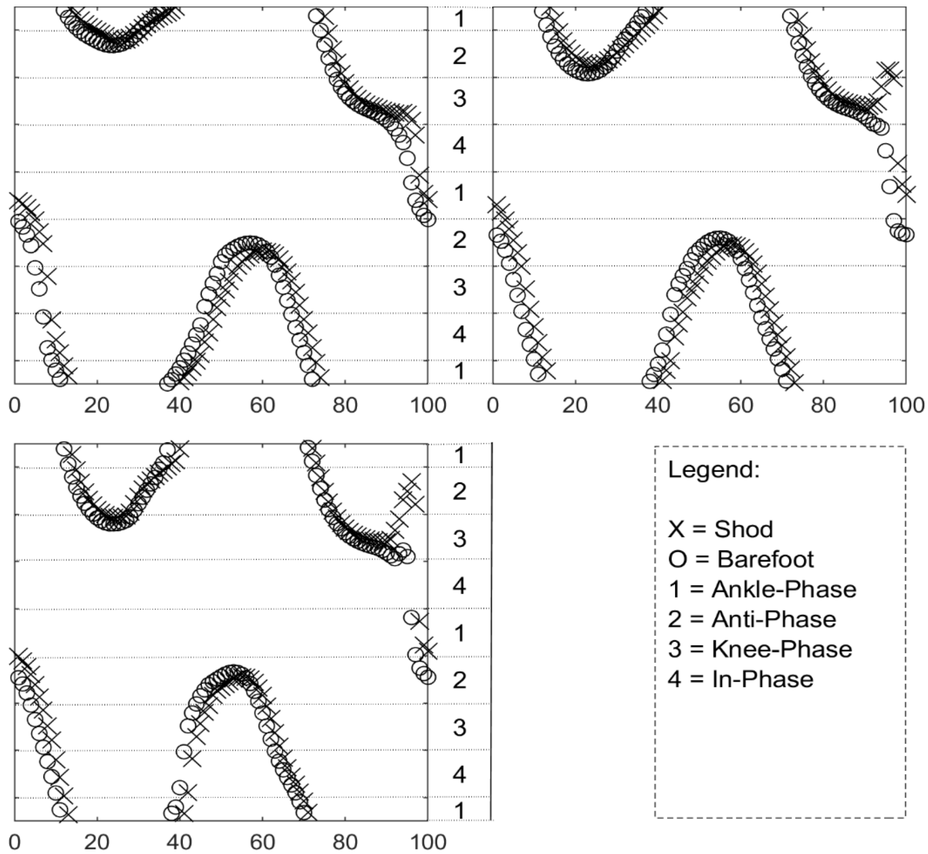

Figure 2.3. Coordination pattern of ankle-knee. upper left: SLOW; upper right: CWS; lower left: FAST. Horizontal axis is stride cycle (unit: %). The numerical labels along the vertical axis are the categories of coordination patterns that are separated by the dotted line from each other.

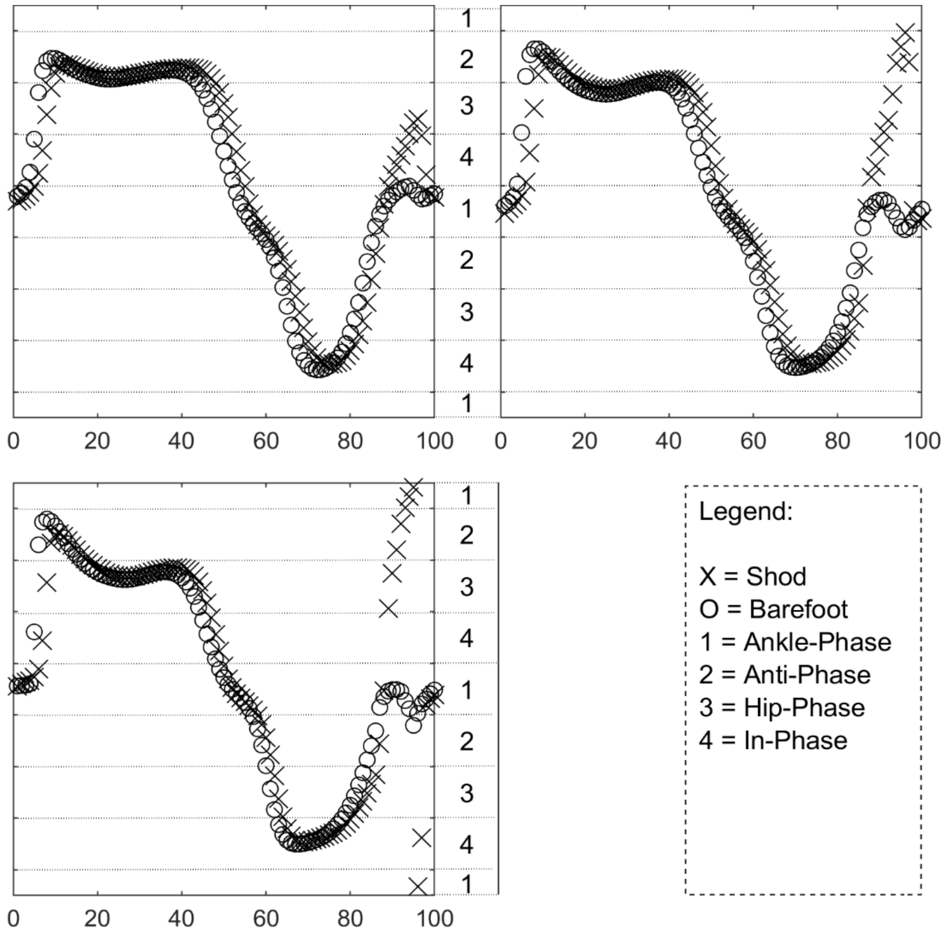

Figure 2.4. Coordination pattern of ankle-hip. upper left: SLOW; upper right: CWS; lower left: FAST. Horizontal axis is stride cycle (unit: %). The numerical labels along the vertical axis are the categories of coordination patterns that are separated by the dotted line from each other.

2.4.3 *Coordination Variability*

For the ankle-hip couple, AD in the late swing phase at SLOW ($P < 0.005$; ES: 0.67) and CWS ($P < 0.05$; ES: 0.74) was significantly lower in the barefoot than in the shod condition; for the knee-hip couple, the AD in the mid-stance phase during CWS ($P < 0.05$; ES: 0.64) and FAST ($P < 0.05$; ES: 0.61) was significantly lower in the barefoot than in the shod. No significant differences were identified in other comparisons (Table 2.2).

Table 2.2: Coordination variability for each inter-joint couple at different speed-category

	SLOW		CWS		FAST	
	Shod	Bf [1]	Shod	Bf [1]	Shod	Bf [1]
Ankle - Knee						
Early Stance	11.6	12.7	10.5	8.7	8.82	7.1
Mid Stance	13.0	13.2	11.7	11.0	11.6	10.0
Late Stance	15.5	16.3	13.6	16.2	16.7	17.4
Late Swing	17.3	16.9	15.2	15.2	14.9	17.0
Knee - Hip						
Early Stance	14.0	13.8	14.5	10.7	11.6	9.1
Mid Stance	8.5	7.8	**6.86**	**5.12***	**5.64**	**4.26***
Late Stance	10.6	11.1	7.5	8.9	8.1	7.1
Late Swing	17.8	19.7	15.5	16.6	15.8	17.7
Ankle - Hip						
Early Stance	11.2	12.4	13.5	12.7	10.7	11.8
Mid Stance	5.15	5.07	4.41	3.96	3.96	3.53
Late Stance	8.26	9.58	7.04	8.13	7.4	7.87
Late Swing	**24.1**	**18.1***	**26.5**	**20.2***	25.5	21.6

[1]Bf: Barefoot. [2] Mean walking speed at different test conditions. *Significant difference between shod and barefoot.

2.5 Discussion

This study examined the pattern and variability of inter-joint coordination of barefoot and shod walking at different walking speeds. We hypothesized that walking speed would change the difference of coordination patterns between barefoot and shod walking. We found that walking speed significantly affected the coordination pattern of ankle-knee and ankle-hip but not knee-hip. Specifically, ankle-knee coordination patterns between barefoot and shod conditions became less different as walking speed increased (CCC was higher and RMSD was lower as walking speed increased); ankle-hip coordination patterns between barefoot and shod conditions, on the other hand, became more different as walking speed increased (CCC was lower and RMSD was higher as walking speed increased) (Figure 2.2).

Our report is the first, to the best of our knowledge, to identify this phenomenon (i.e., as walking speed increases, ankle-knee pattern becomes less different and ankle-hip pattern becomes more different between shod and barefoot walking). Our result suggests that barefoot walking and shod walking adopt different coordination strategies to cope with the increased walking speed (Figure 2.2). For ankle-hip couple, we found that barefoot condition was primarily in the ankle phase region during the late swing phase (≈ 87-100% stride cycle) (Figure 2.4), indicating that ankle motion was more dominant in the late swing, regardless of walking speed; the shod condition, in contrast, clearly demonstrated a pattern where the coordination extended more phase regions as walking speed increased, with no single-phase region being dominant (Figure 2.4). Ankle-knee coordination plot (Figure 2.3) demonstrated a similar pattern, though less noticeable than ankle-hip coordination, in the late swing phase of the stride cycle.

Wallace et al.(2018) found barefoot walking had a significantly smaller impact force than walking in sandals and suggested that the attenuation of impact force was initiated by better exteroception provided by bare feet. Using continuous relative phase (CRP), Kurz & Stergiou (2004) estimated the foot-shank coordination pattern in barefoot running and found that the shank-foot coordination in stance phase was more out-of-phase in barefoot compared to shod. They (Kurz & Stergiou, 2004) suggested that the more out-of-phase coordination pattern in shank-foot modulated the impact force based on the perception of impact, which may be obtained through the mechanoreceptor of the foot given that they contribute to motor planning and movement control (Ackerley & Kavounoudias, 2015; Kennedy & Inglis, 2002; Lane et al., 2019). Experimental studies showed that people had better sensory function when barefoot (Robbins et al., 1995; Robbins et al., 1988). Individuals may adopt other movement strategies without the cushioning of athletic shoes to help absorb impact force at heel strike. The plantar fat pad is the natural shock absorber that dissipates the impact stress generated during walking (Campanelli et al., 2011). The ankle joint is more plantarflexed in the initial heel strike of barefoot walking than shod walking at CWS (Chard et al., 2013; Oeffinger et al., 1999). Our study confirmed this observation and further extended this observation to SLOW and FAST walking speeds (Table 2.1). A more plantarflexed position at the initial heel strike is expected to increase the contact surface area and thus decrease the stress. In addition, our study also found that coordination variability of ankle-hip in late swing at SLOW and CWS was significantly lower in barefoot with medium effect (Table 2.2). Coordination variability of ankle-hip in late swing at FAST was also lower in barefoot than shod; however, no significant difference was identified. Overall, the result of our study strongly suggests that the ankle-dominant coordination pattern in ankle-hip of barefoot during the late swing and the reduction of coordination variability in barefoot may be the consequence of intentional muscular control to prepare for the anticipated impact at the forthcoming heel strike.

The second hypothesis of this study was that coordination variability estimated in early stance, mid stance, late stance, and late swing phase was significantly different between barefoot and shod condition in the three speed-categories. In addition to the lower coordination variability of the ankle-hip couple in barefoot at the late swing phase, we also found a significantly lower coordination variability of the knee-hip couple in barefoot during mid-stance at both CWS and FAST. No significant differences were identified in other comparisons. Romer et al.(2019) found that barefoot walking significantly lowered the segmental coordination variability of the shank-foot couple but increased the coordination variability of the thigh-shank couple at CWS. The coordination variability in Romer et al.'s study (2019) was estimated across the entire strike cycle, which may not be an appropriate approach as coordination variability was likely to change across the stride cycle (Robertson et al., 2013). The conflict between the result of our study and that of Romer et al.(2019) may derive from methodological difference.

The reduction of coordination variability of knee-hip during mid-stance deserves more attention, as mid-stance is a weight-bearing phase and may carry more implications for future study. Khoury-Mireb et al.(2019) examined the gait variability when subjects wore unstable shoe designs, which were utilized to strengthen neuromuscular control. They (Khoury-Mireb et al., 2019) found that the variability of ankle moment was significantly decreased in unstable footwear and suggested that the decrease of variability was likely due to the compensatory strategy to control the dynamic stability of movement. Therefore, the decreased coordination variability in our study may be due to the same compensatory mechanism to control movement stability. Although variability and stability are two coupled phenomenon of human gait, the variability of movement is not entirely equivalent to the stability of movement (Granata & England, 2007). Stergiou & Decker (2011) claimed that the gait stability could only be estimated using non-linear metrics, such as the Largest Lyapunov Exponent or entropy. The stability of movement is significantly lower in barefoot running than shod running both in the short-term (Ekizos et al., 2017) and long-run (Hollander, Hamacher, et al., 2021) as estimated by the Largest Lyapunov Exponent. The change of stability, however, was not identified in barefoot walking (Hollander, Petersen, et al., 2021). These conflicting results indicates that the decrease of coordination variability in our study should not be interpreted as a change of stability during barefoot walking. In orthopedic biomechanics, the reduction of coordination variability was considered an unhealthy state related to overuse injury (Hamill et al., 2012). We think that the decreased coordination variability in the mid-stance observed in our study was unlikely to be the result of orthopedic conditions, as our subjects were healthy and free from medical conditions that influenced gait at the time of data collection. The reduction of coordination variability was theorized to increase the risk of joint wear and tear in the long term, as highly repetitive movement patterns can induce higher stress in the joint (Kumar et al., 2017). One alternative interpretation of the reduced coordination variability in our study, thus, is that humans accommodate developmentally to wearing shoes, and walking barefoot is, therefore, no longer necessarily "natural" for all people as has been suggested by some (Lieberman, 2012; Lieberman, 2013; Sichting et al., 2020). More research is necessary to understand the relation between the decreased coordination variability and joint stress during barefoot walking.

One of the challenges in this study was how to control the walking speed. A treadmill is a viable option, yet the treadmill can interfere with gait variability (Hollman et al., 2016). One method to control overground walking speed is metronome cueing, where a subject walks overground in a step rate deliberately matching with a predetermined beat. Metronome cueing, however, could decrease the gait variability (Wright et al., 2016). Self-selected walking speed has also been utilized in some gait studies (Chiu & Chou, 2012; Chiu et al., 2013; Hutin et al., 2012; Wang et al., 2021), in which subjects have maximum freedom to select their walking speed. Verbal instruction are commonly utilized in clinical practice of gait training and gait study to control walking speed (Lehman et al., 2005). Our study used verbal instruction to simulate three scenarios in daily life, allowing subjects to self-select their walking speed under each speed condition but also maintaining some control. We found no significant difference in walking speed between barefoot and shod within the same speed category, so the difference of coordination pattern between shod and barefoot within the same speed category is not affected by the walking speed. Also, all subjects walked at significantly different speeds between speed categories as instructed and walking speed variation at each test condition within the same subject is low (Figure 2.1). Overall, our method of using verbal instruction to control walking speed was successful.

There are several limitations to this study. First, although we purposely controlled the subjects to be female, young, and healthy, as gender (Boyer et al., 2017), age (Callisaya et al., 2010; Chiu & Chou, 2012; Skiadopoulos et al., 2020), and medical condition (Chiu et al., 2010; Moon et al., 2016) can influence coordination pattern and variability of gait, this decision limits the generalizability of this study. Future work should determine if the same effect of walking speed is observed in other populations. Second, although we identified interesting patterns in gait coordination, some of which have not been reported previously, our ability to understand these results was limited due to the lack of other measurements such as EMG or energy consumption. Further analysis is required to understand the relationship of gait coordination to other parameters such as anthropometrics, muscle activation, or energy expenditure.

2.6 Conclusion

Walking speed influences the difference in the ankle-knee and ankle-hip couples between barefoot and shod walking. As walking speed increases, the ankle-knee coordination pattern becomes less different, but the ankle-hip coordination pattern becomes more different. Compared to shod, barefoot walking has decreased coordination variability in mid-stance of knee-hip at CWS and FAST speed and in the late swing of the ankle-hip at SLOW and CWS speed. Future research should investigate the connection between the decreased coordination variability and joint tissue stress to understand the impact of barefoot walking on the lower extremity joints.

Chapter 3. PELVIC BREADTH, LIMB LENGTH AND PROPORTION ASSOCIATE WITH GAIT COORDINATION

3.1 ABSTRACT

Gait coordination is frequently examined to assess neuromuscular control in patients with medical conditions. Although the relation of lower limb dimensions with gait coordination was briefly discussed in the past, their relation remains unclear. This lack of knowledge may compromise the result of clinical gait studies. To bridge this knowledge gap, we examined the association of the lower limb dimensions with gait coordination. Coordination was estimated with the method of continuous relative phase (CRP) and vector coding (VC). We found that pelvic breadth and lower limb length were significantly associated with the thigh-shank and hip-ankle coordination estimated with CRP but not in the VC method. Crural index was a primary factor for hip-ankle coordination estimated with VC method. The adjusted r^2 range from 0.29-0.78 with the average of 0.50. Clinician researchers should test the difference in lower limb dimensions between treatment and control subjects and may also need to consider including the lower limb dimension parameters into the statistical model. The result of our study also brings new insights that were often overlooked in the neuromuscular control of gait.

3.2 INTRODUCTION

Human gait is a complex motor skill that requires coordination among different joints and limb segments that must be integrated into functional units (Robertson et al., 2013). The assessment of gait coordination can provide insight into the sequencing of neural circuits (Hamill et al., 1999) and explain the failure of motor system under pathological conditions (Krasovsky & Levin, 2010). Gait coordination is a sensitive indicator for the impairment of motor system compared to others (Awai & Curt, 2014; Gimmon et al., 2018; Meijer et al., 2011). Gait coordination, thus, is utilized extensively to assess the motor functions in patients with stroke (Daly Janis et al., 2012; Puentes et al., 2018), multiple sclerosis (Plotnik et al., 2020; Salehi et al., 2020), Parkinson's disease (Filippin et al., 2020; Williams et al., 2013), cerebral palsy (Fowler & Goldberg, 2009; Tavernese et al., 2016), concussion (Chiu et al., 2013; Chou et al., 2015), knee anterior cruciate ligament tear (Davis et al., 2019; Nematollahi et al., 2016), and knee osteoarthritis (Park et al., 2021; Wang et al., 2021).

Gait coordination can also be influenced by other factors, such as age (Chiu & Chou, 2012; Ihlen, 2014), footwear (Romer et al., 2019; Yu & Kramer, 2021), and walking surface (Ippersiel et al., 2021). As such, these factors should be taken into consideration when designing and reporting clinical gait studies. One factor whose impact on gait coordination has not been formally examined but may have a significant impact on the reliability of clinical gait studies is lower limb dimensions. It is theorized that the neuromuscular control of any movement, including gait, must rely on an internal representation of the spatial configuration of the body segment (Graziano & Botvinick, 2002; Head & Holmes, 1911) and take into account limb dimensions (Gandevia et al., 2002; Ivanenko et al., 2011; Pearson & Gramlich, 2010; Soechting & Flanders, 1989). The effect of lower limb dimensions on single joint kinematics and spatiotemporal parameters have been abundantly reported. For instance, crural index (the ratio of tibia to femur length) is positively associated with peak hip extension angle (Hill et al., 2021); lower limb length has a negative effect on hip flexion (Hora et al., 2017) but has a positive effect on the stride length (Gruss et al., 2017). The effect of lower limb dimensions on gait coordination, however, is less understood. Gait coordination and single joint kinematics are related to each other. For instance, the motion of the knee joint is an integral component of hip-knee and knee-ankle coordination. Based on the kinematic chain theory, the alteration of posture in a joint results in corresponding changes of posture in other joints in proximity (Houglum & Bertoti, 2011), thus possibly leading to a different coordination pattern.

In addition to the inter-joint coordination, such as hip-knee coordination, gait coordination can also be estimated with inter-segmental coordination such as thigh-shank coordination. Dominici et al.(2009) found that a patient who had a surgical elongation of the tibia demonstrated an altered thigh-shank coordination pattern compared to pre-surgery. This alteration of thigh-shank coordination, however, was suggested based on the visual comparison and thus no direction of alteration was specified in the report (Dominici et al., 2009). Ivanenko et al.(2007; 2008) also suggested that limb length played a role in the inter-segmental coordination among thigh, shank, and foot segments. They conducted an exploratory analysis only, so hypothesis testing was not performed. No studies have rigorously examined the association between lower limb dimensions and gait coordination. Coordination of movement reflects the self-optimization of the motor system in response to anatomic constraints (Sparrow & Newell, 1998). Examining inter-segmental and inter-joint coordination, thus, may provide a unique perspective to understand the relationship between limb dimensions and the neuromuscular control of gait. It is also of concern that any potential association between limb dimensions and gait coordination may compromise the reliability of clinical gait studies.

The primary purpose of this study is to determine the extent to which lower limb length, femur and tibia length, pelvic breadth, and crural index are associated with gait coordination. Five coordination couples are estimated, including thigh-shank, shank-foot, hip-knee, hip-ankle, and knee-ankle, all of which are examined frequently in clinical gait studies (Park et al., 2021; Wang et al., 2019; Wang et al., 2021; Yi et al., 2016). Because the influences of lower limb dimensions on single joint kinematics are mainly reported in the sagittal plane, only gait coordination in the sagittal plane is examined in this study. We estimate the gait coordination with two methods: continuous relative phase (CRP) and vector coding (VC) methods. Due to the different algorithm utilized in two methods, it is suggested that comparing the results from CRP and VC methods should be performed cautiously (Miller et al., 2010). The secondary purpose of this study, thus, is to determine whether the association between lower limb dimension and gait coordination depends on the method used to assess gait coordination.

3.3 METHODS

3.3.1 *Study Design*

We conducted a secondary data analysis of data derived from three previous studies that were approved by the University of Washington Institutional Review Board (IRB No.: HS#40172, HS#27902, HS#39488). These three research studies were selected due to their similar experiment protocols, which also matched the aim of this current study. All three experiments were initially conducted in the Human Motion Analysis Lab (HMAL) at the University of Washington and supervised by the same PI (PAK). All subjects had reflective markers on both left and right sides, as appropriate, on anatomical landmarks of lower extremities (greater trochanter of femur, lateral/medial side of knee joint space, tibial tuberosity, lateral/medial malleolus of the ankle, Achilles tendon insertion on the calcaneus, and between the 2nd and 3rd metatarsal heads). HMAL was equipped with six high-speed cameras (Qualisys, Inc, Sweden) and an embedded force platform (Kistler, USA). All subjects performed a stance trial before any walking trials and then walked straight on an 8-meter walkway at a self-selected comfortable walking speed. The walking speed was controlled using verbal instruction:“ walk at your normal pace. You have somewhere to go, but you are not in a hurry.” The verbal description was delivered to the subjects consistently, but subjects self-selected their own speed. Each subject completed ten successful trials. A successful trial was defined as the subject’s foot fully stepping on the force platform while research staff observed from the side to make sure the subject did not aim at the force platform.

Subjects with 1) age > 50, 2) current or in the previous two years medical conditions that may affect gait at the time of data collection, and 3) BMI > 30 were excluded. The exclusion criterion of BMI was to eliminate the potential effects of body weight on locomotion (Gruss, 2007; Gruss et al., 2017; Hora et al., 2017). After applying exclusion criteria, 67 healthy subjects (48 females and 19 males) were included in the study.

3.3.2 *Lower Limb Dimensions Measurement*

The lower limb dimensions that are utilized include femur length, tibia length, bi-trochanteric breadth (BTB), lower limb length (LLL) and crural index (Table 3.1). Femur and tibia length and BTB were measured using the 3D position of reflective markers on the anatomical landmarks during the stance trial. LLL and crural index were derived based on measurement of tibia and femur length. Pelvic breadth is ideally estimated using the bi-acetabular breadth; however, bi-acetabular breadth can only be measured from imaging, such as radiograph, which was not available for the sample. BTB is strongly correlated with bi-acetabular breadth (Warrener et al., 2015) and is also utilized in other studies to indicate pelvic breadth (Gruss et al., 2017). BTB, therefore, was used as a proxy in this study for pelvic breadth.

Table 3.1. Lower limb dimension measurement

Lower Limb Dimensions	Definition
Femur length (unit: cm)	distance between the marker position of greater trochanter of the femur and lateral knee joint.
Tibia length (unit: cm)	distance between the marker position of medial knee joint space and medial malleolus of the tibia.
BTB (unit: cm)	distance between the marker position of the greater trochanter of the left and right femur
LLL (unit: cm)	addition of femur and tibia length
Crural index (unitless)	ratio of tibia to femur length

3.3.3 *Joint/segment Kinematics*

Marker data was smoothed using a low-pass, second-order Butterworth filter with a cutoff frequency of 8 Hz. Then, sagittal plane joint angle (hip, knee, and ankle) and segment angle (thigh and shank) were estimated and then interpolated to 100% stride cycle. The stride cycle that included GRF within each trial was extracted for further analysis. In this study, the hip joint angle was defined as thigh movement relative to vertical (0°) and was independent of pelvic motion. Hip joint angle and thigh segment angle, therefore, were considered the equivalent in this study. Shank segment angle was also defined as the tibia movement relative to vertical (0°). The knee joint was defined as the relative angle between thigh and shank, and the ankle joint was defined as the relative angle between shank and foot. A 0° was considered as the neutral position for the ankle joint and the full extension for the knee joint. Joint/segment angles were calibrated using the measurements obtained from the quiet standing trial.

We extract the five gait phases, including loading-response, mid-stance, terminal-stance, pre-swing and swing, from the entire stride cycle. The Initial contact (IC) was firstly identified using a 10N threshold from the vertical ground reaction force (GRF) collected from the force platform. In this study, the 10N was sufficiently sensitive to detect the event of IC (onset of stride cycle) and the toe-off (termination of stance) and robust to accommodate the noise in the data. Loading-response was defined as the duration between the IC and first vertical peak (VP1) of GRF (Perry et al., 2010). The mid-stance was defined as the duration between the VP1 and heel rise of the ipsilateral foot (in terms of the initial heel strike foot) (Perry et al., 2010), which was detected when the velocity of the vertical component of the heel mark surpassed 100 mm/second (Ghoussayni et al., 2004). The terminal-stance was defined as the duration between heel rise and heel strike of the contralateral foot (Perry et al., 2010). Because experimental data only contain one force platform (thus only collect the GRF in one stance phase), heel strike of the contralateral foot and the termination of strike cycle were identified as the lowest position of heel mark in the vertical direction. Pre-swing was the rest of stance phase, and swing was the rest of the stride cycle with the exclusion of stance phase.

To associate the result of this study with previous insights (Gruss, 2007; Hill et al., 2021; Polk, 2002, 2004), we extracted the knee flexion angle at IC, VP1, and second vertical peak of GRF, hip flexion angle at IC, hip range of motion (ROM), shank angle at IC, and shank ROM and examined their correlation with lower limn dimension using Pearson's Correlation. The correlation coefficient among these variables in this study is negligible (0.00 to ± 0.30) based on the recommendation from Hinkle et al.(2003), so the correlation analysis is not reported.

3.3.4 *Continuous Relative Phase (CRP)*

The continuous relative phase method is based on the displacement-velocity algorithm (Hamill et al., 1999; Miller et al., 2010), which required the time series of joint angle and segment angle to be sinusoid-like (Wheat & Glazier, 2006). Thigh, hip, and shank angle satisfied requirement of sinusoidal shape, while knee and ankle did not. Empirical mode decomposition (EMD), therefore, was applied to the time series of knee and ankle angle so that they conformed to the sinusoidal assumption (Huang et al., 1998). The component phase angle(ϕ) was defined from 0° to 360°. The first data point of angular velocity was obtained with the method of three-point forward difference; the last data point of angular velocity was obtained with the method of three-point backward difference; the rest of the data in the middle of angular velocity was obtained with the method of two-point central difference (Subramaniam & Gilat, 2014). The phase difference was calculated by subtracting the component phase angles of the distal segment/joint from those of the proximal segment/joint (thigh-shank: ϕ_{thigh} - ϕ_{shank}; shank-foot: ϕ_{shank} - ϕ_{foot}; hip-knee: ϕ_{hip} - ϕ_{knee}; hip-ankle: ϕ_{hip} - ϕ_{ankle}; knee-ankle: ϕ_{knee} - ϕ_{ankle}). A phase difference value of 0° indicates perfectly in-phase coordination between joints or segments. As values deviate away from 0°, coordination becomes more out of phase. A positive phase difference indicates that the proximal segment/joint leads to the distal segment/joint, meaning that the component phase angle of the proximal segment/joint precedes that of the distal segment/joint. A negative value of phase difference can be explained oppositely. We then obtained the mean phase difference (MPD) within each gait phase (loading-response, mid-stance, terminal-stance, pre-swing, and swing).

3.3.5 *Vector Coding (VC)*

Gait coordination was also estimated with the VC method based on Sparrow et al.(1987) and Chang et al.(2008). First, a phase plane, in which two joint angles were plotted against each other, was constructed. In the present study, the distal joint was placed on the horizontal axis, and the proximal joint was placed on the vertical axis. The coordination pattern in the VC method was indicated by the coupling angle (in degree), which was calculated between the directional vector of the trajectory and the right horizontal axis in the counterclockwise direction for all time increments. Then, we assigned each data point within the coupling angle time series to four distinct categories: 1) in-phase, 2) anti-phase, 3) phase of the proximal joint/segment and 4) phase of the distal joint/segment. Taking the hip-ankle couple as an example, in-phase indicates that the ankle dorsiflexes while the hip flexes or the ankle plantarflexes while the hip extends; anti-phase indicates that the ankle dorsiflexes while the hip extends, or the ankle plantarflexes while the hip flexes; ankle phase indicates that the ankle motion dominate over hip; hip phase indicates that the hip dominate over ankle. The frequency (count) in each of the four distinct regions was utilized for hypothesis testing.

3.3.6 *Statistical Analysis*

The number of male subjects did not meet the assumption of normality for the parametric t-test, so the nonparametric Wilcoxon rank-sum test was used to compare lower limb dimensions between males (n=48) and females (n=19). Because gait coordination in this study was estimated with both CRP and VC, and each method has a different structure, the hypothesis testing for the two methods were conducted with different models and, thus, are discussed separately. The analysis was performed on pooled subjects (n= 67).

For gait coordination estimated with CRP, we constructed a linear mixed effect model (LMM) with MPD of thigh-shank, shank-foot, hip-knee, hip-ankle, and knee-ankle coordination couple in each phase of stride cycle as a dependent variable to test for the association of lower limb dimensions (with significance set at $\alpha = 0.05$). We selected LMM over other models because LMM provides as interpretable result as linear regression does but also takes subject random effects into account (as each subject completed 10 trials in the study).

For gait coordination estimated with the VC method, the count of each category of coordination patterns (such as in-phase, anti-phase, hip-phase, and ankle-phase in the hip-ankle coordination) are treated as an outcome variable for hypothesis testing. We constructed a multinomial logistic regression model (MLRM) to test the association between the outcome variable (count of each category) and explanatory variables (lower limb dimension). The four categories of coordination patterns are mutually exclusive (i.e., a data point within the coordination time series cannot be categorized into more than one region). Moreover, the count of four categories is always summed to 100. There is a competing effect, therefore, among four categories of coordination patterns (i.e., when the count value of one category increases, necessarily at least one other category decreases). As a generalization of the logistic model, MLRM allows modeling a polychotomous dependent variable in the form of counts that have a pre-determined sum and can account for subject random effect as LMM does. MLRM, thus, satisfies all these requirements and is superior to other statistical models in this regard.

All explanatory variables in the LMM and MLRM were standardized (mean of 0 and standard deviation of 1) before the hypothesis testing so that the estimated coefficient was on the same scale, making it easier to compare. We performed the analysis of all possible models using CRP (Appendix A) and VC (Appendix B) and then retained models with all its explanatory variables that were significantly associated with outcome variables. The goodness of fit measures (adjusted r^2, BIC and AIC) were extracted from each model and displayed for the comparison among models. Wilcoxon rank-sum test, LMM were performed in MATLAB (version R2020); MLRM was performed in R (version 3.6.3) with the mclogit package.

3.4 RESULT

Lower limb dimensions are summarized in the boxplot (Figure 3.1). A significant difference was detected in the crural index (p=0.036, M > F) between males and females. No significant difference was detected in BTB, femur length, tibia length, and LLL.

For gait coordination estimated with CRP, Lower limb dimensions are significantly associated with MPD for hip-ankle (Table 3.2) and thigh-shank coordination (Table 3.3) at loading response and mid-stance. No other significant association was identified in other CRP analyses.

For gait coordination estimated with VC, lower limb dimensions are significantly associated with the comparison between the ankle phase and hip phase for hip-ankle coordination (Table 3.4). No significant association was identified in other coordination couples.

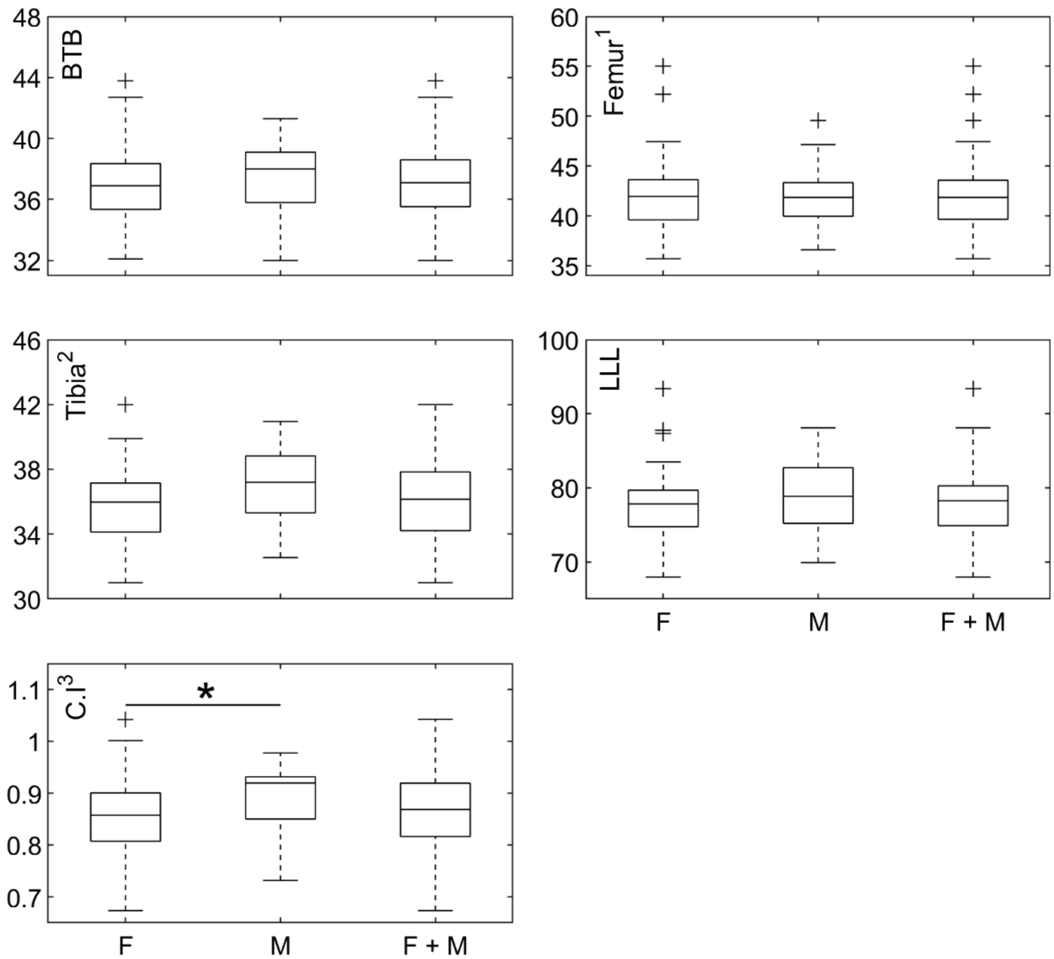

Figure 3.1: Summary of lower limb dimensions. The unit of the vertical axis for subplots in the top row and the middle row is centimeters. The vertical axis for the subplot in the bottom row is unitless. [1]Femur: Femur length; [2]Tibia: Tibia length;[3]C.I: Crural index; [4]F:Female; [5]M: Male; [6]F+M: all subjects; +: outlier; *: $p < 0.05$.

Table 3.2: Association in hip-ankle coordination (CRP method).

Gait phases	Number[1]	Explanatory variables (coefficient/p-value)	Adjusted r^2	AIC	BIC
Loading-Response	1	BTB (11.13/0.025)	0.542	6703	6711
	1	Crural index (-10.29/0.038)	0.542	6704	6722
	2	BTB (11.99/0.013) Tibia length (-10.56/0.028)	0.541	6701	6724
	2	Femur length (21.35/0.030) LLL (-21.68/0.028)	0.541	6706	6728
	2	BTB (12.50/0.009) Crural index (-11.74/0.014)	0.541	6700	6722
	3	BTB (12.75/0.007) Femur length (24.73/0.009) LLL (-24.44/0.009)	0.541	6701	6728
Mid-stance	1	Femur length (6.28/0.028)	0.291	6461	6478
	3	Femur length (-106.15/0.038) LLL (87.81/0.028) Crural index (-57.52/0.027)	0.289	6460	6487

[1]Number of explanatory variables in the model.

Table 3.3: Association in thigh-shank coordination (CRP method).

Gait phases	**Number**[1]	**Explanatory variables (coefficient/p-value)**	**Adjusted r^2**	**AIC**	**BIC**
Loading-Response	1	BTB (9.52 / 0.046)	0.527	6671	6689
	1	Crural index (-9.82 / 0.038)	0.528	6671	6689
	2	BTB (10.83 / 0.019) Crural index (-11.07 / 0.016)	0.527	6668	6690
	2	Femur length (19.88 / 0.035) LLL (-19.07 / 0.044)	0.527	6673	6695
	3	BTB (11.04 / 0.017) Femur length (22.80 / 0.013) Crural index (-21.46 / 0.019)	0.526	6669	6696
Mid-stance	1	LLL (-19.07 / 0.044)	0.777	5121	5139

[1]Number of explanatory variables in the model.

Table 3.4: Association in gait coordination (VC method).

Comparison	Number[1]	Explanatory variables (coefficient[2] / p-value)	Adjusted r^2	AIC	BIC
Ankle-phase vs. Hip-phase[3]	3	LLL (1.46 / 0.0143) Crural index (-1.01 / 0.009) Femur length (-1.90 / 0.013)	na[4]	2838	2892
Ankle-phase vs. Hip-phase[3]	3	Femur length (-0.86 / 0.011) Tibia length (0.77 / 0.014) Crural index (-1.01 / 0.009)	na[4]	2838	2892
Ankle-phase vs. Hip-phase[3]	3	LLL (-1.22 / 0.011) Tibia length (1.41 / 0.013) Crural index (-1.01 / 0.009)	na[4]	2838	2892

[1] Number of explanatory variables in the model.
[2] Coefficient in the MLRM is log odds.
[3] Hip-Phase is the reference category for hip-ankle coordination: log (probability of ankle-phase / probability of hip-phase).
[4] Adjusted r^2 is not available in MLRM.

3.5 DISCUSSION

This study examines the association of lower limb dimensions (femur length, tibia length, LLL, pelvic width, and crural index) with gait coordination (thigh-shank, shank-foot, hip-knee, hip-ankle, and knee-ankle coordination). Gait coordination was estimated with continuous relative phase (CRP) and vector coding (VC). Our first hypothesis was that there was an association between lower limb dimension and gait coordination. We found that lower limb dimensions are significantly associated with thigh-shank coordination and hip-ankle coordination. No association was identified in other coordination couples.

BTB was utilized as a proxy variable for pelvic breadth in this study and is associated with hip-ankle (Table 3.1) and thigh-shank coordination (Table 3.2) at loading-response for coordination estimated with the CRP method. The mean phase difference (MPD) for thigh-shank coordination was primarily negative, suggesting that shank lead thigh at loading-response (Figure 3.2). The positive coefficient for BTB indicates that the phenomenon of shank-leading-thigh becomes less apparent, and thigh-shank coordination trends toward in-phase coordination as pelvic width increases. MPD for hip-ankle coordination was primarily positive (Figure 3.2), suggesting that the hip leads the ankle at loading-response. The positive coefficient for BTB indicates that the hip-ankle coordination becomes more out-of-phase as pelvic width increases. The coefficient of BTB fluctuates minimally from the univariate model to multivariate models (Table 3.1 & 3.2), so we suggest that BTB is independent of other explanatory variables and is a primary factor for thigh-shank and hip-ankle coordination at loading-response. Given that transverse rotation of the pelvis is critical in walking but the maximal pelvic transverse rotation occurs at initial contact (Houglum & Bertoti, 2011), which may explain why BTB is not a significant factor for mid-stance, despite its strong association with loading-response.

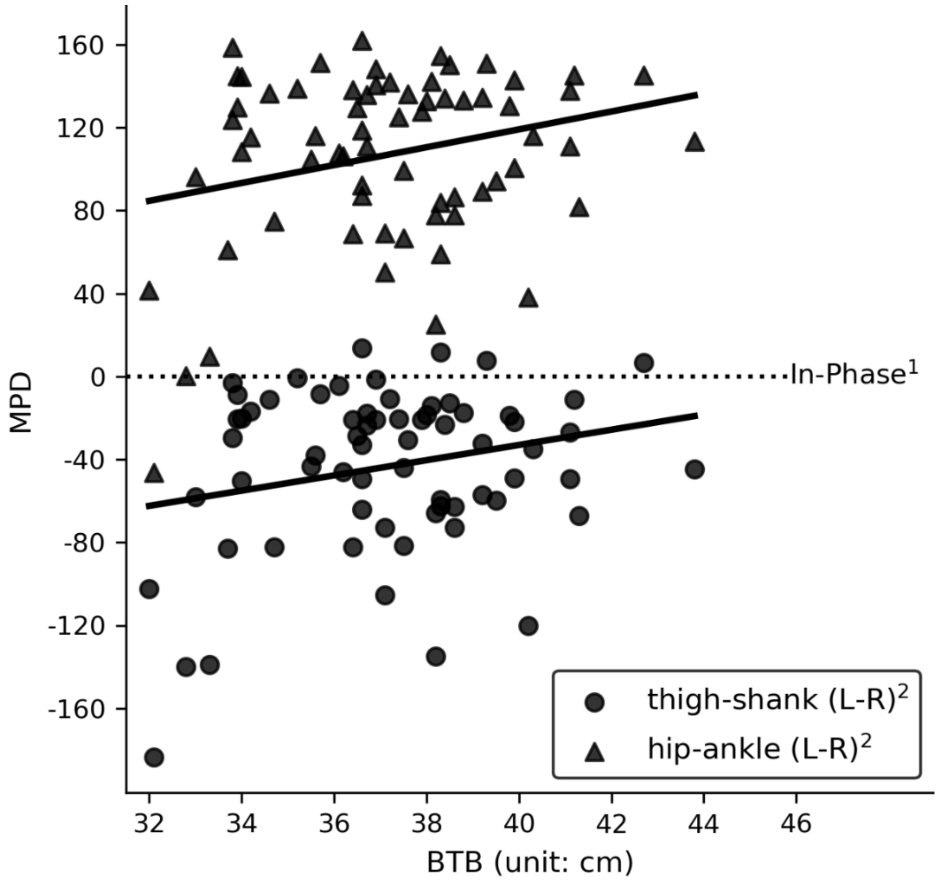

Figure 3.2. BTB vs. MPD in thigh-shank and hip-ankle coordination. [1]In-Phase: dashed line refers to the in-phase; [2]L-R: loading response.

BTB, nevertheless, was not associated with hip-ankle coordination and any coordination couples estimated with the VC method. CRP is less interpretable but more sensitive to the small differences in gait coordination than the VC method (Robertson et al., 2013). One possible reason why CRP is more sensitive than VC is that the displacement-velocity algorithm utilized in the CRP method takes both spatial (angular displacement) and temporal information (angular velocity) into account, whereas VC only contains spatial information (Wheat & Glazier, 2006). Coordination of movement is characterized by appropriate direction, position, and velocity of limb and joint (Schmitz et al., 2014). Neglecting the contribution of angular velocity to gait coordination, thus, is likely to lower down the sensitivity to a difference in gait coordination due to the variation in lower limb dimension. Rak (1991) hypothesized that a wider pelvis is an advantage in walking, as the transverse rotation of the wider pelvis leads to the longer stride length without increasing hip ROM. It is unclear, however, if the wider pelvis is advantageous in terms of hip-ankle and thigh-shank coordination, as the MPD only indicates whether a wider pelvis leads to a more in-phase or out-of-phase coordination pattern between joints/segments. What does seem clear is that, although the spatial information of the hip joint is not altered, the temporal information of the hip joint and thigh segment angle is altered due to the transverse motion of the pelvis. This difference in the algorithm, thus, may explain the reason why BTB is associated with gait coordination pattern in the CRP method but not in the VC method.

LLL is also a significant factor for hip-ankle coordination at loading-response and mid-stance (Table 3.1) and thigh-shank coordination at mid-stance in CRP (Table 3.2). Its associations with MPD can be interpreted similarly to BTB (Figure 3.3). The influence of LLL on knee joint biomechanics at the stance phase of gait has been previously considered. Gruss (2007) found that LLL was negatively correlated with knee flexion angle but was not correlated with the anterior-posterior bending moment at late stance (equivalent to terminal stance + pre-swing in this study); LLL was not associated with knee flexion angle but positively associated with the anterior-posterior bending moment at early stance (equivalent to loading response in our study). This result (Gruss, 2007) is consistent with the theory proposed by Polk (2002, 2004) and Lovejoy (Lovejoy, 2005b), which claim that the more extended knee posture in all primates with relatively long legs was a neuromuscular control strategy to moderate the bending moment at the knee. Observing relationship between LLL and a more extended knee joint posture gives little information, however, on how thigh and shank coordinate to achieve this posture and the potential influence of LLL on thigh-shank coordination. The current study found the association between LLL and thigh-shank coordination exists at loading-response and mid-stance but not at terminal-stance, pre-swing and swing. Unlike previous studies, the correlation of lower limb dimensions, including LLL, with knee angle at IC, VP1, and VP2 in this study is negligible. The thigh-shank coordination and correlation analysis performed in this study suggest that gait coordination is not a simple superposition of single joint kinematics, and the effect of lower limb dimensions on knee joint posture does not necessarily translate into thigh-shank coordination. While joint moments in the lower extremity can affect neuromuscular control of locomotion (Biewener & Daley, 2007), gait coordination may be more sensitive to the different joint moments due to varied LLL. This interpretation, however, is speculative and warrants future research effort to understand the relation between knee joint moment and thigh-shank coordination at the stance phase of gait.

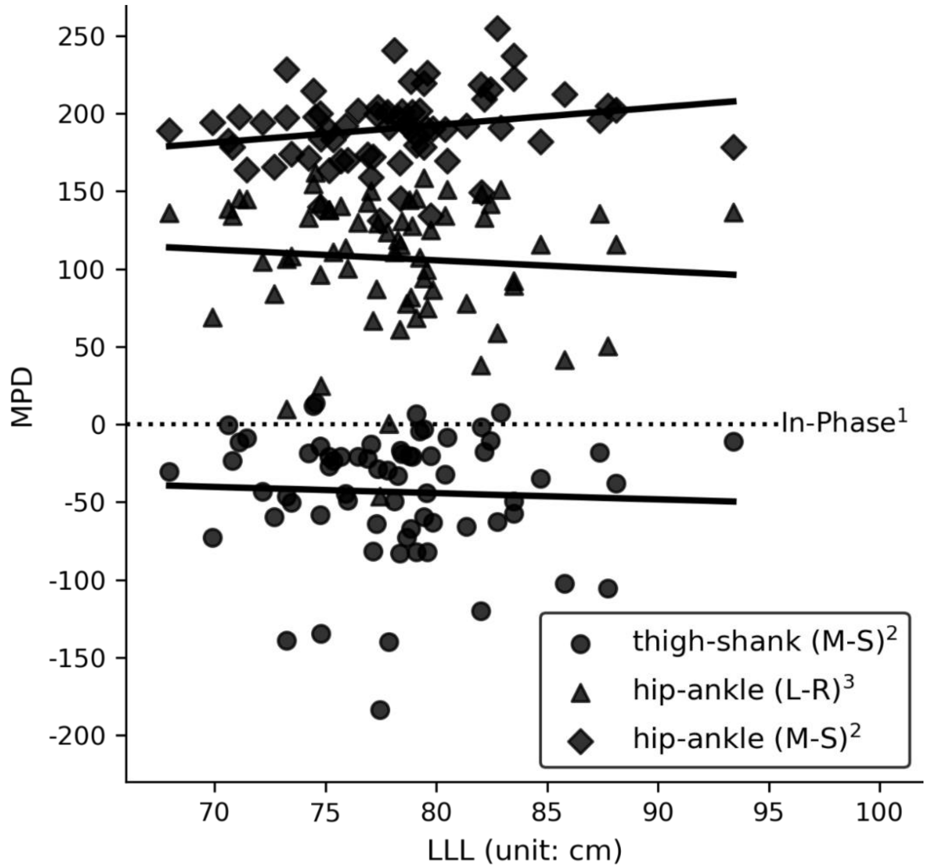

Figure 3.3. LLL vs. MPD in thigh-shank and hip-ankle coordination. [1]In-Phase: dashed line refers to the in-phase; [2]M-S: loading-response. [3]L-R: loading-response.

LLL seems to be associated with the comparison of ankle-phase vs. hip-phase in hip-ankle coordination estimated with VC (Table 3.3). The coefficient for LLL was 1.46 when LLL was with crural index and femur length in the model, which means that, with a one-centimeter increase in the LLL, the odds of being the ankle-phase was 4.31 ($e^{1.46} \approx 4.31$) times that of hip-phase, indicating that longer LLL would favor ankle-phase over hip-phase. The odds of being in ankle-phase is 0.30 ($e^{-1.22} \approx 0.30$) when LLL was combined with crural index and tibia length in the model, indicating that, however, longer LLL would favor hip-phase over ankle-phase. The association of LLL disappeared when femur length and tibia length were both included in the model. Those conflicting results, thus, suggest that the association of LLL with hip-ankle coordination in the VC method is dependent on the femur and tibia length, and LLL is not a significant factor for hip-ankle coordination. Crural index, on the other hand, has the same coefficient (-1.01) across all models, so we suggest that crural index is an independent and primary factor associated with the comparison between ankle-phase and hip-phase in hip-ankle coordination. The odds of being ankle-phase is 0.36 ($e^{-1.01} \approx 0.36$), indicating a larger crural index would favor hip-phase over ankle-phase.

The association of lower limb dimensions, such as crural index, with the comparison between ankle-phase and hip-phase in hip-ankle coordination, has some interesting implications. Ivanenko (2007) suggested that limb length and orientation of thigh and shank specified basic limb movement in modular control of limb kinematics, whereas the foot segment was involved in the endpoint control separately. Hicheur et al.(2006), on the other hand, demonstrated that the modular control of limb kinematics mainly arises from the strong correlation between foot and shank, whereas thigh contributes to the modular control independently. Biewener (2016) considered the proximal muscle/limb function to modulate the majority of work in locomotion.

In the current study, the hip angle is de facto thigh elevation angle, and the ankle angle is the relative angle between shank and foot segment. The hip-ankle coordination, therefore, may bear similar information as the inter-segmental coordination of thigh-shank-foot. Whether human gait should be characterized as proximal control or endpoint control remains open to debate, but our study suggests that the lower limb dimension parameters, such as crural index, tend to modulate the control pattern of gait. The hip-ankle coordination in the sagittal plane estimated in this study, however, is not equivalent to the modular control of inter-segmental coordination, and more research effort is necessary to understand the relation between the two concepts.

One of the motivations of this study was the concern of whether lower limb dimensions would compromise the reliability of clinical gait studies that utilized gait coordination to assess neuromuscular function. The result of our analyses confirmed this concern. The adjusted r^2 for gait coordination estimated with the CRP method range from 0.29-0.78 (Table 3.2 & 3.3). With such higher proportion of variance being explained by lower limb dimensions alone, clinician researchers should test and compare the differences in lower limb dimensions between treatment and control and report this result in publication, so readers will be aware of this possible interference. Clinician researchers may also consider including lower limb dimensions as explanatory variables into the statistical model even when the lower limb dimensions are not the interest of the study. We believe this recommendation can greatly improve the reliability of the gait coordination method utilized in clinical gait studies.

An ideal way to control for the possible influence of lower limb dimensions on gait coordination is to match lower limb dimension parameters between treatment and control subjects. Pelvic width should be controlled in this way, especially when researchers choose to estimate gait coordination with the CRP method. The association between gait coordination with femur length, LLL, and crural index are difficult to distinguish from each other and the relationships among them remain unclear in this study. We, therefore, are unable to provide a recommendation regarding whether femur length, LLL, or crural index should be controlled when designing clinic studies. A more specific study design is necessary to answer this question in the future.

We conducted a secondary data analysis to achieve the aim of this study. This study design is convenient and has an advantage in a large sample size. Furthermore, the consistency of the data is ensured, as all the data sets were merged from several previous experiments that were supervised by the same principal investigator (PAK). While gait coordination was not an initial outcome variable of interest, understanding the mechanics of walking was a central goal of the initial study design. To accommodate the current study design, we measured the lower limb dimensions using the position of reflective markers attached to anatomical landmarks during the stance trial. Measuring anthropometrics with reflective markers, however, may increase the risk of measurement error. For instance, the average crural index in this study is 0.86 ± 0.07 for pooled subjects, 0.85 ± 0.07 for females, and 0.89 ± 0.07 for males, all of which are higher than previous reports. Several outliers also exist in the female group (Figure 3.1). The outliers and higher crural index are possibly the true characteristics of the subjects in this study. Another possibility, however, is measurement error as anthropometric measurements are usually conducted via direct measurement using anthropometric calipers. Although we controlled the body weight by excluding subjects who have BMI > 30, some subjects may have a higher thickness of adipose tissue around the anatomic landmark than others. While the effect of adipose tissue on joint angle estimation was controlled through the calibration technique in this study, it is difficult to calibrate the lower limb dimension measurement based on the current information we had. Although the lower limb dimensions were measured consistently, it may be difficult to compare the result of our study with others with different measurement protocols.

3.6 CONCLUSION

This study examined the association of LLL, femur length, tibia length, BTB, and crural index with gait coordination. We found that hip-ankle and thigh-shank coordination are associated with lower limb dimensions. The association between lower limb dimensions and gait coordination is also dependent on gait coordination methods. Although the possible effect of anthropometrics on gait coordination could be inferred from previous research, our study is the first one, to the best of our knowledge, that rigorously tests the association of anthropometrics on gait coordination.

Chapter 4. CAN LOWER LIMB DIMENSIONS MODULATE MOTOR STRESS IN NON-OPTIMAL WALKING SPEED?

4.1 ABSTRACT

The energy expenditure of walking is minimized when individuals ambulate at a comfortable walking speed (CWS). Its exact mechanism, however, is unsure and several theories are proposed. In 1998, Sparrow and Newell suggested that the minimization of energy expenditure is implemented through a set of movement coordination patterns, and the anatomical configuration can affect the coordination pattern by modulating the motor stress when walking at non-CWS (non-optimal walking speed). Here, we test this hypothesis by addressing the following question: can lower limb dimensions modulate the motor stress at non-CWS? To answer this question, we examine the gait coordination pattern in 67 healthy subjects at CWS, slow walking speed (SWS), and fast walking speed (FWS), and examine the association between lower limb dimensions and the similarity of gait coordination patten between CWS and SWS or FWS. Our study showed that crural index is negatively associated with the similarity of hip-knee coordination between CWS and FWS, and BTB/LLL (pelvic breadth divided by total lower limb length) is negatively associated with the similarity of shank-foot coordination between CWS and SWS. The mechanism of speeds lower than comfortable, however, may derive from the increasing demand for foot clearance rather than the minimization of energy expenditure through the implementation of a more similar coordination pattern.

4.2 INTRODUCTION

Our previous work (Chapter 3) demonstrated that lower limb dimensions, such as pelvic breadth and crural index, were associated with hip-ankle and thigh-shank coordination. Although the influence of lower limb dimensions on gait coordination was implied in other literature works, our study is the first of its kind that rigorously assesses the association between lower limb dimensions and gait coordination, and provides empirical evidence supporting this association.

Gait coordination in our previous work (Chapter 3), as in other gait studies (Fernández Menéndez et al., 2019; Lenz, 2012; Moran et al., 2015) was examined at a self-selected comfortable walking speed (CWS). CWS among people is physiologically equivalent: humans tend to ambulate at or near a CWS to minimize the energy expenditure of walking (Raffalt et al., 2017; RALSTON, 1958; Zarrugh et al., 1974). CWS, thus, is also referred to as the optimal walking speed, and walking at a non-optimal speed, such as slow walking speed (SWS) and fast walking speed (FWS), increases energy expenditure. Although the tendency of minimizing energy expenditure at CWS seems to be established over an evolutionary timescale (Rodman & McHenry, 1980; Sockol et al., 2007), i.e., over millions of years, CWS is also related to the nervous system of control (Abram et al., 2019; Selinger et al., 2015; Wong et al., 2019).

Motor control scientists Sparrow and Newell (1998) proposed a constraints-based model for movement economy (CME) to understand the relation between energy expenditure and movement regulation. CME takes a systems view of human movement and claims that humans prefer to accomplish a motor task with the least energy expenditure through a set of movement coordination patterns. Movement coordination is the selective activation of degrees of freedom in such a combination that their united action will result in smooth and efficient motor activity (Weiss, 1941). A recent experimental result also supports the relation between energy expenditure and movement coordination (Taylor & Faisal, 2018).

According to the CME model, the minimization of energy expenditure at CWS is related to an individual's comfort mode (e.g., comfortable walking and running speed), and an energetic penalty will be imposed with the alteration of coordination patterns when the intensity of the motor task deviates away from the zone of comfort mode. The magnitude of the energetic penalty, nevertheless, is not the same for everyone, as individuals have different anatomical capacities to accommodate the deviation of comfort mode. At the walk-run transition speed (1.9-2.1 m/s), an individual undergoes a reorganization of coordination patterns (Beuter & Lefebvre, 1988; Thorstensson & Roberthson, 1987) and tibia and femur length are positively correlated with walk-run transition speed (Hreljac, 1995). People usually do not ambulate at walk-run transition speed in their daily life. It is unclear, however, whether or not gait coordination patterns can be influenced by the interaction between lower limb dimensions and walking speed that is between CWS and the walk-run transition speed. Furthermore, no related studies examine the relation between limb dimension and gait coordination at SWS.

This lack of knowledge in the relation among walking speed, lower limb dimensions, and gait coordination may also potentially compromise the reliability of clinical gait studies. The ability to walk fast is a functional vital sign (Middleton et al., 2015). Muscle activation is much higher when people walk at SWS and FWS compared to CWS (Sousa & Tavares, 2012). Examining the gait characteristics, such as gait coordination, at SWS and FWS and comparing it with at CWS may better reflect the function of motor control in patients with neurological and orthopedic disorders. Movement coordination generally deteriorates with aging (Schmitz et al., 2014). Chiu & Chou (2012) compared the similarity of gait coordination patterns at SWS, CWS, and FWS in young and elderly individuals and found that different neuromuscular control strategies to cope with the change of walking speed were used. Hutin et al.(2012) found that patients with hemiparesis after stroke demonstrated a higher level of synchronization in shank-foot coordination at FWS than CWS and suggested that gait training with FWS may bring additional benefits for the poststroke rehabilitation. The proper use and understanding of the gait coordination method are critical so that the clinical recommendation based on the analysis of gait coordination would not be misleading. Based on the CME model, individuals with advantages in certain lower limb dimensions may demonstrate a more similar coordination pattern between CWS and FWS or SWS. The adjusted r^2 in our previous work (Chapter 3), where the association between lower limb dimensions and gait coordination at CWS was examined, ranged from 0.29 to 0.78 with an average of 0.5, indicating that half of the variance in thigh-shank and hip-ankle coordination at CWS can be explained by lower limb dimensions alone. The anatomical capacity, as described in the CME model, is not limited to the longitudinal dimension of the limb segment (Cavanagh & Kram, 1985). Should the lower limb dimensions be associated with the similarity of coordination pattern at CWS and FWS/SWS, it is still unclear what the relative importance of lower limb dimensions is.

This study builds on previous work and aims to understand the relation among lower limb dimension, gait coordination, and walking speed based on the CME model. The gait coordination will be examined at three different speed categories, including SWS, CWS, and FWS. With the cross-correlation coefficient, we characterize the similarity of gait coordination patterns between speed categories, i.e., CWS vs. FWS and CWS vs. SWS, to test the hypothesis that an association between lower limb dimensions and the similarity of coordination patterns exit.

Lower limb dimensions, including pelvic breadth, lower limb length (LLL), crural index, femur, and tibia length, all of which were major associating factors for gait coordination at CWS in our previous study, are also examined in this study. The pelvic breadth may play an important role in people with shorter LLL to increase walking speed (Gruss et al., 2017; Rak, 1991), so we divide pelvic breadth by LLL (BTB/LLL) and add BTB/LLL as an additional variable. The pattern of four coordination couples will be analyzed, including thigh-shank, shank-foot, hip-knee, and knee-ankle. Gait coordination is estimated using the method of continuous relative phase, which is more sensitive to the change of coordination pattern than others (Wheat & Glazier, 2006).

4.3 METHODS

4.3.1 *Study Design*

The study design and subjects are generally the same as in our previous work (Chapter 3). A summary and additional relevant information follow.

A retrospective secondary data analysis was conducted to achieve the aims of the study. The data was from three previous studies that were approved by the University of Washington Institutional Review Board (IRB No: HS# 27902, HS# 39488, HS# 40172). These three research studies were selected due to their similar experiment protocols, which also matched the aim of this current study. All three experiments were initially conducted in the Human Motion Analysis Lab (HMAL) at the University of Washington and supervised by the same PI (PAK). Each subject complete ten trials at three different experimental scenarios, which were verbally instructed to all participants. The verbal instruction for scenario 1 was “walk at a stroll. You have nowhere to be and are enjoying yourself. It is a pleasant day, and you have good companionship.” For scenario 2 is “walk at your normal pace. You have somewhere to go, but you are not in a hurry.” For scenario 3 “You are in a hurry—like you are late for your bus— but you have to maintain your speed for 5 minutes. You are walking as fast as you can, but not running, and not so fast that you can stop within a stride." Scenario 1 was intended to induce SWS, scenario 2 was for CWS, and scenario 3 was for FWS. The verbal instruction was delivered to subjects consistently but the subject self-selected their own speed.

The marker data were smoothed using a low-pass, second-order Butterworth filter with a cutoff frequency of 8 Hz. Then, sagittal plane joint angle (hip, knee, and ankle) and segment angle (thigh and shank) were estimated and then interpolated to 100% stride cycle. The continuous relative phase (CRP) method was based on the displacement-velocity algorithm (Hamill et al., 1999; Miller et al., 2010). Before the estimation of hip-knee coordination and knee-ankle coordination, empirical mode decomposition was applied to the time series of knee and ankle angle so that it conformed to the sinusoidal assumption required by the CRP (Huang et al., 1998). The component phase angle(ϕ) was defined from 0° to 360°. The phase difference was calculated by subtracting the component phase angles of the distal segment/joint from those of the proximal segment/joint (thigh-shank: ϕ_{thigh} - ϕ_{shank}; shank-foot: ϕ_{shank} - ϕ_{foot}; hip-knee: ϕ_{hip} - ϕ_{knee}; knee-ankle: ϕ_{knee} - ϕ_{ankle}).

4.3.2 *Statistical Analysis*

The number of male subjects did not meet the assumption of normality for the parametric t-test, so the nonparametric Wilcoxon rank-sum test was used to compare lower limb dimensions between females (n=48) and males (n=19). The similarity of coordination pattern between CWS and non-optimal walking speed, ie., SWS and FWS, within each subject is estimated with the cross-correlation coefficient (CCC). CCC measures the similarity in the spatiotemporal evolution of coordination patterns. The CCC value range between 0 and 1, with the value of 1 indicating perfect similarity and a value of 0 indicating no similarity between two coordination patterns.

We constructed the linear mixed effect model (LMM) with CCC in thigh-shank, shank-foot, hip-knee, and knee-ankle coordination couple as a response variable to test for the association of lower limb dimensions with the similarity of coordination patterns between CWS and suboptimal speed (CWS vs. FWS and CWS vs. SWS) (with significance set at $\alpha = 0.05$). The walking speed difference (FWS-CWS and CWS-SWS) was also included in the LMM as an additional explanatory variable. The rationale to account for the speed difference is explained in more details in the discussion. All explanatory variables were standardized (mean of 0 and standard deviation of 1) before the hypothesis testing so that the estimated coefficients are all on the same scale, making it easier to compare among variables. We performed the analysis in all possible models (Appendix C: CWS vs. FWS; Appendix D: CWS vs. SWS) and then retained the models with explanatory variables that were significantly associated with outcome variables.

Based on our previous work, we suscept that multicollinearity exists among lower dimension variables and, thus, we also conducted the statistical analysis based on the result of multicollinearity analysis. Variance inflation factor (VIF) analysis was utilized to detect any multicollinearity in the model. A VIF value of 1 indicates no correlation, 1-5 indicates moderate correlation, and > 5 indicates high correlation (Dodge, 2008). In the current study, an explanatory variable with a VIF value that is larger than 5 was discarded. If there is more than one variable that is greater than 5, the variable with the largest VIF will be discarded first and then the VIF analysis is performed again until all explanatory variables are less than or equal to 5. The explanatory variables retained finally include speed difference, LLL, BTB, and crural index (VIF = 1.0 ~ 1.1) (the reduced model). The VIF analysis is presented in Table 4.1.

All statistical analyses were conducted in MATLAB (The MathWorks Inc., Natick, MA, USA) except for the VIF analysis, which was obtained using the statsmodels package in Python.

Table 4.1: VIF analysis

	Model 1[1] (C[5] vs. F[6] / C vs. S[7])	Model 2[2] (C vs. F / C vs. S)	Model 3[3] (C vs. F / C vs. S)	Model 4[4] (C vs. F / C vs. S)
speed diff[8]	1.0/1.2	1.0/1.2	1.0/1.1	1.0/1.1
LLL	Infinity[9]	149.5/160.9	73.5/74.9	1.0/1.1
BTB	138.1/138.2	138.1/138.2	101.9/105.2	1.0/1.0
Crural index	116.8/123.4	116.8/123.4	1.2/1.2	1.0/1.1
BTB/LLL	234.2/234.2	234.2/234.2	175.3/180.4	-
Tibia	infinity	258.7/274.4	-	-
Femur	infinity	-	-	-

[1] Model 1: speed difference + LLL + BTB + Crural index + BTB/LLL + Tibia + Femur.
[2] Model 2: speed difference + LLL + BTB + Crural index + BTB/LLL+ Tibia.
[3] Model 3: speed difference + LLL + BTB + Crural index + BTB/LLL.
[4] Model 4: speed difference + LLL + BTB + Crural index.
[5] C: CWS.
[6] F: FWS.
[7] S: SWS.
[8] speed diff: speed difference (FWS-CWS and CWS-SWS).
[9] infinity: maximal VIF value

4.4 RESULTS

The distribution of lower limb dimensions (Figure 4.1) and CCC are summarized (Figure 4.2). For the comparison between CWS and FWS, BTB is negatively associated with the similarity of thigh-shank coordination (coefficient= -0.031; p =0.020), whereas the crural index is positively associated with the similarity of hip-knee coordination (coefficient= 0.014; p =0.012). The results from the reduced models were utilized (Table 4.2) due to its higher adjusted r^2 than other models (Table 4.4). For the comparison between CWS and SWS, BTB/LLL is significantly associated with shank-foot coordination (coefficient= 0.047; p =0.031) (Table 4.3).

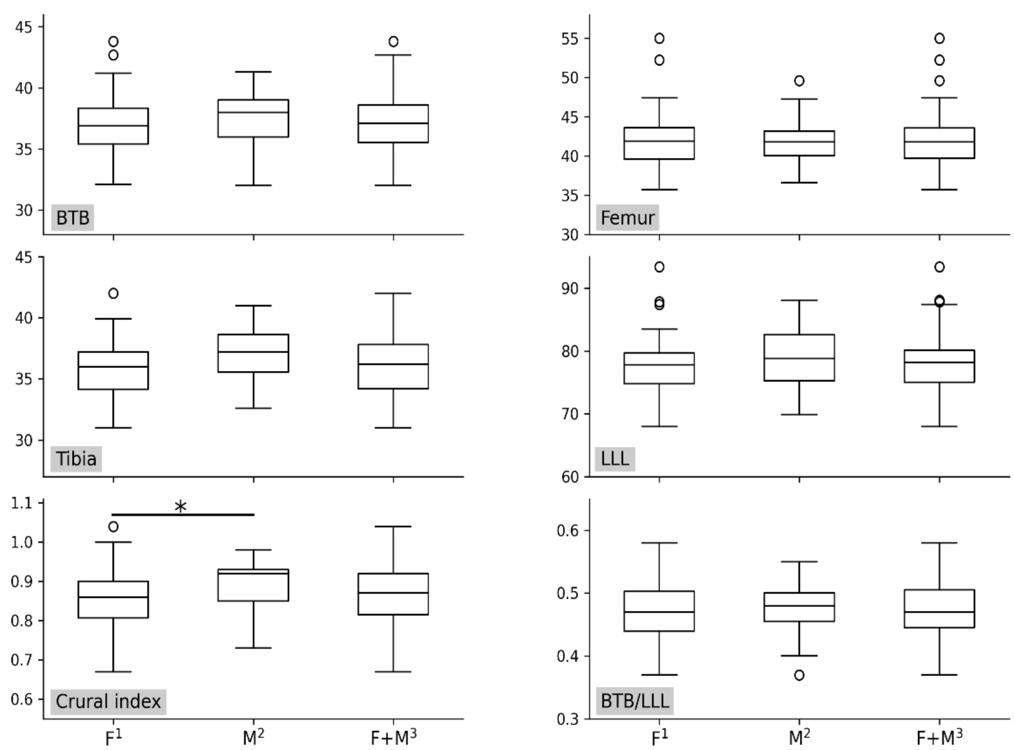

Figure 4.1: summary of lower limb dimensions parameters. The unit of the BTB, femur length, tibia length, LLL is centimeters; crural index and BTB/LLL are unitless. [1]F: Female; [2]M: Male; [3]F+M: all subjects; o: outlier; *: p <0.05.

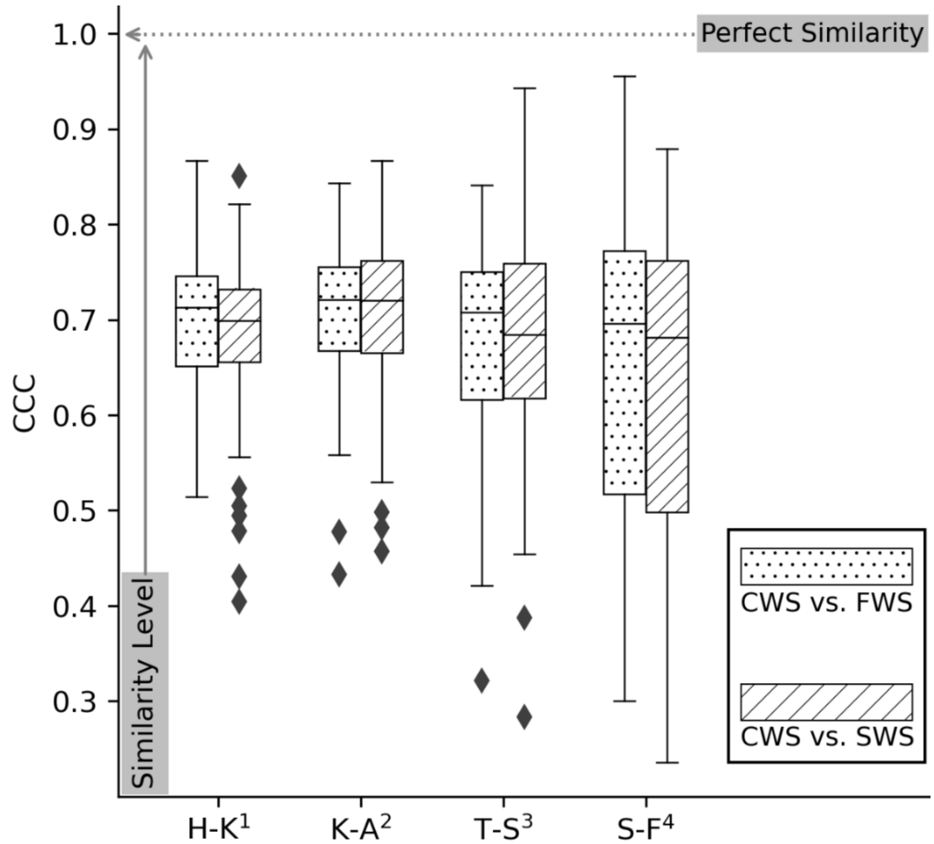

Figure 4.2. The similarity of coordination pattern between CWS and FWS/SWS. [1]H-K: hip-knee coordination; [2]K-A: knee-ankle coordination; [3]T-S: thigh-shank coordination; [4]S-F: shank-foot coordination; ♦: outlier.

Table 4.2. Association based on "all possible models" (CWS and FWS)

Coordination	**Number[1]**	**Explanatory variable(s) (coefficient/P-value)**	**Adjusted r^2**
Hip-Knee	1	C.I[2] (0.011/0.034)	0.006
	1	speed diff [3] (-0.017/0.0001)	0.016
	2	BTB (-0.011/0.043) + C.I (0.013/0.017)	0.010
	2	Femur (-0.022/0.038) + LLL (0.022/0.044)	0.004
	2	Femur (-0.014/0.034) + BTB/LLL (-0.019/0.009)	0.009
	2	C.I (0.014/0.012) + BTB/LLL (-0.012/0.031)	0.011
	2	C.I (0.012/0.027) + speed diff (-0.018/0.007)	0.022
	3	Tibia (0.018/0.020) + LLL (-0.021/0.031) + BTB/LLL (-0.016/0.035)	0.009
	3	BTB/LLL (-0.016/0.024) + Femur (-0.014/0.039) Speed diff (-0.017/0.0002)	0.022
Knee-Ankle	1	Speed diff (-0.029/0.00001)	0.233
Thigh-Shank	1	BTB (-0.031/0.025)	0.256
	1	BTB/LLL (-0.029/0.033)	0.256
	1	Speed diff (-0.021/0.039)	0.260

[1] Number of explanatory variables in the model.
[2] C.I: Crural index.
[3] speed diff: speed difference.

Table 4.3. Association based on "all possible models" (CWS and SWS)

Coordination	**Number**	**Explanatory variable(s) (coefficient/P-value)**	**Adjusted r^2**
Hip-Knee	1	speed difference (-0.025/0.003)	0.181
Knee-Ankle	1	speed difference (-0.044/0.00001)	0.280
Thigh-Shank	1	speed difference (-0.023/0.041)	0.230
Shank-Foot	1	BTB/LLL (0.044/0.043)	0.360
	1	speed difference (-0.034/0.037)	0.370
	2	BTB/LLL (0.047/0.031) + speed difference (-0.036/0.025)	0.371

Table 4.4. Association based on reduced model (CWS and SWS/FWS)

	CWS vs. FWS		CWS vs. SWS	
	Explanatory variables (coefficient/P-value)	Adjusted r^2	Explanatory variables (coefficient/P-value)	Adjusted r^2
Thigh-shank	**BTB (-0.031/0.020)*** + LLL (0.011/0.404) + C.I (0.022/0.105) + speed diff (-0.019/0.056)	0.267	BTB (-0.023/0.094) + LLL (0.010/0.447) + C.I (0.006/0.656) + **speed diff[1] (-0.023/0.046)***	0.188
Shank-foot	BTB (0.007/0.717) + LLL (-0.029/0.163) + C.I (0.003/0.890) + speed diff (-0.005/0.705)	0.290	BTB (0.035/0.101) + LLL (-0.035/0.113) + C.I (-0.014/0.499) + **speed diff (-0.037/0.024)***	0.369
Hip-knee	BTB (-0.009/0.094) + LLL (0.004/0.477) + **C.I[2] (0.014/0.012)*** + **speed diff (-0.016/0.002)***	0.024	BTB (-0.007/0.469) + LLL (0.002/0.821 + C.I (-0.008/0.379) + **speed diff (-0.017/0.003)***	0.177
Knee-ankle	BTB (0.005/0.600) + LLL (-0.004/0.683) + C.I (0.004/0.645) + **speed diff (-0.029/0.001)***	0.230	BTB (0.001/0.894) + LLL (-0.001/0.927) + C.I (-0.006/0.466) + **speed diff (-0.044/0.001)***	0.276

[1] speed diff: speed difference.
[2] C.I: crural index.

4.5 DISCUSSION

4.5.1 *Similarity of Coordination Pattern between CWS and FWS*

This study examines the question of whether or not the similarity of coordination pattern between CWS and non-optimal walking speed (SWS and FWS) is associated with the lower limb dimensions. The increase or decrease in walking speed from CWS is considered as a perturbation parameter affecting the gait coordination based on the CME model. We, thus, included the speed difference (walking speed at the FWS – walking speed at the CWS) in the statistical model. The result confirmed our speculation: the negative coefficient indicates that the larger speed differences resulted in a less similar coordination patterns between CWS and FWS and between CWS and SWS (Table 4.4).

The crural index is significantly associated with the similarity of hip-knee coordination: the positive coefficient indicated that the hip-knee coordination pattern between CWS and FWS becomes more similar as the crural index become higher (Table 4.4). The crural index is the ratio of tibia-to-femur length. Holliday (1999) suggested that the variation of the crural index was primarily affected by the tibia length. This suggestion is consistent with the VIF analysis conducted in this study: the removal of femur length only changed the VIF of LLL; VIF of the crural index, however, dropped to 1.2 when tibia length was discarded (Table 4.1).

Of note, the crural index in this study seem to behave as a variable to counteract speed difference on the similarity of hip-knee coordination pattern based on the inspection of the coefficient (speed difference vs. crural index: -0.016 vs. 0.014). Muscle activation is much higher when people walk at FWS compared to CWS (Sousa & Tavares, 2012; Wall-Scheffler et al., 2010). Wall-Scheffler et al.(2010) found that crural index is negatively associated with the increase of muscle activation in the biceps femoris and gluteus medius, both of which played an important role in the gait control (Biewener, 2016; Winter, 1995). They (Wall-Scheffler et al., 2010) suggested that a higher crural index can modulate motor stress due to the increase of locomotion intensity. Our result, i.e., the similarity of hip-knee coordination pattern, is negatively associated with the speed difference but positively associated with the crural index, thus, echos that of Wall-Scheffler et al.(2010). Wall-Scheffler et al.(2010) did not discuss the possible mechanism in the modulating effect of the crural index, but we suggested that the CME model provides a good framework for understanding this phenomenon. This modulating effect, however, is small, as the adjusted r^2 in the model is 0.024 (Table 2.4).

BTB in this study was utilized as a proxy variable for pelvic breadth. One of the direct outcomes of pelvic remodeling during evolution is the widening of the pelvis (Lovejoy, 2005a). The hypothesis of obstetrical dilemma claims that, while a widened pelvis facilitates the birth delivery, it also increases the locomotion cost (Correia et al., 2005; Lovejoy et al., 1973). Compared to quadrupedal locomotion, bipedalism is a more “dangerous” mode of locomotion, in which the base of support is significantly reduced, so the movement system is unstable inherently unless control the system actively. The hip abductors, such as the gluteus medius, plays a critical role in maintaining the mediolateral balance during walking (Winter, 1995). The wide pelvis decreases the effective mechanical advantage of the hip abductor muscle, so the hip abductor must generate more force to maintain the mediolateral balance (Inman, 1947; Merchant, 1965). Wall-Scheffler et al.(2010) also found, in addition to the crural index, that BTB width was positively correlated with the increase of muscle activity in gluteus medius, gluteus maximus, and biceps femoris when locomotion intensity increased.

We found that BTB is negatively associated with the similarity of thigh-shank coordination pattern between CWS and FWS. Following the line of rationale based on the CME model and other previous insights, the suggestion that the wider pelvis is a disadvantage in the regulation of movement coordination and may result in a worsened locomotion economy seems plausible. Gruss et al.(2017) and Rak (1991), however, suggested that individuals with wider pelvis had a smaller hip range of motion for a given stride length, thus leading to better locomotion efficiency. One of the explanations for this conflicted interpretation is that locomotion efficiency is not equivalent to locomotion economy. The locomotion efficiency, which was investigated in Gruss et al.(2017), is defined as the ratio of work done to the energy expended; locomotion economy, in contrast, is the thrifty use of energy and the amount of energy expended to locomote a certain distance (Steudel, 1994). Since the CME model is based on the locomotion economy (Sparrow & Newell, 1998), an individual with a wide pelvis may possibly have better locomotion efficiency but a worse locomotion economy. Warrener et al.(2015) found that, despite the significantly higher hip abductor cost in females, who have a wider pelvis than males (but did not have significant difference in this study), the locomotion efficiency was no difference between females and males, indicating that locomotion efficiency was unlikely to be determined by the pelvic breadth alone.

4.5.2 *Similarity of Coordination Pattern between CWS and SWS*

BTB/LLL is associated with the similarity of shank-foot coordination between CWS and SWS in the bivariate model and the multivariate model when it is combined with the variable of speed difference (Table 4.3). BTB/LLL is not included in the reduced model due to its higher multicollinearity (180.4) with BTB(105.2) and LLL(74.9). Once BTB/LLL is removed, the VIF value of BTB and LLL drop to 1.0. BTB and LLL, however, are not significantly associated with the similarity of shank-foot coordination in the reduced model. The multivariate model (CCC~ BTB/LLL + speed difference) also has a slightly higher adjusted r^2 than in the reduced model

(0.371 vs. 0.369). These analyses indicate that the information contained in the variable of BTB/LLL cannot be fully captured by BTB and LLL.

Gruss et al.(2017) found that BTB/LLL is positively associated with stride length but negatively associated with the hip sagittal range of motion (ROM). BTB/LLL in this study, as the relation between the crural index and the similarity of hip-knee coordination pattern between CWS and FWS, offsets the effect of speed difference on the similarity of shank-foot coordination pattern (speed difference vs. BTB/LLL: -0.036 vs. 0.047). Hip and knee motion are responsible for the control of walking speed (Fukuchi et al., 2019), so an individual may choose to decrease the ROM of the hip and knee to maintain SWS. This movement strategy, nevertheless, may increase the difficulty of foot clearance during the swing phase, as the trajectory of the foot is mainly controlled by the proximal joints such as the hip (Pang & Yang, 2000; Winter, 1992). Individuals, therefore, may intentionally alter the shank-foot coordination pattern to meet the demands of foot clearance. Maintaining SWS while clearing foot maybe even more difficult for individuals with longer femur or tibia, thus possibly leading to a larger compensation of shank-foot coordination. Evidence supporting the influence of lower limb length on the foot clearance LLL is scarce. The current study shows that LLL is highly correlated with the femur and tibia length and the coefficient has the same sign as the speed difference. Although LLL is not significantly associated with thigh-shank coordination, the decrease of LLL also increases BTB/LLL. When BTB/LLL is combined with the speed difference, the adjusted r^2 is 0.371, which is much higher than the comparison between CWS and FWS in hip-knee (adjusted r^2: 0.024) coordination. These insights suggest that the positive association between BTB/LLL and the similarity of shank-foot coordination patterns may be due to the requirement of foot clearance at SWS rather than the minimization of energy expenditure through the implementation of a more similar coordination pattern. Because we investigate the shank-foot coordination in the full stride cycle instead of the swing phase, this interpretation remains speculative and warrants future research effort to understand the relationship among limb length, foot clearance, and shank-foot coordination.

4.6 Conclusion

Based on the CME model, we tested for an association between lower limb dimensions and similarity of gait coordination pattern between optimal walking speed (CWS) and non-optimal walking speed (FWS or SWS). We found lower limb dimensions, such as BTB, crural index, and BTB/LLL, are associated with similarity of coordination between optimal walking speed and suboptimal walking speed. While the association between the crural index and hip-knee coordination is likely due to the mechanism of crural index modulating the motor stress at FWS, as proposed in the CME model, this modulating effect, nevertheless, is small. Lower limb dimensions play a more important role in the regulation of movement coordination at CWS (Chapter 3). The association between BTB/LLL and shank-foot coordination may derive from the compensatory mechanism to meet the needs of foot clearance.

Chapter 5. SUMMARY, FUTURE DIRECTION, AND CONCLUSION

5.1 SUMMARY AND FUTURE DIRECTION

The research documented herein aimed to understand more fully the effect of footwear and lower limb dimensions on gait coordination.

The influence of barefoot walking on gait biomechanics (Franklin et al., 2015; Fukuchi et al., 2019) and health (Hollander et al., 2017; Lieberman, 2013) is abundantly reported but the mechanism that connects biomechanics with the neuromuscular control of gait remains poorly understood. Chapter 2 addressed the question of how the walking speed alters barefoot gait coordination by observing the gait coordination of 20 young female subjects in two footwear conditions (athletic shoes and barefoot) and three walking speeds (slow, normal, and fast walking speed). We found that, as walking speed increases, hip-ankle coordination of shod and barefoot become less similar and knee-ankle coordination become more similar, suggesting that barefoot and shod walking use different coordination strategies to cope with the increased walking speed. This result, to the best of our knowledge, is the first report of this difference in strategy in the literature. We also found barefoot walking has significant lower coordination variability in hip-ankle coordination at terminal-swing phase and knee-ankle coordination at mid-stance phase compared to shod walking.

We speculate that these phenomena in our study may be due to more intense muscular control when barefoot as walking speed increased. Franklin et al.(2018) found that barefoot walking has significantly lower muscle activation in tibialis anterior and peroneus longus at early stance, while Scott et al. (2012) showed that barefoot walking has a reduced muscular activity in tibialis anterior but a higher muscular activity in peroneus longus in stance phase. Additionally, Péter et al.(2020) found no statistically significant difference in flexor hallucis longus, soleus, and gastrocnemius activation at propulsion (late stance) among different footwear conditions. All of them (Franklin et al., 2018; Péter et al., 2020; Scott et al., 2012) examined the effect of footwear on muscle activity, however, at self-selected comfortable walking speed. Muscle activation is generally higher in slow and fast walking speed compared to comfortable walking speed (Sousa & Tavares, 2012). Muscle activation, thus, may demonstrate a different pattern when individuals walk at slow and fast walking speed as well as in different footwear. To better understand the phenomenon identified in this study and the effect of footwear on neuromuscular control of gait, examination of the similarity of muscle activation pattern between shod and barefoot as walking speed shift away from comfortable walking speed.

Chapter 3 and 4 aims were to understand the relationship among lower limb dimensions, gait coordination, and walking speed. We found that lower limb dimensions, such as pelvic breadth and crural index, are associated with thigh-shank coordination and hip-ankle coordination. Furthermore, by testing Sparrow and Newell's theoretical model (1998), we find that the crural index is also positively associated with the similarity of hip-knee coordination and this suggests that crural index may modulate the motor stress as walking speed increase. The effect of lower limb dimensions on single joint kinematics is abundantly reported in the literature (Gruss, 2007; Gruss et al., 2017; Hill et al., 2021; Hora et al., 2017). Although the potential role of lower limb dimensions on motor control is suggested in several theoretical frameworks (Gandevia et al., 2002; Pearson & Gramlich, 2010; Sparrow & Newell, 1998), no studies rigorously test the association between lower limb dimension and gait coordination. It is unclear, thus, whether lower limb dimension play any role in the neural circuit of gait control. Because gait coordination reflects the sequencing of neural circuits (Hamill et al., 1999), our study provides the first empirical evidence to support the role of lower limb dimensions in motor control.

Our findings, i.e., lower limb dimension play a role in the regulation of movement and motor system, have a significant impact on the current technical standard of conducting a clinical gait study to assess the motor deficiency of patients using gait coordination method. Footwear and age are commonly controlled when designing the clinical gait studies, as both factors are known to affect the performance of the motor system and gait coordination. An ideal way to control the effect of lower limb dimensions on gait coordination is to match lower limb dimensions between treatment and control subjects. Beyond matching for pelvic breadth, we are, however, unable to provide a recommendation on which lower limb dimensions -- total limb length, femoral or tibial length or crural index -- should be controlled when designing studies and recruiting subjects, as their individual effect on gait coordination cannot be distinguished from each other. The current study design cannot solve this problem, and a more specific study design is required to address this problem. For instance, multiple groups based on specific lower limb dimension parameters could be recruited and then the difference if gait coordination among groups assessed. This highly controlled study design requires large sample size and thus is expensive and time consuming. A more feasible option might be to use the open-source gait data. This method is advantageous in the availability of large size of data, so the scheme of dividing subjects into multiple groups and comparing gait coordination can be applied. Because the open-source data is collected from different research laboratories with different experimental protocols, a careful screening process is required when determining which data source should be included. Before the availability of new insights based on the future analysis, we recommend that clinician researchers should report lower limb dimensions of the treatment and control groups and include the lower limb dimensions in the statistical model when possible. For instance, Wang et al.(2021) compared the thigh-shank and shank-foot coordination between 44 patients with knee osteoarthritis and 22 healthy adults, and found that found that patient with knee osteoarthritis exhibit altered coordination pattern. They, however, did not compare the lower limb dimensions between two groups of subjects. To improve reliability of the study, lower limb dimensions must be considered and investigated.

5.2 CONCLUSION

This dissertation strives to understand the mechanism of gait coordination that are commonly examined in patients with orthopedic and neurological disorders. The dissertation contains three articles that are united by two motivations: 1) improve the rigor of clinical gait study that estimates gait coordination of patients, and 2) bridge the knowledge gap between evolutionary anthropologists and motor control scientists. Chapter 2 examined the relation among walking speed, footwear, and gait coordination. I found barefoot and shod walking used different coordination strategies to cope with increasing walking speed. Chapter 3 investigated the association between gait coordination and lower limb dimensions. I found gait coordination is associated with pelvic breadth, lower limb length, and crural index. This result suggested that lower limb dimensions play certain role in the neural circuit of gait control and researchers should take into account lower limb dimensions when designing clinical gait studies. Chapter 4 builds on the Chapter 3 and experimentally test a motor control theory that claimed anatomical configuration can modulate the locomotion intensity due to increased walking speed. The result partially supported this theory. However, the influence of the lower limb dimensions is small and less dominant than other factors.

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Appendix A

1. Thigh-Shank Coordination
loading: loading-response
mid: mid-stance
terminal: terminal-stance
preSwing: pre-swing
swing: swing

Model: loading ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :9.5237/0.046076

Model: loading ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-8.1142/0.090717

Model: loading ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :3.3962/0.48544

Model: loading ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.8439/0.70593

Model: loading ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-9.8173/0.038358

Model: loading ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.2566/0.02788
Tibia :-8.9436/0.054259

Model: loading ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :9.8474/0.03863
Femur :4.1568/0.37981

Model: loading ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :9.5024/0.046374
LLL :-1.724/0.71649

Model: loading ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.8257/0.018912
cruralIndex :-11.0702/0.015795

Model: loading ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-10.0056/0.04384
Femur :6.3644/0.19876

Model: loading ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-14.7173/0.035391
LLL :8.9786/0.19876

Model: loading ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-3.9367/0.48405
cruralIndex :-7.6867/0.17116

Model: loading ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :19.8795/0.035391
LLL :-19.0667/0.04384

Model: loading ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-4.754/0.43606
cruralIndex :-12.8339/0.035651

Model: loading ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-3.5726/0.45573
cruralIndex :-10.4095/0.029711

Model: loading ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :11.0403/0.016531
Tibia :-11.263/0.018741
Femur :7.588/0.11219

Model: loading ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :11.0403/0.016531
Tibia :-16.8806/0.012678
LLL :10.7049/0.11219

Model: loading ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.9053/0.017572
Tibia :-4.2151/0.43506
cruralIndex :-8.7988/0.10394

Model: loading ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :11.0403/0.016531
Femur :22.8015/0.012678
LLL :-21.4627/0.018741

Model: loading ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.8108/0.018518
Femur :-4.69/0.42361
cruralIndex :-14.0451/0.017118

Model: loading ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.8537/0.01807
LLL :-3.6501/0.42731
cruralIndex :-11.6792/0.011654

Model: loading ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :15.8516/0.65877
Femur :-21.7555/0.57676
cruralIndex :-32.2012/0.46711

Model: loading ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :31.9578/0.62057
LLL :-30.692/0.57676
cruralIndex :-32.2012/0.46711

Model: loading ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-43.1672/0.62057
LLL :30.2068/0.65877
cruralIndex :-32.2012/0.46711

Model: loading ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.7608/0.020826
Tibia :2.243/0.94891
Femur :-7.096/0.85189
cruralIndex :-16.78/0.69696

Model: loading ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.7608/0.020826
Tibia :7.4964/0.90522
LLL :-10.0108/0.85189
cruralIndex :-16.78/0.69696

Model: loading ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :10.7608/0.020826
Femur :-10.1257/0.90522
LLL :4.2743/0.94891
cruralIndex :-16.78/0.69696

Model: loading ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1571/0.62062

Model: mid ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :3.9911/0.081435

Model: mid ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :3.661/0.11102

Model: mid ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :4.6914/0.038909

Model: mid ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-0.1364/0.95347

Model: mid ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.4768/0.51914
Tibia :4.1058/0.073051

Model: mid ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.87873/0.70285
Femur :3.5931/0.11849

Model: mid ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.0914/0.63025
LLL :4.6761/0.039229

Model: mid ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1565/0.62307
cruralIndex :-0.005324/0.99819

Model: mid ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :3.1823/0.18036
Femur :2.7131/0.25306

Model: mid ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.1737/0.72587
LLL :3.8275/0.25306

Model: mid ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :5.7574/0.032877
cruralIndex :-3.2554/0.22677

Model: mid ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.5854/0.72587
LLL :6.0641/0.18036

Model: mid ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

Femur :5.9782/0.041936
cruralIndex :3.6538/0.21321

Model: mid ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :4.7998/0.037062
cruralIndex :0.65613/0.77511

Model: mid ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.2157/0.59453
Tibia :3.3167/0.16415
Femur :2.5792/0.27889

Model: mid ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.2157/0.59453
Tibia :1.4073/0.67617
LLL :3.6386/0.27889

Model: mid ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.2517/0.58244
Tibia :5.7861/0.031666
cruralIndex :-3.129/0.24595

Model: mid ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.2157/0.59453
Femur :-1.9009/0.67617
LLL :6.3203/0.16415

Model: mid ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1244/0.62247
Femur :5.9682/0.041912
cruralIndex :3.775/0.1992

Model: mid ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1797/0.60487
LLL :4.8056/0.036465
cruralIndex :0.79087/0.73171

Model: mid ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :13.152/0.44528
Femur :-8.131/0.66388
cruralIndex :-12.4163/0.55908

Model: mid ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :19.1716/0.53613
LLL :-11.4709/0.66388
cruralIndex :-12.4163/0.55908

Model: mid ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-25.8961/0.53613
LLL :25.0625/0.44528
cruralIndex :-12.4163/0.55908

Model: mid ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.4577/0.52696
Tibia :15.0039/0.38928
Femur :-10.1305/0.59238
cruralIndex :-14.5219/0.49841

Model: mid ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.4577/0.52696
Tibia :22.5037/0.47276
LLL :-14.2917/0.59238
cruralIndex :-14.5219/0.49841

Model: mid ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.4577/0.52696
Femur :-30.397/0.47276
LLL :28.5914/0.38928
cruralIndex :-14.5219/0.49841

Model: mid ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.2161/0.36601

Model: terminal ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.90892/0.49934

Model: terminal ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.6657/0.21179

Model: terminal ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :1.6595/0.2139

Model: terminal ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-0.89401/0.50589

Model: terminal ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.2963/0.33475
Tibia :1.0115/0.45062

Model: terminal ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.0931/0.41298
Femur :1.5814/0.23494

Model: terminal ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1939/0.36944
LLL :1.6438/0.21564

Model: terminal ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1279/0.40375
cruralIndex :-0.76508/0.56975

Model: terminal ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.45321/0.74555

Femur :1.531/0.27273

Model: terminal ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.68024/0.72969
LLL :2.1599/0.27273

Model: terminal ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.9752/0.21239
cruralIndex :-1.9637/0.21445

Model: terminal ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :0.91884/0.72969
LLL :0.86363/0.74555

Model: terminal ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.8382/0.28666
cruralIndex :0.27179/0.87472

Model: terminal ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :1.5539/0.25025
cruralIndex :-0.63704/0.63683

Model: terminal ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1531/0.38995
Tibia :0.58235/0.67685
Femur :1.4038/0.31469

Model: terminal ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1531/0.38995
Tibia :-0.45692/0.81707
LLL :1.9804/0.31469

Model: terminal ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1623/0.38404
Tibia :2.0034/0.20359
cruralIndex :-1.846/0.24233

Model: terminal ~BTB+Femur+LLL+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :-1.1531/0.38995
Femur :0.61718/0.81707
LLL :1.1097/0.67685

Model: terminal ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1193/0.40343
Femur :1.8298/0.28645
cruralIndex :0.39445/0.81876

Model: terminal ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1367/0.3954
LLL :1.5607/0.24575
cruralIndex :-0.50593/0.70805

Model: terminal ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :12.4301/0.21636
Femur :-11.4951/0.29238
cruralIndex :-14.9156/0.22911

Model: terminal ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :20.9402/0.24683
LLL :-16.2169/0.29238
cruralIndex :-14.9156/0.22911

Model: terminal ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-28.2851/0.24683
LLL :23.6868/0.21636
cruralIndex :-14.9156/0.22911

Model: terminal ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.4359/0.28374
Tibia :14.2516/0.15892
Femur :-13.4595/0.22038

cruralIndex :-16.9837/0.17259

Model: terminal ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.4359/0.28374
Tibia :24.2161/0.18319
LLL :-18.9883/0.22038
cruralIndex :-16.9837/0.17259

Model: terminal ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.4359/0.28374
Femur :-32.71/0.18319
LLL :27.1579/0.15892
cruralIndex :-16.9837/0.17259

Model: terminal ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.047917/0.96045

Model: preSwing ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.84576/0.37842

Model: preSwing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.95164/0.32075

Model: preSwing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.1188/0.242

Model: preSwing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-0.0049437/0.99591

Model: preSwing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.01761/0.98542
Tibia :-0.84712/0.37909

Model: preSwing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.12235/0.8988
Femur :-0.96109/0.31736

Model: preSwing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.063926/0.94672
LLL :-1.1197/0.24165

Model: preSwing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.047971/0.96066
cruralIndex :0.00047895/0.99961

Model: preSwing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.61672/0.538
Femur :-0.76783/0.44311

Model: preSwing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.048277/0.97273
LLL :-1.0832/0.44311

Model: preSwing ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.1941/0.29498
cruralIndex :0.64213/0.57299

Model: preSwing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :0.06521/0.97273
LLL :-1.1752/0.538

Model: preSwing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.5963/0.19559
cruralIndex :-1.0167/0.4095

Model: preSwing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.1509/0.23505
cruralIndex :-0.19474/0.8406

Model: preSwing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.060704/0.94983
Tibia :-0.61004/0.54465
Femur :-0.77451/0.44169

Model: preSwing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.060704/0.94983
Tibia :-0.03665/0.97947
LLL :-1.0926/0.44169

Model: preSwing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.028723/0.97625
Tibia :-1.1934/0.29533
cruralIndex :0.64502/0.57266

Model: preSwing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.060704/0.94983
Femur :0.049505/0.97947
LLL :-1.1625/0.54465

Model: preSwing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.057/0.95268
Femur :-1.5968/0.19544
cruralIndex :-1.0106/0.41393

Model: preSwing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.042844/0.9645
LLL :-1.1507/0.23513
cruralIndex :-0.18986/0.84551

Model: preSwing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :10.5726/0.13974
Femur :-12.9386/0.096201
cruralIndex :-13.9352/0.11464

Model: preSwing ~Tibia+LLL+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
Tibia :20.1514/0.11764
LLL :-18.2533/0.096201
cruralIndex :-13.9352/0.11464

Model: preSwing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-27.2196/0.11764
LLL :20.1472/0.13974
cruralIndex :-13.9352/0.11464

Model: preSwing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.30018/0.7541
Tibia :10.9542/0.13121
Femur :-13.3507/0.090344
cruralIndex :-14.3692/0.10779

Model: preSwing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.30018/0.7541
Tibia :20.838/0.11045
LLL :-18.8347/0.090344
cruralIndex :-14.3692/0.10779

Model: preSwing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.30018/0.7541
Femur :-28.1471/0.11045
LLL :20.8743/0.13121
cruralIndex :-14.3692/0.10779

Model: preSwing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.6698/0.10626

Model: swing ~Tibia+(1|subject_id)

Explanatory variable : coefficient/P-value
Tibia :0.56822/0.84649

Model: swing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-2.6074/0.37131

Model: swing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.5532/0.59596

Model: swing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :2.665/0.36057

Model: swing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.7448/0.10159
Tibia :0.94315/0.74404

Model: swing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.9004/0.088499
Femur :-2.985/0.29751

Model: swing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.6908/0.1039
LLL :-1.6156/0.57414

Model: swing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.0427/0.080373
cruralIndex :3.241/0.25895

Model: swing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.4741/0.62908
Femur :-3.0453/0.31803

Model: swing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :3.7286/0.38617
LLL :-4.2961/0.31803

Model: swing ~Tibia+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
Tibia :-1.2457/0.71956
cruralIndex :3.3395/0.33527

Model: swing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-5.0364/0.38617
LLL :2.809/0.62908

Model: swing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.5329/0.68407
cruralIndex :1.6927/0.65304

Model: swing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.1429/0.69894
cruralIndex :2.4759/0.40163

Model: swing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.1116/0.076366
Tibia :2.0458/0.49553
Femur :-3.6089/0.22888

Model: swing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.1116/0.076366
Tibia :4.7175/0.26638
LLL :-5.0913/0.22888

Model: swing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.023/0.081371
Tibia :-1.1249/0.74045
cruralIndex :3.8478/0.25833

Model: swing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.1116/0.076366
Femur :-6.3722/0.26638
LLL :3.8984/0.49553

Model: swing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.0496/0.079554

Femur :-1.5712/0.66985
cruralIndex :2.2452/0.54366

Model: swing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.0359/0.080446
LLL :-1.1134/0.70017
cruralIndex :3.056/0.29323

Model: swing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :6.0783/0.78412
Femur :-8.0528/0.73822
cruralIndex :-5.734/0.83405

Model: swing ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :12.04/0.76286
LLL :-11.3607/0.73822
cruralIndex :-5.734/0.83405

Model: swing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-16.2631/0.76286
LLL :11.5828/0.78412
cruralIndex :-5.734/0.83405

Model: swing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.3352/0.067172
Tibia :12.8449/0.55887
Femur :-15.3514/0.51998
cruralIndex :-13.4178/0.61984

Model: swing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.3352/0.067172
Tibia :24.2099/0.54017
LLL :-21.6572/0.51998
cruralIndex :-13.4178/0.61984

Model: swing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-5.3352/0.067172
Femur :-32.7017/0.54017
LLL :24.4772/0.55887
cruralIndex :-13.4178/0.61984

Model: swing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

2.Shank-foot coordination
loading: loading-response
mid: mid-stance
terminal: terminal-stance
preSwing: pre-swing
swing: swing

Model: loading ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.71721/0.29553

Model: loading ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.55239/0.41952

Model: loading ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.57481/0.39971

Model: loading ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.69887/0.30566

Model: loading ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :0.12456/0.85573

Model: loading ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.67543/0.32433
Tibia :-0.49607/0.46675

Model: loading ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.76664/0.26188
Femur :-0.63346/0.35019

Model: loading ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.72505/0.28642
LLL :-0.70666/0.29615

Model: loading ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.74245/0.28192
cruralIndex :0.21149/0.75711

Model: loading ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.41877/0.55757
Femur :-0.45133/0.5264

Model: loading ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.084635/0.9329
LLL :-0.63672/0.5264

Model: loading ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.87896/0.27872
cruralIndex :0.59971/0.45823

Model: loading ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :0.11432/0.9329
LLL :-0.79801/0.55757

Model: loading ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.83172/0.34614
cruralIndex :-0.4037/0.64702

Model: loading ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.69747/0.31346
cruralIndex :0.0084088/0.99027

Model: loading ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.73061/0.28719
Tibia :-0.33386/0.63933
Femur :-0.53229/0.45371

Model: loading ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.73061/0.28719
Tibia :0.060203/0.95227
LLL :-0.75093/0.45371

Model: loading ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.72531/0.28922
Tibia :-0.85878/0.28592
cruralIndex :0.67376/0.40242

Model: loading ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.73061/0.28719
Femur :-0.081319/0.95227
LLL :-0.63621/0.63933

Model: loading ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.74431/0.27749
Femur :-0.83422/0.34037
cruralIndex :-0.31812/0.71689

Model: loading ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.73631/0.28232
LLL :-0.69074/0.31392
cruralIndex :0.095766/0.88934

Model: loading ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-4.993/0.33292
Femur :4.5223/0.41919
cruralIndex :5.696/0.37048

Model: loading ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-8.3409/0.36838
LLL :6.3798/0.41919
cruralIndex :5.696/0.37048

Model: loading ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :11.2666/0.36838
LLL :-9.5147/0.33292
cruralIndex :5.696/0.37048

Model: loading ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.65109/0.34657
Tibia :-4.1725/0.4219
Femur :3.6403/0.51852
cruralIndex :4.7686/0.45574

Model: loading ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.65109/0.34657
Tibia :-6.8675/0.46225
LLL :5.1356/0.51852
cruralIndex :4.7686/0.45574

Model: loading ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.65109/0.34657
Femur :9.2764/0.46225
LLL :-7.9512/0.4219
cruralIndex :4.7686/0.45574

Model: loading ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.0403/0.29734

Model: mid ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.014/0.60441

Model: mid ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.0699/0.5836

Model: mid ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :0.23044/0.90643

Model: mid ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-1.241/0.52401

Model: mid ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.9675/0.31596
Tibia :-0.84733/0.66382

Model: mid ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.969/0.31522
Femur :0.91911/0.63609

Model: mid ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.0382/0.29782
LLL :0.20982/0.91406

Model: mid ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.9181/0.32971
cruralIndex :-1.0143/0.60245

Model: mid ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.4573/0.47513
Femur :1.4982/0.46157

Model: mid ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-2.5665/0.37152
LLL :2.1137/0.46157

Model: mid ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.47894/0.83694
cruralIndex :-0.9822/0.67174

Model: mid ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :3.4667/0.37152
LLL :-2.7771/0.47513

Model: mid ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

Femur :0.46924/0.85267
cruralIndex :-0.94293/0.70866

Model: mid ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :0.022433/0.99097
cruralIndex :-1.2373/0.53112

Model: mid ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.8332/0.35154
Tibia :-1.2415/0.54283
Femur :1.2944/0.52435

Model: mid ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.8332/0.35154
Tibia :-2.1998/0.44492
LLL :1.826/0.52435

Model: mid ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.9092/0.33199
Tibia :-0.42383/0.8545
cruralIndex :-0.78633/0.73353

Model: mid ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.8332/0.35154
Femur :2.9714/0.44492
LLL :-2.3659/0.54283

Model: mid ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.9176/0.32974
Femur :0.46503/0.85292
cruralIndex :-0.71894/0.77504

Model: mid ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.9185/0.32963
LLL :0.041673/0.98311
cruralIndex :-1.0073/0.61006

Model: mid ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-36.9361/0.0092531
Femur :40.0657/0.0093054
cruralIndex :44.1757/0.011599

Model: mid ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-66.5978/0.009064
LLL :56.5233/0.0093054
cruralIndex :44.1757/0.011599

Model: mid ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :89.9574/0.009064
LLL :-70.3855/0.0092531
cruralIndex :44.1757/0.011599

Model: mid ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1265/0.55554
Tibia :-35.5178/0.013342
Femur :38.5434/0.013342
cruralIndex :42.5758/0.015914

Model: mid ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1265/0.55554
Tibia :-64.0525/0.01307
LLL :54.3757/0.013342
cruralIndex :42.5758/0.015914

Model: mid ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1265/0.55554
Femur :86.5193/0.01307
LLL :-67.6828/0.013342
cruralIndex :42.5758/0.015914

Model: mid ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
  Error: singular matrix

Model: terminal ~BTB+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.20786/0.91411

Model: terminal ~Tibia+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :1.2782/0.50414

Model: terminal ~Femur+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Femur :0.26811/0.88867

Model: terminal ~LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   LLL :0.8612/0.65312

Model: terminal ~cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   cruralIndex :1.1925/0.53213

Model: terminal ~BTB+Tibia+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.31603/0.86977
   Tibia :1.3042/0.4969

Model: terminal ~BTB+Femur+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.18815/0.92245
   Femur :0.25367/0.89494

Model: terminal ~BTB+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.19793/0.91809
   LLL :0.85893/0.65398

Model: terminal ~BTB+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.3535/0.85504
   cruralIndex :1.2336/0.52087

Model: terminal ~Tibia+Femur+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :1.3139/0.51191

Femur :-0.12019/0.95206

Model: terminal ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.4028/0.619
LLL :-0.16956/0.95206

Model: terminal ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.89194/0.69512
cruralIndex :0.70995/0.75441

Model: terminal ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.8949/0.619
LLL :2.5037/0.51191

Model: terminal ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.721/0.48515
cruralIndex :2.2849/0.3537

Model: terminal ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :1.0903/0.57338
cruralIndex :1.3735/0.47701

Model: terminal ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.33221/0.86394
Tibia :1.3521/0.50226
Femur :-0.15698/0.93775

Model: terminal ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.33221/0.86394
Tibia :1.4683/0.60595
LLL :-0.22147/0.93775

Model: terminal ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.37096/0.84784
Tibia :0.90188/0.6919
cruralIndex :0.74775/0.74265

Model: terminal ~BTB+Femur+LLL+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :-0.33221/0.86394
Femur :-1.9833/0.60595
LLL :2.5765/0.50226

Model: terminal ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.34877/0.85647
Femur :1.7194/0.48544
cruralIndex :2.3245/0.3472

Model: terminal ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.36248/0.85108
LLL :1.0933/0.57224
cruralIndex :1.4162/0.46639

Model: terminal ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-27.5269/0.051481
Femur :31.239/0.04183
cruralIndex :35.913/0.039447

Model: terminal ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-50.6539/0.046304
LLL :44.0709/0.04183
cruralIndex :35.913/0.039447

Model: terminal ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :68.4211/0.046304
LLL :-52.4553/0.051481
cruralIndex :35.913/0.039447

Model: terminal ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.27353/0.88574
Tibia :-27.8726/0.051876
Femur :31.6108/0.042256

cruralIndex :36.3041/0.039663

Model: terminal ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.27353/0.88574
Tibia :-51.2749/0.046731
LLL :44.5954/0.042256
cruralIndex :36.3041/0.039663

Model: terminal ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.27353/0.88574
Femur :69.2598/0.046731
LLL :-53.114/0.051876
cruralIndex :36.3041/0.039663

Model: terminal ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.50292/0.64761

Model: preSwing ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.2686/0.80719

Model: preSwing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.0346/0.34417

Model: preSwing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :0.87474/0.42483

Model: preSwing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-0.55188/0.61538

Model: preSwing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.48506/0.66017
Tibia :0.23117/0.83388

Model: preSwing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.5866/0.59238
Femur :1.0799/0.32387

Model: preSwing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.5156/0.63777
LLL :0.88211/0.42021

Model: preSwing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.57279/0.60413
cruralIndex :-0.61662/0.57626

Model: preSwing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.043981/0.96938
Femur :1.0477/0.36051

Model: preSwing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.81964/0.61205
LLL :1.4781/0.36051

Model: preSwing ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.80436/0.53745
cruralIndex :-0.98777/0.44868

Model: preSwing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.1071/0.61205
LLL :-0.08381/0.96938

Model: preSwing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.1447/0.41817
cruralIndex :0.17368/0.9022

Model: preSwing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :0.80556/0.46802
cruralIndex :-0.41905/0.70563

Model: preSwing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.59768/0.58747
Tibia :-0.10973/0.92396
Femur :1.1135/0.3328

Model: preSwing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.59768/0.58747
Tibia :-0.93409/0.56574
LLL :1.5709/0.3328

Model: preSwing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.56009/0.61127
Tibia :0.79176/0.54312
cruralIndex :-1.0443/0.42396

Model: preSwing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.59768/0.58747
Femur :1.2617/0.56574
LLL :-0.20911/0.92396

Model: preSwing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.57939/0.59819
Femur :1.1502/0.415
cruralIndex :0.11162/0.93714

Model: preSwing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.5693/0.60495
LLL :0.803/0.46854
cruralIndex :-0.48382/0.66412

Model: preSwing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-9.7124/0.23944
Femur :11.5642/0.19723
cruralIndex :12.041/0.2371

Model: preSwing ~Tibia+LLL+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
Tibia :-18.2737/0.2185
LLL :16.3144/0.19723
cruralIndex :12.041/0.2371

Model: preSwing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :24.6833/0.2185
LLL :-18.5079/0.23944
cruralIndex :12.041/0.2371

Model: preSwing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.8182/0.45771
Tibia :-10.7526/0.19737
Femur :12.6878/0.16136
cruralIndex :13.2243/0.19777

Model: preSwing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.8182/0.45771
Tibia :-20.1456/0.17937
LLL :17.8995/0.16136
cruralIndex :13.2243/0.19777

Model: preSwing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.8182/0.45771
Femur :27.2118/0.17937
LLL :-20.4901/0.19737
cruralIndex :13.2243/0.19777

Model: preSwing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.7525/0.14958

Model: swing ~Tibia+(1|subject_id)

Explanatory variable : coefficient/P-value
Tibia :-0.31937/0.54445

Model: swing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.094118/0.85839

Model: swing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.23442/0.65675

Model: swing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-0.27572/0.60033

Model: swing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.78385/0.13296
Tibia :-0.38312/0.4609

Model: swing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.74965/0.15233
Femur :-0.036703/0.94382

Model: swing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.74978/0.15046
LLL :-0.22559/0.66394

Model: swing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.79557/0.1288
cruralIndex :-0.36763/0.48004

Model: swing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.31952/0.56253
Femur :0.00051924/0.99925

Model: swing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.3199/0.68069
LLL :0.00073253/0.99925

Model: swing ~Tibia+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
Tibia :-0.24017/0.70165
cruralIndex :-0.14574/0.81579

Model: swing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :0.43211/0.68069
LLL :-0.60888/0.56253

Model: swing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.45131/0.50643
cruralIndex :-0.56209/0.4077

Model: swing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.2883/0.58888
cruralIndex :-0.32351/0.54345

Model: swing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.79287/0.13067
Tibia :-0.41/0.45225
Femur :0.088001/0.87158

Model: swing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.79287/0.13067
Tibia :-0.47515/0.53755
LLL :0.12415/0.87158

Model: swing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.80045/0.12599
Tibia :-0.26118/0.6715
cruralIndex :-0.22685/0.71298

Model: swing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.79287/0.13067
Femur :0.64181/0.53755
LLL :-0.78129/0.45225

Model: swing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.79412/0.12813

Femur :-0.44722/0.50272
cruralIndex :-0.65127/0.33066

Model: swing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.79778/0.12678
LLL :-0.29448/0.5741
cruralIndex :-0.41672/0.42866

Model: swing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :6.9642/0.075195
Femur :-7.9213/0.06239
cruralIndex :-9.0713/0.060296

Model: swing ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :12.8286/0.068402
LLL :-11.1752/0.06239
cruralIndex :-9.0713/0.060296

Model: swing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-17.3283/0.068402
LLL :13.2711/0.075195
cruralIndex :-9.0713/0.060296

Model: swing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.65822/0.20566
Tibia :6.13/0.11784
Femur :-7.0232/0.098883
cruralIndex :-8.1261/0.092148

Model: swing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.65822/0.20566
Tibia :11.3295/0.10802
LLL :-9.9081/0.098883
cruralIndex :-8.1261/0.092148

Model: swing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :0.65822/0.20566
   Femur :-15.3034/0.10802
   LLL :11.6814/0.11784
   cruralIndex :-8.1261/0.092148

Model: swing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
  Error: singular matrix

Model: swing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
  Error: singular matrix

3.Hip-knee coordination
loading: loading-response
mid: mid-stance
terminal: terminal-stance
preSwing: pre-swing
swing: swing

Model: loading ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.8272/0.45127

Model: loading ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-5.1891/0.3031

Model: loading ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.0446/0.83653

Model: loading ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.9783/0.69638

Model: loading ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-5.045/0.31518

Model: loading ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.2965/0.39521
Tibia :-5.5475/0.26997

Model: loading ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.932/0.44007
Femur :1.3467/0.78992

Model: loading ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.8062/0.45332
LLL :-1.9365/0.70127

Model: loading ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

BTB :4.4932/0.37548
cruralIndex :-5.5722/0.26776

Model: loading ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-6.0253/0.2523
Femur :2.8229/0.59073

Model: loading ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-8.1152/0.27344
LLL :3.9825/0.59073

Model: loading ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-3.4615/0.56294
cruralIndex :-3.1735/0.59462

Model: loading ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :10.9616/0.27344
LLL :-11.4817/0.2523

Model: loading ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-3.6323/0.57613
cruralIndex :-7.3518/0.25751

Model: loading ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-2.9024/0.56905
cruralIndex :-5.5281/0.27677

Model: loading ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.6428/0.35953
Tibia :-6.5654/0.2122
Femur :3.3386/0.52445

Model: loading ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.6428/0.35953
Tibia :-9.0371/0.22391
LLL :4.7101/0.52445

Model: loading ~BTB+Tibia+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :4.5662/0.36666
Tibia :-3.5879/0.54634
cruralIndex :-3.641/0.54047

Model: loading ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.6428/0.35953
Femur :12.2069/0.22391
LLL :-12.511/0.2122

Model: loading ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.4863/0.37513
Femur :-3.6165/0.57546
cruralIndex :-7.8683/0.22465

Model: loading ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.5206/0.37143
LLL :-2.9431/0.56123
cruralIndex :-6.0654/0.23315

Model: loading ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-6.4154/0.86671
Femur :3.2471/0.93763
cruralIndex :0.48582/0.99178

Model: loading ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-8.8193/0.8979
LLL :4.581/0.93763
cruralIndex :0.48582/0.99178

Model: loading ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :11.9128/0.8979
LLL :-12.2252/0.86671
cruralIndex :0.48582/0.99178

Model: loading ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.7643/0.35285
Tibia :-12.4208/0.74709
Femur :9.7035/0.81645
cruralIndex :7.274/0.87803

Model: loading ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.7643/0.35285
Tibia :-19.6046/0.77713
LLL :13.6894/0.81645
cruralIndex :7.274/0.87803

Model: loading ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :4.7643/0.35285
Femur :26.481/0.77713
LLL :-23.6691/0.74709
cruralIndex :7.274/0.87803

Model: loading ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.0782/0.72095

Model: mid ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.26071/0.93084

Model: mid ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :4.3109/0.14411

Model: mid ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :2.935/0.32509

Model: mid ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

cruralIndex :-4.295/0.14517

Model: mid ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.0636/0.72556
Tibia :-0.17015/0.95494

Model: mid ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.75382/0.8005
Femur :4.2533/0.15045

Model: mid ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.0525/0.72549
LLL :2.9248/0.32617

Model: mid ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.57328/0.84833
cruralIndex :-4.2271/0.1544

Model: mid ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.6797/0.58659
Femur :4.8043/0.11909

Model: mid ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-5.2365/0.22849
LLL :6.7778/0.11909

Model: mid ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :2.9497/0.4
cruralIndex :-5.8884/0.0918

Model: mid ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :7.0732/0.22849
LLL :-3.2009/0.58659

Model: mid ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :2.6454/0.48754
cruralIndex :-2.6137/0.49217

Model: mid ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :2.2771/0.44596
cruralIndex :-3.9147/0.18852

Model: mid ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.5774/0.84724
Tibia :-1.6114/0.60409
Femur :4.7401/0.1261

Model: mid ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.5774/0.84724
Tibia :-5.1206/0.24317
LLL :6.6872/0.1261

Model: mid ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.63901/0.83035
Tibia :2.9686/0.39687
cruralIndex :-5.8228/0.096547

Model: mid ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.5774/0.84724
Femur :6.9167/0.24317
LLL :-3.0707/0.60409

Model: mid ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.57221/0.84807
Femur :2.6445/0.48748
cruralIndex :-2.5465/0.50498

Model: mid ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.59916/0.8409
LLL :2.2834/0.44449
cruralIndex :-3.8426/0.19979

Model: mid ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~Tibia+Femur+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
Tibia :22.1114/0.32044
Femur :-21.0611/0.38329
cruralIndex :-29.6244/0.2805

Model: mid ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :37.7035/0.34609
LLL :-29.7123/0.38329
cruralIndex :-29.6244/0.2805

Model: mid ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-50.9282/0.34609
LLL :42.1356/0.32044
cruralIndex :-29.6244/0.2805

Model: mid ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1025/0.71385
Tibia :23.4988/0.29729
Femur :-22.5501/0.35667
cruralIndex :-31.1894/0.26096

Model: mid ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1025/0.71385
Tibia :40.1932/0.32144
LLL :-31.8129/0.35667
cruralIndex :-31.1894/0.26096

Model: mid ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.1025/0.71385
Femur :-54.2912/0.32144
LLL :44.7794/0.29729
cruralIndex :-31.1894/0.26096

Model: mid ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.32574/0.79693

Model: terminal ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.11013/0.93017

Model: terminal ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.7717/0.15106

Model: terminal ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :1.3222/0.28864

Model: terminal ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-1.5063/0.22346

Model: terminal ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.33821/0.79012
Tibia :0.13983/0.91169

Model: terminal ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.19037/0.87905
Femur :1.7572/0.15554

Model: terminal ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.31557/0.80149
LLL :1.3196/0.28928

Model: terminal ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.14315/0.90973
cruralIndex :-1.4891/0.23219

Model: terminal ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.44936/0.72835
Femur :1.9031/0.14011

Model: terminal ~Tibia+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :-1.8583/0.30715
   LLL :2.6848/0.14011

Model: terminal ~Tibia+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :1.3237/0.36847
   cruralIndex :-2.2207/0.12941

Model: terminal ~Femur+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Femur :2.5101/0.30715
   LLL :-0.8563/0.72835

Model: terminal ~Femur+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Femur :1.3642/0.39342
   cruralIndex :-0.63862/0.68891

Model: terminal ~LLL+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   LLL :1.0991/0.3807
   cruralIndex :-1.3221/0.28924

Model: terminal ~BTB+Tibia+Femur+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.14166/0.9104
   Tibia :-0.43223/0.74
   Femur :1.8873/0.14571

Model: terminal ~BTB+Tibia+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.14166/0.9104
   Tibia :-1.8295/0.31937
   LLL :2.6626/0.14571

Model: terminal ~BTB+Tibia+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.17442/0.88948
   Tibia :1.3293/0.36653
   cruralIndex :-2.2028/0.13395

Model: terminal ~BTB+Femur+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :-0.14166/0.9104

Femur :2.4712/0.31937
LLL :-0.82366/0.74

Model: terminal ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.14441/0.90843
Femur :1.3643/0.39329
cruralIndex :-0.62117/0.69823

Model: terminal ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.15746/0.90017
LLL :1.1011/0.37979
cruralIndex :-1.3028/0.29985

Model: terminal ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :3.3468/0.72118
Femur :-2.2233/0.82709
cruralIndex :-4.7267/0.68278

Model: terminal ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :4.9928/0.76715
LLL :-3.1365/0.82709
cruralIndex :-4.7267/0.68278

Model: terminal ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-6.744/0.76715
LLL :6.3777/0.72118
cruralIndex :-4.7267/0.68278

Model: terminal ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.22622/0.85887
Tibia :3.6312/0.7026
Femur :-2.5279/0.80646
cruralIndex :-5.0468/0.66625

Model: terminal ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.22622/0.85887
Tibia :5.5027/0.74758
LLL :-3.5662/0.80646
cruralIndex :-5.0468/0.66625

Model: terminal ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.22622/0.85887
Femur :-7.4327/0.74758
LLL :6.9196/0.7026
cruralIndex :-5.0468/0.66625

Model: terminal ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.33933/0.78031

Model: preSwing ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.34167/0.77763

Model: preSwing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.7744/0.13556

Model: preSwing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.084/0.3677

Model: preSwing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :1.8905/0.11051

Model: preSwing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.31251/0.79788
Tibia :0.31541/0.79495

Model: preSwing ~BTB+Femur+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :0.20212/0.86635
Femur :-1.759/0.14011

Model: preSwing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.32786/0.78635
LLL :-1.0806/0.36898

Model: preSwing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.1136/0.92478
cruralIndex :1.8771/0.11561

Model: preSwing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.95023/0.44392
Femur :-2.0542/0.097328

Model: preSwing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :2.471/0.15746
LLL :-2.898/0.097328

Model: preSwing ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.97417/0.48951
cruralIndex :2.4172/0.085492

Model: preSwing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-3.3377/0.15746
LLL :1.8108/0.44392

Model: preSwing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.95822/0.53147
cruralIndex :1.2819/0.40199

Model: preSwing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.78891/0.51126
cruralIndex :1.7592/0.14185

Model: preSwing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value

BTB :0.099837/0.93389
Tibia :0.93853/0.45244
Femur :-2.0431/0.1011

Model: preSwing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.099837/0.93389
Tibia :2.4511/0.16474
LLL :-2.8823/0.1011

Model: preSwing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.13369/0.91125
Tibia :-0.978/0.48791
cruralIndex :2.4035/0.08846

Model: preSwing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.099837/0.93389
Femur :-3.3108/0.16474
LLL :1.7885/0.45244

Model: preSwing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.11196/0.92565
Femur :-0.95794/0.53157
cruralIndex :1.2689/0.4087

Model: preSwing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.12116/0.91955
LLL :-0.79009/0.51063
cruralIndex :1.7447/0.148

Model: preSwing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-4.1777/0.64223
Femur :3.5213/0.71831
cruralIndex :6.3857/0.5648

Model: preSwing ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-6.7846/0.67479

LLL :4.9678/0.71831
cruralIndex :6.3857/0.5648

Model: preSwing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :9.1643/0.67479
LLL :-7.961/0.64223
cruralIndex :6.3857/0.5648

Model: preSwing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.21139/0.86188
Tibia :-4.4443/0.62605
Femur :3.8078/0.70047
cruralIndex :6.6869/0.55134

Model: preSwing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.21139/0.86188
Tibia :-7.2633/0.65784
LLL :5.3719/0.70047
cruralIndex :6.6869/0.55134

Model: preSwing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.21139/0.86188
Femur :9.811/0.65784
LLL :-8.4691/0.62605
cruralIndex :6.6869/0.55134

Model: preSwing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.8404/0.23

Model: swing ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.23929/0.94083

Model: swing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.65524/0.83874

Model: swing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.3397/0.91606

Model: swing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :0.79352/0.80522

Model: swing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.8838/0.22614
Tibia :0.54652/0.86438

Model: swing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.9145/0.22222
Femur :-0.95674/0.76458

Model: swing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.8455/0.22936
LLL :-0.39043/0.90259

Model: swing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.9842/0.21557
cruralIndex :1.2488/0.69668

Model: swing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.47643/0.88774
Femur :-0.79678/0.8132

Model: swing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.0663/0.82265
LLL :-1.1241/0.8132

Model: swing ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.27147/0.94357

cruralIndex :0.94053/0.80601

Model: swing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.4403/0.82265
LLL :0.90788/0.88774

Model: swing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.25365/0.95144
cruralIndex :0.63265/0.87921

Model: swing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.214/0.94777
cruralIndex :0.75813/0.81627

Model: swing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.01/0.21356
Tibia :0.92523/0.78285
Femur :-1.2389/0.71178

Model: swing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.01/0.21356
Tibia :1.8424/0.69785
LLL :-1.7478/0.71178

Model: swing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.9811/0.21601
Tibia :-0.17533/0.96314
cruralIndex :1.3434/0.72381

Model: swing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.01/0.21356
Femur :-2.4887/0.69785
LLL :1.7631/0.78285

Model: swing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.9855/0.21541
Femur :-0.28352/0.94512
cruralIndex :1.0691/0.79585

Model: swing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-3.9831/0.21569
LLL :-0.1904/0.95301
cruralIndex :1.2172/0.70786

Model: swing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.6701/0.94575
Femur :1.5379/0.95399
cruralIndex :2.6733/0.92964

Model: swing ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-2.8087/0.94927
LLL :2.1696/0.95399
cruralIndex :2.6733/0.92964

Model: swing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :3.7938/0.94927
LLL :-3.1826/0.94575
cruralIndex :2.6733/0.92964

Model: swing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.063/0.21308
Tibia :3.4833/0.88749
Femur :-4.0205/0.88045
cruralIndex :-3.1783/0.91647

Model: swing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-4.063/0.21308
Tibia :6.4597/0.88402
LLL :-5.6719/0.88045
cruralIndex :-3.1783/0.91647

Model: swing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :-4.063/0.21308
Femur :-8.7255/0.88402
LLL :6.6377/0.88749
cruralIndex :-3.1783/0.91647

Model: swing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

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4. Hip-ankle coordination
loading: loading-response
mid: mid-stance
terminal: terminal-stance
preSwing: pre-swing
swing: swing

Model: loading ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :11.1281/0.025104

Model: loading ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-9.5957/0.054885

Model: loading ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :2.6128/0.60908

Model: loading ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-3.1783/0.53408

Model: loading ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-10.2924/0.038253

Model: loading ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :11.9916/0.012781
Tibia :-10.5625/0.0277

Model: loading ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :11.3998/0.021666
Femur :3.4943/0.47876

Model: loading ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :11.0905/0.025212
LLL :-3.0361/0.53801

Model: loading ~BTB+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :12.5046/0.0090723
cruralIndex :-11.7376/0.013759

Model: loading ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-11.3754/0.028225
Femur :5.989/0.24674

Model: loading ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-15.8092/0.03045
LLL :8.449/0.24674

Model: loading ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-5.6697/0.33462
cruralIndex :-7.2236/0.21816

Model: loading ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :21.3543/0.03045
LLL :-21.677/0.028225

Model: loading ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-6.5685/0.30287
cruralIndex :-14.4601/0.023454

Model: loading ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-5.0239/0.31528
cruralIndex :-11.1249/0.026125

Model: loading ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.7548/0.0074439
Tibia :-12.8246/0.0096863
Femur :7.4029/0.134

Model: loading ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.7548/0.0074439
Tibia :-18.3052/0.0089769
LLL :10.4438/0.134

Model: loading ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.6176/0.0079508
Tibia :-5.9881/0.28392
cruralIndex :-8.5106/0.12844

Model: loading ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.7548/0.0074439
Femur :24.7258/0.0089769
LLL :-24.4386/0.0096863

Model: loading ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.4838/0.0086215
Femur :-6.4907/0.28469
cruralIndex :-15.8547/0.0093357

Model: loading ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.5436/0.0083069
LLL :-5.1104/0.28289
cruralIndex :-12.5901/0.0086077

Model: loading ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :12.4742/0.73947
Femur :-19.9477/0.62435
cruralIndex :-29.7009/0.52098

Model: loading ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :27.242/0.68635
LLL :-28.1416/0.62435
cruralIndex :-29.7009/0.52098

Model: loading ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-36.7973/0.68635
LLL :23.7708/0.73947
cruralIndex :-29.7009/0.52098

Model: loading ~BTB+Tibia+Femur+LLL+(1|subject_id)

Error: singular matrix

Model: loading ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.5597/0.0091771
Tibia :-3.4046/0.92513
Femur :-2.8388/0.94246
cruralIndex :-11.7035/0.79297

Model: loading ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.5597/0.0091771
Tibia :-1.303/0.98405
LLL :-4.0048/0.94246
cruralIndex :-11.7035/0.79297

Model: loading ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :12.5597/0.0091771
Femur :1.76/0.98405
LLL :-6.4877/0.92513
cruralIndex :-11.7035/0.79297

Model: loading ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.1539/0.4687

Model: mid ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.7409/0.55609

Model: mid ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :6.2776/0.028188

Model: mid ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value

LLL :5.3868/0.062583

Model: mid ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-4.7264/0.10312

Model: mid ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.0189/0.49764
Tibia :1.57/0.59568

Model: mid ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.655/0.35557
Femur :6.4806/0.023069

Model: mid ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.2051/0.4466
LLL :5.4088/0.06051

Model: mid ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.7623/0.34584
cruralIndex :-5.0527/0.081698

Model: mid ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.12067/0.96788
Femur :6.313/0.034916

Model: mid ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-4.7944/0.25574
LLL :8.9062/0.034916

Model: mid ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :6.1257/0.070278
cruralIndex :-8.0346/0.017205

Model: mid ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :6.476/0.25574
LLL :-0.22995/0.96788

Model: mid ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :5.4892/0.13806
cruralIndex :-1.2373/0.73761

Model: mid ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :4.7267/0.10246
cruralIndex :-3.9363/0.17199

Model: mid ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.7033/0.35
Tibia :-0.43926/0.8835
Femur :6.6134/0.0271

Model: mid ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.7033/0.35
Tibia :-5.3353/0.20752
LLL :9.3299/0.0271

Model: mid ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.6318/0.35794
Tibia :6.0488/0.072265
cruralIndex :-8.3045/0.013618

Model: mid ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.7033/0.35
Femur :7.2067/0.20752
LLL :-0.83705/0.8835

Model: mid ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.7671/0.33711
Femur :5.4944/0.13514
cruralIndex :-1.5613/0.67179

Model: mid ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.712/0.34531
LLL :4.6988/0.10237
cruralIndex :-4.2618/0.13962

Model: mid ~Tibia+Femur+LLL+(1|subject_id)
  Error: singular matrix

Model: mid ~Tibia+Femur+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :46.0815/0.028403
   Femur :-43.9097/0.054271
   cruralIndex :-57.5235/0.026546

Model: mid ~Tibia+LLL+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :78.589/0.03761
   LLL :-61.9464/0.054271
   cruralIndex :-57.5235/0.026546

Model: mid ~Femur+LLL+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Femur :-106.1546/0.03761
   LLL :87.813/0.028403
   cruralIndex :-57.5235/0.026546

Model: mid ~BTB+Tibia+Femur+LLL+(1|subject_id)
  Error: singular matrix

Model: mid ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :1.7812/0.52973
   Tibia :43.8407/0.039263
   Femur :-41.5049/0.071998
   cruralIndex :-54.9961/0.035604

Model: mid ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :1.7812/0.52973
   Tibia :74.5679/0.05113
   LLL :-58.5538/0.071998
   cruralIndex :-54.9961/0.035604

Model: mid ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :1.7812/0.52973
   Femur :-100.723/0.05113
   LLL :83.5429/0.039263
   cruralIndex :-54.9961/0.035604

Model: mid ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)

Error: singular matrix

Model: mid ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.6219/0.55772

Model: terminal ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.12/0.80215

Model: terminal ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-2.4755/0.57865

Model: terminal ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-2.3453/0.59921

Model: terminal ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :0.765/0.86393

Model: terminal ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.7283/0.54291
Tibia :-1.3361/0.76517

Model: terminal ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.444/0.58513
Femur :-2.2872/0.60822

Model: terminal ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5911/0.56164
LLL :-2.3113/0.60374

Model: terminal ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5675/0.56846
cruralIndex :0.47138/0.91628

Model: terminal ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.42017/0.92835
Femur :-2.3507/0.61458

Model: terminal ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.3201/0.84114
LLL :-3.3163/0.61458

Model: terminal ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-2.175/0.68237
cruralIndex :1.943/0.71428

Model: terminal ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.7831/0.84114
LLL :-0.80068/0.92835

Model: terminal ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-3.3307/0.56346
cruralIndex :-1.3471/0.81514

Model: terminal ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-2.2809/0.6142
cruralIndex :0.38795/0.93158

Model: terminal ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5166/0.57623
Tibia :-0.70217/0.88099
Femur :-2.0731/0.65812

Model: terminal ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5166/0.57623
Tibia :0.83261/0.90006
LLL :-2.9247/0.65812

Model: terminal ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.6063/0.56222
Tibia :-2.2382/0.67305

cruralIndex :1.6791/0.75205

Model: terminal ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5166/0.57623
Femur :-1.1246/0.90006
LLL :-1.3381/0.88099

Model: terminal ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5521/0.56987
Femur :-3.3119/0.56484
cruralIndex :-1.6271/0.77798

Model: terminal ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5808/0.56574
LLL :-2.2965/0.61102
cruralIndex :0.090222/0.98414

Model: terminal ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :34.9926/0.29932
Femur :-40.8643/0.26442
cruralIndex :-44.1001/0.28898

Model: terminal ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :65.2455/0.28194
LLL :-57.65/0.26442
cruralIndex :-44.1001/0.28898

Model: terminal ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-88.1307/0.28194
LLL :66.6819/0.29932
cruralIndex :-44.1001/0.28898

Model: terminal ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

BTB :1.8229/0.68705
Tibia :32.6809/0.33878
Femur :-38.3714/0.30097
cruralIndex :-41.4759/0.324

Model: terminal ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.8229/0.68705
Tibia :61.0883/0.32014
LLL :-54.1331/0.30097
cruralIndex :-41.4759/0.324

Model: terminal ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.8229/0.68705
Femur :-82.5154/0.32014
LLL :62.2768/0.33878
cruralIndex :-41.4759/0.324

Model: terminal ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :0.028227/0.99201

Model: preSwing ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.33684/0.9046

Model: preSwing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-3.5359/0.20276

Model: preSwing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-2.6873/0.3358

Model: preSwing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :2.6407/0.34372

Model: preSwing ~BTB+Tibia+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :0.055371/0.98437
Tibia :-0.34122/0.90367

Model: preSwing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.24859/0.92904
Femur :-3.555/0.20163

Model: preSwing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.0078397/0.99776
LLL :-2.6874/0.33582

Model: preSwing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.28052/0.92067
cruralIndex :2.6728/0.34104

Model: preSwing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.78467/0.78722
Femur :-3.7689/0.19464

Model: preSwing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :3.5749/0.38309
LLL :-5.3171/0.19464

Model: preSwing ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-2.5089/0.44838
cruralIndex :3.9994/0.22634

Model: preSwing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-4.8288/0.38309
LLL :1.4953/0.78722

Model: preSwing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-3.1126/0.38586
cruralIndex :0.6667/0.85255

Model: preSwing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

LLL :-2.313/0.41163
cruralIndex :2.2583/0.42216

Model: preSwing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.33358/0.90538
Tibia :0.82208/0.77857
Femur :-3.8058/0.19277

Model: preSwing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.33358/0.90538
Tibia :3.6396/0.37865
LLL :-5.369/0.19277

Model: preSwing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.23733/0.93258
Tibia :-2.5032/0.44948
cruralIndex :4.0235/0.22524

Model: preSwing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.33358/0.90538
Femur :-4.9162/0.37865
LLL :1.5665/0.77857

Model: preSwing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.29509/0.9161
Femur :-3.1148/0.38549
cruralIndex :0.6991/0.84601

Model: preSwing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.26726/0.92403
LLL :-2.3114/0.41192
cruralIndex :2.2891/0.41887

Model: preSwing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :13.1873/0.5318
Femur :-17.2581/0.45119

cruralIndex :-15.4459/0.55271

Model: preSwing ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :25.9639/0.49368
LLL :-24.3472/0.45119
cruralIndex :-15.4459/0.55271

Model: preSwing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-35.0709/0.49368
LLL :25.1297/0.5318
cruralIndex :-15.4459/0.55271

Model: preSwing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.60596/0.83061
Tibia :13.9556/0.51405
Femur :-18.0867/0.43608
cruralIndex :-16.3181/0.53533

Model: preSwing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.60596/0.83061
Tibia :27.3456/0.47713
LLL :-25.5161/0.43608
cruralIndex :-16.3181/0.53533

Model: preSwing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.60596/0.83061
Femur :-36.9373/0.47713
LLL :26.5938/0.51405
cruralIndex :-16.3181/0.53533

Model: preSwing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value

BTB :-1.3314/0.75147

Model: swing ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :4.0196/0.33467

Model: swing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-3.1587/0.44879

Model: swing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-0.13531/0.97425

Model: swing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :6.2358/0.13003

Model: swing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.6667/0.69063
Tibia :4.1538/0.31987

Model: swing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.5851/0.70569
Femur :-3.2807/0.43243

Model: swing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.3332/0.75114
LLL :-0.15193/0.97108

Model: swing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.0828/0.61645
cruralIndex :6.476/0.11775

Model: swing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :5.4367/0.20872
Femur :-4.7705/0.26927

Model: swing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :8.9684/0.14118

LLL :-6.73/0.26927

Model: swing ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.89243/0.85569
cruralIndex :5.7527/0.24036

Model: swing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-12.1141/0.14118
LLL :10.3601/0.20872

Model: swing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.344/0.80084
cruralIndex :7.0885/0.18336

Model: swing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :0.92602/0.82466
cruralIndex :6.3892/0.12597

Model: swing ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.1783/0.60147
Tibia :5.6837/0.19061
Femur :-5.0113/0.24766

Model: swing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.1783/0.60147
Tibia :9.3937/0.12594
LLL :-7.0697/0.24766

Model: swing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.1001/0.61352
Tibia :0.9457/0.84695
cruralIndex :5.9661/0.22429

Model: swing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.1783/0.60147
Femur :-12.6886/0.12594
LLL :10.8309/0.19061

Model: swing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.0779/0.61715
Femur :1.3312/0.80236
cruralIndex :7.32/0.17036

Model: swing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-2.0894/0.61523
LLL :0.94062/0.82164
cruralIndex :6.6326/0.114

Model: swing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-13.5024/0.66659
Femur :15.8258/0.64192
cruralIndex :23.5854/0.54182

Model: swing ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-25.2186/0.65456
LLL :22.3265/0.64192
cruralIndex :23.5854/0.54182

Model: swing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :34.0642/0.65456
LLL :-25.7301/0.66659
cruralIndex :23.5854/0.54182

Model: swing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.8284/0.66425
Tibia :-11.1872/0.72458
Femur :13.3315/0.69894
cruralIndex :20.9605/0.59173

Model: swing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.8284/0.66425

Tibia :-21.0568/0.7123
LLL :18.8076/0.69894
cruralIndex :20.9605/0.59173

Model: swing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-1.8284/0.66425
Femur :28.4426/0.7123
LLL :-21.3183/0.72458
cruralIndex :20.9605/0.59173

Model: swing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

5.Knee-ankle coordination
loading: loading-response
mid: mid-stance
terminal: terminal-stance
preSwing: pre-swing
swing: swing

Model: loading ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :7.3424/0.072754

Model: loading ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-4.4038/0.28719

Model: loading ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.6051/0.69965

Model: loading ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.1701/0.77889

Model: loading ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :-5.2685/0.20048

Model: loading ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :7.7493/0.056276
Tibia :-5.0265/0.21386

Model: loading ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :7.5118/0.066637
Femur :2.1837/0.59185

Model: loading ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :7.3288/0.073159
LLL :-1.0776/0.7913

Model: loading ~BTB+cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :8.064/0.046481
cruralIndex :-6.1969/0.12385

Model: loading ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-5.3528/0.21492
Femur :3.1927/0.45874

Model: loading ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-7.7164/0.20457
LLL :4.5041/0.45874

Model: loading ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-2.183/0.65581
cruralIndex :-4.0868/0.40326

Model: loading ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :10.423/0.20457
LLL :-10.2003/0.21492

Model: loading ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-2.916/0.58325
cruralIndex :-7.1185/0.18046

Model: loading ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-2.1031/0.61407
cruralIndex :-5.6168/0.17756

Model: loading ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :8.1689/0.043957
Tibia :-6.2777/0.13662
Femur :4.0952/0.3305

Model: loading ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :8.1689/0.043957
Tibia :-9.3095/0.11832
LLL :5.7774/0.3305

Model: loading ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :8.1077/0.044961
Tibia :-2.3875/0.61587
cruralIndex :-4.9097/0.30307

Model: loading ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :8.1689/0.043957
Femur :12.5748/0.11832
LLL :-11.9627/0.13662

Model: loading ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :8.0534/0.046276
Femur :-2.865/0.57906
cruralIndex :-8.0135/0.12221

Model: loading ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :8.0791/0.045627
LLL :-2.1584/0.59424
cruralIndex :-6.5563/0.10765

Model: loading ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: loading ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :19.2052/0.53854
Femur :-23.5149/0.48804
cruralIndex :-30.5831/0.42725

Model: loading ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :36.6139/0.51443
LLL :-33.174/0.48804
cruralIndex :-30.5831/0.42725

Model: loading ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-49.4564/0.51443
LLL :36.5974/0.53854
cruralIndex :-30.5831/0.42725

Model: loading ~BTB+Tibia+Femur+LLL+(1|subject_id)

Error: singular matrix

Model: loading ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :7.8472/0.055407
Tibia :9.2547/0.76409
Femur :-12.7925/0.70239
cruralIndex :-19.2979/0.61117

Model: loading ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :7.8472/0.055407
Tibia :18.7254/0.73563
LLL :-18.0473/0.70239
cruralIndex :-19.2979/0.61117

Model: loading ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :7.8472/0.055407
Femur :-25.2934/0.73563
LLL :17.6358/0.76409
cruralIndex :-19.2979/0.61117

Model: loading ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: loading ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.2408/0.42243

Model: mid ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :2.0063/0.6183

Model: mid ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.9675/0.62408

Model: mid ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :2.4543/0.54166

Model: mid ~cruralIndex+(1|subject_id)

Explanatory variable : coefficient/P-value
cruralIndex :-0.43046/0.91464

Model: mid ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.0902/0.44536
Tibia :1.7422/0.66492

Model: mid ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.4152/0.39819
Femur :2.2288/0.57772

Model: mid ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.2659/0.4175
LLL :2.4861/0.53429

Model: mid ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.3411/0.41144
cruralIndex :-0.82683/0.83715

Model: mid ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.5604/0.71084
Femur :1.5093/0.7191

Model: mid ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.44301/0.94037
LLL :2.1293/0.7191

Model: mid ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :3.1768/0.50689
cruralIndex :-2.1471/0.65229

Model: mid ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-0.5984/0.94037
LLL :2.9735/0.71084

Model: mid ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :2.8453/0.58438

cruralIndex :1.3775/0.79085

Model: mid ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :2.4507/0.54798
cruralIndex :-0.021621/0.99575

Model: mid ~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.2862/0.41904
Tibia :1.1716/0.78101
Femur :1.875/0.65519

Model: mid ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.2862/0.41904
Tibia :-0.21653/0.97095
LLL :2.6452/0.65519

Model: mid ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.276/0.41929
Tibia :3.0803/0.5178
cruralIndex :-2.4837/0.60168

Model: mid ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.2862/0.41904
Femur :0.29248/0.97095
LLL :2.2325/0.78101

Model: mid ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.3444/0.40992
Femur :2.8504/0.58162
cruralIndex :0.98393/0.84956

Model: mid ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :3.3163/0.41371
LLL :2.4157/0.55157
cruralIndex :-0.42093/0.91761

Model: mid ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :23.9613/0.43109
Femur :-22.8439/0.48925
cruralIndex :-27.8937/0.45739

Model: mid ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :40.8732/0.45511
LLL :-32.2275/0.48925
cruralIndex :-27.8937/0.45739

Model: mid ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-55.2098/0.45511
LLL :45.6606/0.43109
cruralIndex :-27.8937/0.45739

Model: mid ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.8897/0.48118
Tibia :20.3296/0.50847
Femur :-18.946/0.57012
cruralIndex :-23.7974/0.52933

Model: mid ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.8897/0.48118
Tibia :34.3558/0.53428
LLL :-26.7283/0.57012
cruralIndex :-23.7974/0.52933

Model: mid ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.8897/0.48118
Femur :-46.4062/0.53428
LLL :38.7401/0.50847
cruralIndex :-23.7974/0.52933

Model: mid ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: mid ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)

Error: singular matrix

Model: terminal ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.8824/0.548

Model: terminal ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.1912/0.80376

Model: terminal ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-4.2306/0.37445

Model: terminal ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-3.6297/0.44725

Model: terminal ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :2.2932/0.63134

Model: terminal ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.9972/0.53327
Tibia :-1.4304/0.76557

Model: terminal ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.568/0.5916
Femur :-4.033/0.39767

Model: terminal ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.8352/0.55295
LLL :-3.5935/0.45076

Model: terminal ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.6515/0.58251
cruralIndex :1.989/0.67871

Model: terminal ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :0.074397/0.98811
Femur :-4.2527/0.39392

Model: terminal ~Tibia+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :3.2228/0.64696
   LLL :-5.9996/0.39392

Model: terminal ~Tibia+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Tibia :-3.4519/0.5436
   cruralIndex :4.1625/0.46317

Model: terminal ~Femur+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Femur :-4.3532/0.64696
   LLL :0.14177/0.98811

Model: terminal ~Femur+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   Femur :-4.6452/0.45102
   cruralIndex :-0.65288/0.91557

Model: terminal ~LLL+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   LLL :-3.3405/0.48986
   cruralIndex :1.7407/0.7185

Model: terminal ~BTB+Tibia+Femur+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :2.5907/0.59054
   Tibia :-0.21748/0.9654
   Femur :-3.9668/0.42821

Model: terminal ~BTB+Tibia+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :2.5907/0.59054
   Tibia :2.7192/0.70115
   LLL :-5.5962/0.42821

Model: terminal ~BTB+Tibia+cruralIndex+(1|subject_id)
  Explanatory variable : coefficient/P-value
   BTB :2.7135/0.57275
   Tibia :-3.5191/0.53502
   cruralIndex :3.8875/0.49392

Model: terminal ~BTB+Femur+LLL+(1|subject_id)
  Explanatory variable : coefficient/P-value

BTB :2.5907/0.59054
Femur :-3.673/0.70115
LLL :-0.41443/0.9654

Model: terminal ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.6313/0.58386
Femur :-4.6274/0.45188
cruralIndex :-0.94352/0.87845

Model: terminal ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.6721/0.57826
LLL :-3.3578/0.48674
cruralIndex :1.4312/0.76799

Model: terminal ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :31.6545/0.38069
Femur :-38.5973/0.32501
cruralIndex :-39.3273/0.37728

Model: terminal ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :60.2291/0.35372
LLL :-54.4517/0.32501
cruralIndex :-39.3273/0.37728

Model: terminal ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-81.3548/0.35372
LLL :60.3209/0.38069
cruralIndex :-39.3273/0.37728

Model: terminal ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.9808/0.68296
Tibia :29.1442/0.42574
Femur :-35.8913/0.36631
cruralIndex :-36.4791/0.41795

Model: terminal ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.9808/0.68296
Tibia :55.7155/0.39719
LLL :-50.6343/0.36631
cruralIndex :-36.4791/0.41795

Model: terminal ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.9808/0.68296
Femur :-75.258/0.39719
LLL :55.5372/0.42574
cruralIndex :-36.4791/0.41795

Model: terminal ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: terminal ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.32846/0.91832

Model: preSwing ~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.66952/0.83394

Model: preSwing ~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.7692/0.5784

Model: preSwing ~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.608/0.61401

Model: preSwing ~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :0.76148/0.8112

Model: preSwing ~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.27649/0.93141
Tibia :-0.64744/0.83984

Model: preSwing ~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.46876/0.88371
Femur :-1.8053/0.57175

Model: preSwing ~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.34934/0.91299
LLL :-1.6124/0.61302

Model: preSwing ~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.42237/0.89573
cruralIndex :0.80999/0.8007

Model: preSwing ~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-0.15729/0.96241
Femur :-1.7226/0.60539

Model: preSwing ~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :1.118/0.81213
LLL :-2.4301/0.60539

Model: preSwing ~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-1.5346/0.68602
cruralIndex :1.5923/0.67434

Model: preSwing ~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-1.5101/0.81213
LLL :-0.29973/0.96241

Model: preSwing ~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-2.1529/0.6012
cruralIndex :-0.60421/0.88331

Model: preSwing ~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :-1.5234/0.63742
cruralIndex :0.50933/0.87459

Model: preSwing ~BTB+Tibia+Femur+(1|subject_id)

Explanatory variable : coefficient/P-value
BTB :-0.45777/0.88708
Tibia :-0.10568/0.97489
Femur :-1.7731/0.59687

Model: preSwing ~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.45777/0.88708
Tibia :1.207/0.79919
LLL :-2.5015/0.59687

Model: preSwing ~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.39529/0.90228
Tibia :-1.5248/0.68794
cruralIndex :1.6324/0.66775

Model: preSwing ~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.45777/0.88708
Femur :-1.6304/0.79919
LLL :-0.20138/0.97489

Model: preSwing ~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.43147/0.89328
Femur :-2.1559/0.60066
cruralIndex :-0.5565/0.89284

Model: preSwing ~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.41275/0.89793
LLL :-1.5207/0.63797
cruralIndex :0.55718/0.86379

Model: preSwing ~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :17.3365/0.47341
Femur :-20.7483/0.42947
cruralIndex :-21.7861/0.46516

Model: preSwing ~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

Tibia :32.697/0.45215
LLL :-29.2711/0.42947
cruralIndex :-21.7861/0.46516

Model: preSwing ~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-44.1657/0.45215
LLL :33.0364/0.47341
cruralIndex :-21.7861/0.46516

Model: preSwing ~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.84169/0.79561
Tibia :18.4029/0.45288
Femur :-21.8979/0.41072
cruralIndex :-22.996/0.44603

Model: preSwing ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.84169/0.79561
Tibia :34.6145/0.43244
LLL :-30.8928/0.41072
cruralIndex :-22.996/0.44603

Model: preSwing ~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :-0.84169/0.79561
Femur :-46.7557/0.43244
LLL :35.0686/0.45288
cruralIndex :-22.996/0.44603

Model: preSwing ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: preSwing ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing~BTB+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5306/0.36869

Model: swing~Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value

Tibia :3.7904/0.17294

Model: swing~Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-2.5299/0.36518

Model: swing~LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :0.18789/0.94681

Model: swing~cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
cruralIndex :5.4654/0.045308

Model: swing~BTB+Tibia+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.2275/0.42483
Tibia :3.6039/0.19445

Model: swing~BTB+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.3486/0.40293
Femur :-2.3507/0.39896

Model: swing~BTB+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.5329/0.36827
LLL :0.21436/0.93896

Model: swing~BTB+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.9076/0.48958
cruralIndex :5.2414/0.055689

Model: swing~Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :4.974/0.083096
Femur :-3.9979/0.16245

Model: swing~Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :7.9338/0.04965
LLL :-5.6401/0.16245

Model: swing~Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value

Tibia :1.154/0.72289
cruralIndex :4.8416/0.13573

Model: swing~Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :-10.7166/0.04965
LLL :9.4785/0.083096

Model: swing~Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :1.5888/0.65277
cruralIndex :6.4746/0.066748

Model: swing~LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
LLL :1.1325/0.68277
cruralIndex :5.654/0.040951

Model: swing~BTB+Tibia+Femur+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.8357/0.50767
Tibia :4.7597/0.098232
Femur :-3.7945/0.18594

Model: swing~BTB+Tibia+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.8357/0.50767
Tibia :7.5689/0.062622
LLL :-5.3531/0.18594

Model: swing~BTB+Tibia+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.8851/0.4945
Tibia :1.1004/0.73443
cruralIndex :4.6492/0.15204

Model: swing~BTB+Femur+LLL+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.8357/0.50767
Femur :-10.2237/0.062622
LLL :9.0701/0.098232

Model: swing~BTB+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.9106/0.48829
Femur :1.5941/0.6505

cruralIndex :6.2536/0.076703

Model: swing~BTB+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :1.8971/0.4915
LLL :1.1142/0.68656
cruralIndex :5.4282/0.050479

Model: swing~Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing~Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-11.8896/0.56617
Femur :14.3376/0.52399
cruralIndex :20.9998/0.41141

Model: swing~Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Tibia :-22.5041/0.54595
LLL :20.227/0.52399
cruralIndex :20.9998/0.41141

Model: swing~Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
Femur :30.3976/0.54595
LLL :-22.6569/0.56617
cruralIndex :20.9998/0.41141

Model: swing~BTB+Tibia+Femur+LLL+(1|subject_id)
Error: singular matrix

Model: swing~BTB+Tibia+Femur+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.2402/0.42142
Tibia :-14.7175/0.48177
Femur :17.3758/0.44417
cruralIndex :24.1952/0.34742

Model: swing~BTB+Tibia+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.2402/0.42142
Tibia :-27.5812/0.46348
LLL :24.5132/0.44417
cruralIndex :24.1952/0.34742

Model: swing~BTB+Femur+LLL+cruralIndex+(1|subject_id)
Explanatory variable : coefficient/P-value
BTB :2.2402/0.42142
Femur :37.2555/0.46348
LLL :-28.0456/0.48177
cruralIndex :24.1952/0.34742

Model: swing~Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Model: swing~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)
Error: singular matrix

Appendix B

1. **Thigh-Shank Coordination**
   Proximal: thigh-phase
   Distal: shank-phase
   In: in-phase
   Anti: anti-phase
   cbind: a function to bundle proximal, distal, in and anti together

<u>Model: cbind(proximal, distal, In, anti) ~ BTB</u>

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39227    0.05313  26.207   <2e-16 ***
BTB         -0.02271    0.05315  -0.427    0.669

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25554    0.06990  17.963   <2e-16 ***
BTB         -0.05821    0.06993  -0.832    0.405

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17044    0.05874  -2.901  0.00372 **
BTB         -0.05884    0.05884  -1.000  0.31737
```

<u>Model: cbind(proximal, distal, In, anti) ~ Femur</u>

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39175    0.05212  26.704   <2e-16 ***
Femur        0.03711    0.05216   0.712    0.477

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25517    0.06949  18.063   <2e-16 ***
Femur        0.02844    0.06950   0.409    0.682

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17072    0.05814  -2.936  0.00332 **
Femur        0.03945    0.05813   0.679  0.49741
```

Model: cbind(proximal, distal, In, anti) ~ Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39174	0.05170	26.92	<2e-16	***
Tibia	0.06117	0.05183	1.18	0.238	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25514	0.06892	18.212	<2e-16	***
Tibia	0.07513	0.06900	1.089	0.276	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17120	0.05723	-2.991	0.00278	**
Tibia	0.09210	0.05735	1.606	0.10829	

Model: cbind(proximal, distal, In, anti) ~ LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39168	0.05176	26.886	<2e-16	***
LLL	0.05857	0.05188	1.129	0.259	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25513	0.06915	18.151	<2e-16	***
LLL	0.05970	0.06922	0.862	0.388	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17108	0.05757	-2.972	0.00296	**
LLL	0.07653	0.05767	1.327	0.18449	

Model: cbind(proximal, distal, In, anti) ~ CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39187	0.05234	26.592	<2e-16	***
CruralIndex	0.01238	0.05231	0.237	0.813	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25522	0.06950	18.062	<2e-16	***
CruralIndex	0.03347	0.06946	0.482	0.63	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17059	0.05820	-2.931	0.00338	**
CruralIndex	0.03745	0.05813	0.644	0.51943	

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39215	0.05290	26.317	<2e-16	***
BTB	-0.02007	0.05308	-0.378	0.705	
Femur	0.03547	0.05309	0.668	0.504	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25549	0.06980	17.986	<2e-16	***
BTB	-0.05652	0.07004	-0.807	0.420	
Femur	0.02398	0.07002	0.342	0.732	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17061	0.05855	-2.914	0.00357	**
BTB	-0.05621	0.05881	-0.956	0.33917	
Femur	0.03510	0.05870	0.598	0.54993	

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39222	0.05256	26.488	<2e-16	***
BTB	-0.02723	0.05273	-0.516	0.606	
Tibia	0.06311	0.05283	1.194	0.232	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25553	0.06922	18.138	<2e-16	***
BTB	-0.06390	0.06945	-0.920	0.358	
Tibia	0.08004	0.06950	1.152	0.249	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17116	0.05758	-2.973	0.00295	**
BTB	-0.06655	0.05785	-1.150	0.24998	
Tibia	0.09752	0.05787	1.685	0.09196	.

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39211	0.05255	26.491	<2e-16	***
BTB	-0.02182	0.05258	-0.415	0.678	
LLL	0.05813	0.05267	1.104	0.270	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25547	0.06946	18.074	<2e-16	***
BTB	-0.05723	0.06950	-0.823	0.410	
LLL	0.05883	0.06955	0.846	0.398	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17099	0.05796	-2.950	0.00318	**
BTB	-0.05784	0.05806	-0.996	0.31916	
LLL	0.07580	0.05806	1.305	0.19174	

Model: cbind(proximal, distal, In, anti) ~ BTB + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39231	0.05318	26.181	<2e-16	***
BTB	-0.02433	0.05353	-0.455	0.649	
CruralIndex	0.01511	0.05347	0.283	0.778	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25556	0.06978	17.993	<2e-16	***
BTB	-0.06284	0.07025	-0.894	0.371	
CruralIndex	0.04067	0.07018	0.579	0.562	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17054	0.05856	-2.912	0.00359	**
BTB	-0.06413	0.05903	-1.086	0.27732	
CruralIndex	0.04486	0.05885	0.762	0.44585	

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39169	0.05165	26.943	<2e-16	***
Femur	0.02088	0.05412	0.386	0.70	
Tibia	0.05505	0.05421	1.015	0.31	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.255125	0.068924	18.210	<2e-16	***
Femur	0.006787	0.072206	0.094	0.925	
Tibia	0.073162	0.072274	1.012	0.311	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17125	0.05721	-2.993	0.00276	**
Femur	0.01378	0.05988	0.230	0.81796	
Tibia	0.08810	0.06001	1.468	0.14212	

Model: cbind(proximal, distal, In, anti) ~ Femur + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39169	0.05165	26.943	<2e-16	***
Femur	-0.05347	0.10315	-0.518	0.604	
LLL	0.10489	0.10331	1.015	0.310	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25512	0.06892	18.210	<2e-16	***
Femur	-0.09204	0.13761	-0.669	0.504	
LLL	0.13942	0.13773	1.012	0.311	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17125	0.05721	-2.993	0.00276	**
Femur	-0.10521	0.11414	-0.922	0.35662	
LLL	0.16788	0.11436	1.468	0.14212	

Model: cbind(proximal, distal, In, anti) ~ Femur + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39171	0.05176	26.889	<2e-16	***
Femur	0.07550	0.06708	1.126	0.260	

CruralIndex 0.06029 0.06700 0.900 0.368

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25513	0.06899	18.193	<2e-16	***
Femur	0.08335	0.08929	0.933	0.351	
CruralIndex	0.08634	0.08923	0.968	0.333	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17126	0.05729	-2.989	0.0028	**
Femur	0.10676	0.07422	1.438	0.1503	
CruralIndex	0.10530	0.07413	1.421	0.1554	

Model: cbind(proximal, distal, In, anti) ~ Tibia + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39169	0.05165	26.943	<2e-16	***
Tibia	0.03959	0.07637	0.518	0.604	
LLL	0.02946	0.07635	0.386	0.700	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.255125	0.068924	18.210	<2e-16	***
Tibia	0.068138	0.101876	0.669	0.504	
LLL	0.009575	0.101866	0.094	0.925	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17125	0.05721	-2.993	0.00276	**
Tibia	0.07789	0.08450	0.922	0.35662	
LLL	0.01944	0.08448	0.230	0.81796	

Model: cbind(proximal, distal, In, anti) ~ Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39168	0.05162	26.959	<2e-16	***
Tibia	0.07722	0.06158	1.254	0.210	
CruralIndex	-0.02936	0.06140	-0.478	0.633	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25512	0.06892	18.211	<2e-16	***
Tibia	0.08071	0.08211	0.983	0.326	

```
CruralIndex -0.01017    0.08198  -0.124    0.901

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17124    0.05720  -2.993  0.00276 **
Tibia        0.10169    0.06823   1.490  0.13609
CruralIndex -0.01747    0.06799  -0.257  0.79717
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex</u>

```
quation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39169    0.05169  26.921   <2e-16 ***
LLL          0.06234    0.05255   1.186    0.235
CruralIndex  0.02274    0.05240   0.434    0.664

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25513    0.06895  18.202   <2e-16 ***
LLL          0.06709    0.07000   0.958    0.338
CruralIndex  0.04460    0.06989   0.638    0.523

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17125    0.05725  -2.991  0.00278 **
LLL          0.08530    0.05817   1.466  0.14256
CruralIndex  0.05170    0.05798   0.892  0.37258
```

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia</u>

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39216    0.05250  26.515   <2e-16 ***
BTB         -0.02552    0.05296  -0.482    0.630
Femur        0.01801    0.05530   0.326    0.745
Tibia        0.05771    0.05540   1.042    0.297

Equation for In vs proximal:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.2555029  0.0692085  18.141   <2e-16 ***
BTB         -0.0641431  0.0698215  -0.919    0.358
Femur       -0.0003679  0.0728987  -0.005    0.996
Tibia        0.0802477  0.0729653   1.100    0.271

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.171200   0.057555  -2.975  0.00293 **
BTB         -0.066022   0.058138  -1.136  0.25612
```

Femur	0.006487	0.060561	0.107	0.91470
Tibia	0.095635	0.060705	1.575	0.11516

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.39216	0.05250	26.515	<2e-16 ***
BTB	-0.02552	0.05296	-0.482	0.630
Femur	-0.05995	0.10570	-0.567	0.571
LLL	0.10998	0.10556	1.042	0.297

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.25550	0.06921	18.141	<2e-16 ***
BTB	-0.06414	0.06982	-0.919	0.358
Femur	-0.10876	0.13932	-0.781	0.435
LLL	0.15292	0.13904	1.100	0.271

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.17120	0.05756	-2.975	0.00293 **
BTB	-0.06602	0.05814	-1.136	0.25612
Femur	-0.12269	0.11577	-1.060	0.28924
LLL	0.18224	0.11568	1.575	0.11516

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.39217	0.05260	26.466	<2e-16 ***
BTB	-0.02375	0.05295	-0.449	0.654
Femur	0.07507	0.06817	1.101	0.271
CruralIndex	0.06266	0.06831	0.917	0.359

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.25550	0.06928	18.123	<2e-16 ***
BTB	-0.06209	0.06975	-0.890	0.373
Femur	0.08271	0.08967	0.922	0.356
CruralIndex	0.09304	0.08990	1.035	0.301

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.17121	0.05765	-2.970	0.00298 **
BTB	-0.06367	0.05811	-1.096	0.27325
Femur	0.10642	0.07469	1.425	0.15419
CruralIndex	0.11247	0.07484	1.503	0.13290

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39216	0.05250	26.515	<2e-16	***
BTB	-0.02552	0.05296	-0.482	0.630	
Tibia	0.04438	0.07825	0.567	0.571	
LLL	0.02540	0.07802	0.326	0.745	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.255503	0.069209	18.141	<2e-16	***
BTB	-0.064143	0.069821	-0.919	0.358	
Tibia	0.080520	0.103142	0.781	0.435	
LLL	-0.000519	0.102843	-0.005	0.996	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.171200	0.057555	-2.975	0.00293	**
BTB	-0.066022	0.058138	-1.136	0.25612	
Tibia	0.090833	0.085708	1.060	0.28924	
LLL	0.009152	0.085437	0.107	0.91470	

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39215	0.05246	26.537	<2e-16	***
BTB	-0.02546	0.05281	-0.482	0.630	
Tibia	0.07761	0.06259	1.240	0.215	
CruralIndex	-0.02674	0.06261	-0.427	0.669	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.255496	0.069194	18.145	<2e-16	***
BTB	-0.063901	0.069671	-0.917	0.359	
Tibia	0.082095	0.082455	0.996	0.319	

```
CruralIndex -0.003628   0.082595  -0.044    0.965

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17120    0.05754  -2.976  0.00292 **
BTB         -0.06595    0.05801  -1.137  0.25556
Tibia        0.10342    0.06863   1.507  0.13184
CruralIndex -0.01078    0.06861  -0.157  0.87517
```

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39216    0.05254  26.496   <2e-16 ***
BTB         -0.02446    0.05289  -0.463    0.644
LLL          0.06228    0.05340   1.166    0.243
CruralIndex  0.02545    0.05358   0.475    0.635

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25550    0.06924  18.132   <2e-16 ***
BTB         -0.06287    0.06971  -0.902    0.367
LLL          0.06733    0.07029   0.958    0.338
CruralIndex  0.05182    0.07061   0.734    0.463

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17121    0.05760  -2.972  0.00295 **
BTB         -0.06466    0.05806  -1.114  0.26543
LLL          0.08579    0.05853   1.466  0.14269
CruralIndex  0.05927    0.05869   1.010  0.31256
```

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + LLL

Error: singular matrix

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39171    0.05142  27.067   <2e-16 ***
Femur       -0.30007    0.42618  -0.704    0.481
Tibia        0.35003    0.39228   0.892    0.372
```

```
CruralIndex -0.36723    0.48382  -0.759    0.448

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25514    0.06887  18.226   <2e-16 ***
Femur       -0.13350    0.57049  -0.234    0.815
Tibia        0.20197    0.52519   0.385    0.701
CruralIndex -0.16032    0.64779  -0.247    0.805

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17125    0.05718  -2.995  0.00275 **
Femur       -0.09484    0.47311  -0.200  0.84111
Tibia        0.18777    0.43557   0.431  0.66640
CruralIndex -0.12395    0.53726  -0.231  0.81754
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia</u>

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39171    0.05142  27.067   <2e-16 ***
LLL         -0.42332    0.60124  -0.704    0.481
CruralIndex -0.36723    0.48382  -0.759    0.448
Tibia        0.57217    0.70564   0.811    0.417

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25514    0.06887  18.226   <2e-16 ***
LLL         -0.18834    0.80483  -0.234    0.815
CruralIndex -0.16032    0.64779  -0.247    0.805
Tibia        0.30081    0.94466   0.318    0.750

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17125    0.05718  -2.995  0.00275 **
LLL         -0.13380    0.66745  -0.200  0.84111
CruralIndex -0.12395    0.53726  -0.231  0.81754
Tibia        0.25799    0.78343   0.329  0.74192
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39171	0.05142	27.067	<2e-16	***
LLL	0.66701	0.74754	0.892	0.372	
CruralIndex	-0.36723	0.48382	-0.759	0.448	
Femur	-0.77287	0.95315	-0.811	0.417	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25514	0.06887	18.226	<2e-16	***
LLL	0.38488	1.00080	0.385	0.701	
CruralIndex	-0.16032	0.64779	-0.247	0.805	
Femur	-0.40631	1.27600	-0.318	0.750	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17125	0.05718	-2.995	0.00275	**
LLL	0.35782	0.83003	0.431	0.66640	
CruralIndex	-0.12395	0.53726	-0.231	0.81754	
Femur	-0.34848	1.05822	-0.329	0.74192	

Model: cbind(proximal, distal, In, anti) ~ LLL + Tibia + Femur + BTB

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39216	0.05250	26.515	<2e-16	***
BTB	-0.02552	0.05296	-0.482	0.63	
Femur	9.29545	NA	NA	NA	
Tibia	6.92605	NA	NA	NA	
LLL	-13.08831	NA	NA	NA	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.256e+00	6.921e-02	18.141	<2e-16	***
BTB	-6.414e-02	6.982e-02	-0.919	0.358	
Femur	7.963e-01	1.203e+05	0.000	1.000	
Tibia	6.700e-01	8.903e+04	0.000	1.000	
LLL	-1.124e+00	1.697e+05	0.000	1.000	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-1.712e-01	5.756e-02	-2.975	0.00293	**

```
BTB         -6.602e-02  5.814e-02  -1.136  0.25612
Femur       -1.529e+02  1.580e+05  -0.001  0.99923
Tibia       -1.131e+02  1.170e+05  -0.001  0.99923
LLL          2.157e+02  2.229e+05   0.001  0.99923
```

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + CruralIndex</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39218    0.05219  26.675   <2e-16 ***
BTB         -0.03269    0.05332  -0.613    0.540
Femur       -0.34597    0.43901  -0.788    0.431
Tibia        0.39233    0.40416   0.971    0.332
CruralIndex -0.41562    0.49743  -0.836    0.403
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25553    0.06909  18.173   <2e-16 ***
BTB         -0.06875    0.07058  -0.974    0.330
Femur       -0.22865    0.58066  -0.394    0.694
Tibia        0.28998    0.53462   0.542    0.588
CruralIndex -0.26053    0.65804  -0.396    0.692
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17118    0.05745  -2.979  0.00289 **
BTB         -0.07001    0.05877  -1.191  0.23359
Femur       -0.19061    0.48233  -0.395  0.69271
Tibia        0.27668    0.44414   0.623  0.53331
CruralIndex -0.22482    0.54667  -0.411  0.68089
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + Femur + Tibia + CruralIndex</u>

quation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.392e+00	5.142e-02	27.067	<2e-16	***
Femur	3.415e+01	8.104e+04	0.000	1.000	
Tibia	2.585e+01	6.000e+04	0.000	1.000	
LLL	-4.860e+01	1.143e+05	0.000	1.000	
CruralIndex	-3.672e-01	4.838e-01	-0.759	0.448	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.255e+00	6.887e-02	18.226	<2e-16	***
Femur	1.630e+02	2.119e+05	0.001	0.999	
Tibia	1.210e+02	1.569e+05	0.001	0.999	
LLL	-2.301e+02	2.990e+05	-0.001	0.999	
CruralIndex	-1.603e-01	6.478e-01	-0.247	0.805	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.17125	0.05718	-2.995	0.00275	**
Femur	138.72127	NA	NA	NA	
Tibia	102.95698	NA	NA	NA	
LLL	-195.83714	NA	NA	NA	
CruralIndex	-0.12395	0.53726	-0.231	0.81754	

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur + BTB

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.39218	0.05219	26.675	<2e-16	***
LLL	0.74762	0.77016	0.971	0.332	
CruralIndex	-0.41562	0.49743	-0.836	0.403	
Femur	-0.87591	0.98202	-0.892	0.372	
BTB	-0.03269	0.05332	-0.613	0.540	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.25553	0.06909	18.173	<2e-16	***
LLL	0.55258	1.01878	0.542	0.588	
CruralIndex	-0.26053	0.65804	-0.396	0.692	
Femur	-0.62034	1.29895	-0.478	0.633	
BTB	-0.06875	0.07058	-0.974	0.330	

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17118    0.05745  -2.979  0.00289 **
LLL          0.52725    0.84636   0.623  0.53331
CruralIndex -0.22482    0.54667  -0.411  0.68089
Femur       -0.56434    1.07905  -0.523  0.60098
BTB         -0.07001    0.05877  -1.191  0.23359
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia + BTB

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.39218    0.05219  26.675   <2e-16 ***
LLL         -0.48809    0.61934  -0.788    0.431
CruralIndex -0.41562    0.49743  -0.836    0.403
Tibia        0.64846    0.72702   0.892    0.372
BTB         -0.03269    0.05332  -0.613    0.540

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.25553    0.06909  18.173   <2e-16 ***
LLL         -0.32257    0.81917  -0.394    0.694
CruralIndex -0.26053    0.65804  -0.396    0.692
Tibia        0.45925    0.96165   0.478    0.633
BTB         -0.06875    0.07058  -0.974    0.330

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.17118    0.05745  -2.979  0.00289 **
LLL         -0.26890    0.68046  -0.395  0.69271
CruralIndex -0.22482    0.54667  -0.411  0.68089
Tibia        0.41779    0.79885   0.523  0.60098
BTB         -0.07001    0.05877  -1.191  0.23359
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + LLL + CruralIndex

Error: singular matrix

2. Shank-Foot Coordination
Proximal: shank-phase
Distal: foot-phase
In: in-phase
Anti: anti-phase
cbind: a function to bundle proximal, distal, in and anti together

Model: cbind(proximal, distal, In, anti) ~ BTB

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66907    0.07299  -9.167   <2e-16 ***
BTB          0.03405    0.07315   0.466    0.642

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04517    0.05538  18.873   <2e-16 ***
BTB          0.01493    0.05546   0.269    0.788

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21363    0.08383 -38.336   <2e-16 ***
BTB         -0.02219    0.08499  -0.261    0.794
```

Model: cbind(proximal, distal, In, anti) ~ Femur

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66905    0.07281  -9.189   <2e-16 ***
Femur       -0.05125    0.07316  -0.701    0.484

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04514    0.05539  18.870   <2e-16 ***
Femur        0.01221    0.05533   0.221    0.825

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21357    0.08394  -38.28   <2e-16 ***
Femur       -0.04795    0.08415   -0.57    0.569
```

<u>Model: cbind(proximal, distal, In, anti) ~ Tibia</u>

Equation for distal vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66914    0.07310  -9.153   <2e-16 ***
Tibia        0.01794    0.07319   0.245    0.806
```

Equation for In vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04512    0.05531  18.897   <2e-16 ***
Tibia        0.02679    0.05529   0.485    0.628
```

Equation for anti vs proximal:
```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.213088   0.083807  -38.34   <2e-16 ***
Tibia        0.001662   0.084701    0.02    0.984
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL</u>

Equation for distal vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66904    0.07301  -9.163   <2e-16 ***
LLL         -0.02689    0.07334  -0.367    0.714
```

Equation for In vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04513    0.05534  18.885   <2e-16 ***
LLL          0.02272    0.05531   0.411    0.681
```

Equation for anti vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21322    0.08387 -38.313   <2e-16 ***
LLL         -0.03335    0.08433  -0.395    0.693
```

<u>Model: cbind(proximal, distal, In, anti) ~ CruralIndex</u>

Equation for distal vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66918    0.07289  -9.181   <2e-16 ***
CruralIndex  0.05009    0.07292   0.687    0.492
```

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.04514	0.05538	18.873	<2e-16	***
CruralIndex	0.01076	0.05534	0.194	0.846	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-3.21376	0.08395	-38.281	<2e-16	***
CruralIndex	0.04563	0.08421	0.542	0.588	

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.66902	0.07272	-9.200	<2e-16	***
BTB	0.03058	0.07308	0.418	0.676	
Femur	-0.04903	0.07326	-0.669	0.503	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.04516	0.05537	18.877	<2e-16	***
BTB	0.01597	0.05562	0.287	0.774	
Femur	0.01346	0.05548	0.243	0.808	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-3.21399	0.08391	-38.303	<2e-16	***
BTB	-0.02589	0.08531	-0.304	0.762	
Femur	-0.04976	0.08429	-0.590	0.555	

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.66910	0.07300	-9.165	<2e-16	***
BTB	0.03288	0.07340	0.448	0.654	
Tibia	0.01528	0.07333	0.208	0.835	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.04514	0.05530	18.899	<2e-16	***
BTB	0.01294	0.05555	0.233	0.816	
Tibia	0.02579	0.05545	0.465	0.642	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)

```
(Intercept) -3.213567   0.083845 -38.327   <2e-16 ***
BTB         -0.022145   0.085406  -0.259    0.795
Tibia        0.004382   0.085141   0.051    0.959
```

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66900    0.07290  -9.177   <2e-16 ***
BTB          0.03392    0.07306   0.464    0.642
LLL         -0.02659    0.07323  -0.363    0.716

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04515    0.05532  18.891   <2e-16 ***
BTB          0.01527    0.05541   0.276    0.783
LLL          0.02295    0.05530   0.415    0.678

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21361    0.08385 -38.325   <2e-16 ***
BTB         -0.02200    0.08501  -0.259    0.796
LLL         -0.03304    0.08428  -0.392    0.695
```

Model: cbind(proximal, distal, In, anti) ~ BTB + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66914    0.07282  -9.189   <2e-16 ***
BTB          0.02881    0.07344   0.392    0.695
CruralIndex  0.04687    0.07331   0.639    0.523

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 1.045163   0.055371  18.876   <2e-16 ***
BTB         0.013879   0.055814   0.249    0.804
CruralIndex 0.009186   0.055696   0.165    0.869

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21434    0.08399 -38.272   <2e-16 ***
BTB         -0.02852    0.08586  -0.332    0.740
CruralIndex  0.04961    0.08487   0.584    0.559
```

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66914    0.07276  -9.196   <2e-16 ***
Femur       -0.06197    0.07653  -0.810    0.418
Tibia        0.03604    0.07626   0.473    0.636
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 1.045122   0.055308  18.896   <2e-16 ***
Femur       0.004635   0.057892   0.080    0.936
Tibia       0.025406   0.057928   0.439    0.661
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21366    0.08398 -38.265   <2e-16 ***
Femur       -0.05315    0.08819  -0.603    0.547
Tibia        0.01745    0.08889   0.196    0.844
```

<u>Model: cbind(proximal, distal, In, anti) ~ Femur + LLL</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66914    0.07276  -9.196   <2e-16 ***
Femur       -0.11066    0.14535  -0.761    0.446
LLL          0.06868    0.14531   0.473    0.636
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04512    0.05531  18.896   <2e-16 ***
Femur       -0.02968    0.11035  -0.269    0.788
LLL          0.04841    0.11039   0.439    0.661
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21366    0.08398 -38.265   <2e-16 ***
Femur       -0.07672    0.16884  -0.454    0.650
LLL          0.03325    0.16939   0.196    0.844
```

<u>Model: cbind(proximal, distal, In, anti) ~ Femur + CruralIndex</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66910    0.07280  -9.191   <2e-16 ***
Femur       -0.03232    0.09444  -0.342    0.732
CruralIndex  0.02986    0.09404   0.318    0.751
```

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.04512	0.05531	18.895	<2e-16	***
Femur	0.03182	0.07144	0.445	0.656	
CruralIndex	0.03094	0.07147	0.433	0.665	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-3.21369	0.08398	-38.266	<2e-16	***
Femur	-0.03210	0.10927	-0.294	0.769	
CruralIndex	0.02498	0.10942	0.228	0.819	

<u>Model: cbind(proximal, distal, In, anti) ~ Tibia + LLL</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.66914	0.07276	-9.196	<2e-16	***
Tibia	0.08192	0.10761	0.761	0.446	
LLL	-0.08743	0.10796	-0.810	0.418	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.045122	0.055308	18.896	<2e-16	***
Tibia	0.021975	0.081695	0.269	0.788	
LLL	0.006539	0.081672	0.080	0.936	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-3.21366	0.08398	-38.265	<2e-16	***
Tibia	0.05680	0.12500	0.454	0.650	
LLL	-0.07499	0.12442	-0.603	0.547	

<u>Model: cbind(proximal, distal, In, anti) ~ Tibia + CruralIndex</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.66913	0.07288	-9.182	<2e-16	***
Tibia	-0.01366	0.08708	-0.157	0.875	
CruralIndex	0.05762	0.08702	0.662	0.508	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.045122	0.055310	18.896	<2e-16	***
Tibia	0.029665	0.065799	0.451	0.652	
CruralIndex	-0.005308	0.065778	-0.081	0.936	

```
Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21368    0.08398 -38.268   <2e-16 ***
Tibia       -0.03254    0.10069  -0.323    0.747
CruralIndex  0.06280    0.10002   0.628    0.530
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66911    0.07284  -9.187   <2e-16 ***
LLL         -0.01930    0.07413  -0.260    0.795
CruralIndex  0.04711    0.07383   0.638    0.523

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04512    0.05531  18.896   <2e-16 ***
LLL          0.02517    0.05605   0.449    0.653
CruralIndex  0.01492    0.05604   0.266    0.790

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21368    0.08398 -38.266   <2e-16 ***
LLL         -0.02639    0.08574  -0.308    0.758
CruralIndex  0.04091    0.08558   0.478    0.633
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66910    0.07269  -9.204   <2e-16 ***
BTB          0.02722    0.07347   0.370    0.711
Femur       -0.05909    0.07686  -0.769    0.442
Tibia        0.03300    0.07662   0.431    0.667

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 1.045141   0.055304  18.898   <2e-16 ***
BTB         0.013551   0.055865   0.243    0.808
Femur       0.006134   0.058216   0.105    0.916
Tibia       0.023916   0.058249   0.411    0.681

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21417    0.08398 -38.272   <2e-16 ***
BTB         -0.02811    0.08606  -0.327    0.744
Femur       -0.05637    0.08864  -0.636    0.525
```

Tibia	0.02170	0.08958	0.242	0.809

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.66910	0.07269	-9.204	<2e-16 ***
BTB	0.02722	0.07347	0.370	0.711
Femur	-0.10367	0.14644	-0.708	0.479
LLL	0.06288	0.14601	0.431	0.667

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.04514	0.05530	18.898	<2e-16 ***
BTB	0.01355	0.05587	0.243	0.808
Femur	-0.02617	0.11129	-0.235	0.814
LLL	0.04557	0.11100	0.411	0.681

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-3.21417	0.08398	-38.272	<2e-16 ***
BTB	-0.02811	0.08606	-0.327	0.744
Femur	-0.08569	0.17055	-0.502	0.615
LLL	0.04135	0.17070	0.242	0.809

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.66907	0.07272	-9.201	<2e-16 ***
BTB	0.02885	0.07335	0.393	0.694
Femur	-0.03225	0.09434	-0.342	0.733
CruralIndex	0.02670	0.09428	0.283	0.777

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.04514	0.05531	18.897	<2e-16 ***
BTB	0.01406	0.05575	0.252	0.801
Femur	0.03195	0.07144	0.447	0.655
CruralIndex	0.02943	0.07171	0.410	0.681

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-3.21420	0.08398	-38.272	<2e-16 ***
BTB	-0.02795	0.08585	-0.326	0.745
Femur	-0.03121	0.10924	-0.286	0.775
CruralIndex	0.02944	0.10999	0.268	0.789

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.66910	0.07269	-9.204	<2e-16	***
BTB	0.02722	0.07347	0.370	0.711	
Tibia	0.07675	0.10841	0.708	0.479	
LLL	-0.08337	0.10843	-0.769	0.442	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.045141	0.055304	18.898	<2e-16	***
BTB	0.013551	0.055865	0.243	0.808	
Tibia	0.019374	0.082389	0.235	0.814	
LLL	0.008654	0.082130	0.105	0.916	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-3.21417	0.08398	-38.272	<2e-16	***
BTB	-0.02811	0.08606	-0.327	0.744	
Tibia	0.06344	0.12626	0.502	0.615	
LLL	-0.07953	0.12505	-0.636	0.525	

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.66910	0.07280	-9.191	<2e-16	***
BTB	0.02918	0.07344	0.397	0.691	
Tibia	-0.01449	0.08701	-0.166	0.868	
CruralIndex	0.05482	0.08722	0.629	0.530	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.045141	0.055305	18.898	<2e-16	***
BTB	0.013410	0.055757	0.241	0.810	
Tibia	0.029373	0.065804	0.446	0.655	
CruralIndex	-0.006672	0.066016	-0.101	0.919	

```
Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21417    0.08397 -38.279   <2e-16 ***
BTB         -0.02717    0.08588  -0.316    0.752
Tibia       -0.03093    0.10072  -0.307    0.759
CruralIndex  0.06573    0.10032   0.655    0.512
```

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66908    0.07276  -9.196   <2e-16 ***
BTB          0.02908    0.07339   0.396    0.692
LLL         -0.01958    0.07405  -0.264    0.791
CruralIndex  0.04382    0.07422   0.590    0.555

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04514    0.05530  18.898   <2e-16 ***
BTB          0.01377    0.05575   0.247    0.805
LLL          0.02512    0.05604   0.448    0.654
CruralIndex  0.01335    0.05640   0.237    0.813

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21418    0.08397 -38.277   <2e-16 ***
BTB         -0.02761    0.08585  -0.322    0.748
LLL         -0.02538    0.08573  -0.296    0.767
CruralIndex  0.04493    0.08623   0.521    0.602
```

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + LLL

```
Equation for distal vs proximal:
             Estimate Std. Error z value Pr(>|z|)
```

```
(Intercept) -6.691e-01  7.276e-02  -9.196   <2e-16 ***
Femur        8.803e+01  4.575e+04   0.002    0.998
Tibia        6.525e+01  3.387e+04   0.002    0.998
LLL         -1.243e+02  6.455e+04  -0.002    0.998
```

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.045e+00  5.531e-02  18.896   <2e-16 ***
Femur        3.806e+02  3.829e+05   0.001    0.999
Tibia        2.818e+02  2.835e+05   0.001    0.999
LLL         -5.369e+02  5.402e+05  -0.001    0.999
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)   -3.21366    0.08398  -38.27   <2e-16 ***
Femur       -218.75228         NA      NA       NA
Tibia       -161.89124         NA      NA       NA
LLL          308.53343         NA      NA       NA
```

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + CruralIndex

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66921    0.07213  -9.278   <2e-16 ***
Femur       -0.72187    0.59884  -1.205    0.228
Tibia        0.64303    0.55160   1.166    0.244
CruralIndex -0.75499    0.67987  -1.111    0.267
```

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.0451286  0.0553218  18.892   <2e-16 ***
Femur       -0.0001453  0.4575560   0.000    1.000
Tibia        0.0298518  0.4214147   0.071    0.944
CruralIndex -0.0055257  0.5198619  -0.011    0.992
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21379    0.08397 -38.272   <2e-16 ***
Femur        0.11147    0.69758   0.160    0.873
Tibia       -0.13414    0.64324  -0.209    0.835
CruralIndex  0.18793    0.79171   0.237    0.812
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66921    0.07213  -9.278   <2e-16 ***
LLL         -1.01839    0.84482  -1.205    0.228
Tibia        1.17745    0.99191   1.187    0.235
CruralIndex -0.75499    0.67987  -1.111    0.267
```

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.045129   0.055322  18.892   <2e-16 ***
LLL         -0.000205   0.645505   0.000    1.000
Tibia        0.029959   0.757848   0.040    0.968
CruralIndex -0.005526   0.519862  -0.011    0.992
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21379    0.08397 -38.272   <2e-16 ***
LLL          0.15726    0.98413   0.160    0.873
Tibia       -0.21667    1.15615  -0.187    0.851
CruralIndex  0.18793    0.79171   0.237    0.812
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur

Error: singular matrix

Model: cbind(proximal, distal, In, anti) ~ LLL + Tibia + Femur + BTB

Error: singular matrix

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + CruralIndex

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
```

```
(Intercept) -0.66919    0.07210  -9.281   <2e-16 ***
BTB          0.01521    0.07374   0.206    0.837
Femur       -0.70141    0.60687  -1.156    0.248
Tibia        0.62400    0.55913   1.116    0.264
CruralIndex -0.73342    0.68770  -1.066    0.286
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.04515    0.05531  18.896   <2e-16 ***
BTB          0.01381    0.05655   0.244    0.807
Femur        0.01871    0.46390   0.040    0.968
Tibia        0.01240    0.42732   0.029    0.977
CruralIndex  0.01432    0.52604   0.027    0.978
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21422    0.08397 -38.280   <2e-16 ***
BTB         -0.02563    0.08703  -0.295    0.768
Femur        0.07876    0.70704   0.111    0.911
Tibia       -0.10289    0.65230  -0.158    0.875
CruralIndex  0.15390    0.80085   0.192    0.848
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + Femur + Tibia + CruralIndex</u>

Error: singular matrix

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur + BTB</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66919    0.07210  -9.281   <2e-16 ***
LLL          1.18910    1.06549   1.116    0.264
CruralIndex -0.73342    0.68770  -1.066    0.286
Femur       -1.54428    1.35809  -1.137    0.255
BTB          0.01521    0.07374   0.206    0.837
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 1.045146   0.055311  18.896   <2e-16 ***
LLL         0.023631   0.814303   0.029    0.977
CruralIndex 0.014317   0.526039   0.027    0.978
Femur       0.001957   1.038036   0.002    0.998
BTB         0.013810   0.056548   0.244    0.807
```

Equation for anti vs proximal:

```
           Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21422    0.08397 -38.280   <2e-16 ***
LLL         -0.19607    1.24303  -0.158    0.875
CruralIndex  0.15390    0.80085   0.192    0.848
Femur        0.21774    1.58344   0.138    0.891
BTB         -0.02563    0.08703  -0.295    0.768
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia + BTB</u>

```
Equation for distal vs proximal:
           Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.66919    0.07210  -9.281   <2e-16 ***
LLL         -0.98952    0.85615  -1.156    0.248
CruralIndex -0.73342    0.68770  -1.066    0.286
Tibia        1.14327    1.00543   1.137    0.255
BTB          0.01521    0.07374   0.206    0.837

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.045146   0.055311  18.896   <2e-16 ***
LLL          0.026392   0.654458   0.040    0.968
CruralIndex  0.014317   0.526039   0.027    0.978
Tibia       -0.001449   0.768485  -0.002    0.998
BTB          0.013810   0.056548   0.244    0.807

Equation for anti vs proximal:
           Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.21422    0.08397 -38.280   <2e-16 ***
LLL          0.11111    0.99747   0.111    0.911
CruralIndex  0.15390    0.80085   0.192    0.848
Tibia       -0.16120    1.17226  -0.138    0.891
BTB         -0.02563    0.08703  -0.295    0.768
```

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + LLL + CruralIndex</u>

```
Equation for distal vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.692e-01  7.210e-02  -9.281   <2e-16 ***
BTB          1.521e-02  7.374e-02   0.206    0.837
Femur        6.765e+02  3.973e+05   0.002    0.999
Tibia        5.020e+02  2.942e+05   0.002    0.999
LLL         -9.554e+02  5.606e+05  -0.002    0.999
CruralIndex -7.334e-01  6.877e-01  -1.066    0.286
```

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	1.045e+00	5.531e-02	18.896	<2e-16	***
BTB	1.381e-02	5.655e-02	0.244	0.807	
Femur	5.702e+02	3.387e+05	0.002	0.999	
Tibia	4.222e+02	2.508e+05	0.002	0.999	
LLL	-8.045e+02	4.779e+05	-0.002	0.999	
CruralIndex	1.432e-02	5.260e-01	0.027	0.978	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-3.21422	0.08397	-38.280	<2e-16	***
BTB	-0.02563	0.08703	-0.295	0.768	
Femur	-206.85414	NA	NA	NA	
Tibia	-153.30073	NA	NA	NA	
LLL	291.93402	NA	NA	NA	
CruralIndex	0.15390	0.80085	0.192	0.848	

3. **Hip-Knee Coordination**
   Proximal: hip-phase
   Distal: knee-phase
   In: in-phase
   Anti: anti-phase
   cbind: a function to bundle proximal, distal, in and anti together

Model: cbind(proximal, distal, In, anti) ~ BTB

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.4942600	0.0396199	12.475	<2e-16	***
BTB	0.0007339	0.0397580	0.018	0.985	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.083770	0.046707	1.794	0.0729	.
BTB	-0.002533	0.046835	-0.054	0.9569	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360208	0.039013	-9.233	<2e-16	***
BTB	-0.004862	0.039210	-0.124	0.901	

Model: cbind(proximal, distal, In, anti) ~ Femur

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494207	0.039582	12.486	<2e-16	***
Femur	0.006556	0.039551	0.166	0.868	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08383	0.04658	1.800	0.0719	.
Femur	-0.01730	0.04656	-0.372	0.7102	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360191	0.039055	-9.223	<2e-16	***
Femur	-0.008884	0.038924	-0.228	0.819	

Model: cbind(proximal, distal, In, anti) ~ Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.49423	0.03954	12.501	<2e-16	***
Tibia	-0.01352	0.03951	-0.342	0.732	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08385	0.04636	1.809	0.0705	.
Tibia	-0.03968	0.04636	-0.856	0.3921	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360195	0.038996	-9.237	<2e-16	***
Tibia	-0.004056	0.038981	-0.104	0.917	

Model: cbind(proximal, distal, In, anti) ~ LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494197	0.039579	12.486	<2e-16	***
LLL	-0.002426	0.039576	-0.061	0.951	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08387	0.04645	1.806	0.071	.
LLL	-0.03315	0.04646	-0.713	0.476	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36018	0.03905	-9.224	<2e-16	***
LLL	-0.00848	0.03898	-0.218	0.828	

Model: cbind(proximal, distal, In, anti) ~ CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.49425	0.03950	12.513	<2e-16	***

CruralIndex -0.02105 0.03943 -0.534 0.593

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08378	0.04657	1.799	0.072	.
CruralIndex	-0.01792	0.04650	-0.385	0.700	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360212	0.038988	-9.239	<2e-16	***
CruralIndex	0.006644	0.038880	0.171	0.864	

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Femur</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494224	0.039620	12.474	<2e-16	***
BTB	0.001210	0.039879	0.030	0.976	
Femur	0.006636	0.039711	0.167	0.867	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.083815	0.046655	1.796	0.0724	.
BTB	-0.003839	0.046924	-0.082	0.9348	
Femur	-0.017582	0.046773	-0.376	0.7070	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360207	0.039074	-9.219	<2e-16	***
BTB	-0.005676	0.039403	-0.144	0.885	
Femur	-0.009359	0.039075	-0.240	0.811	

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494243	0.039572	12.490	<2e-16	***
BTB	0.001761	0.039841	0.044	0.965	
Tibia	-0.013660	0.039674	-0.344	0.731	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838465	0.0464396	1.805	0.071	.
BTB	0.0006025	0.0467161	0.013	0.990	
Tibia	-0.0397144	0.0465847	-0.853	0.394	

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360208   0.039043  -9.226   <2e-16 ***
BTB         -0.004545   0.039375  -0.115    0.908
Tibia       -0.003676   0.039162  -0.094    0.925
```

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.4942131  0.0396209  12.474   <2e-16 ***
BTB          0.0006261  0.0397622   0.016    0.987
LLL         -0.0024298  0.0396212  -0.061    0.951
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083857   0.046524   1.802   0.0715 .
BTB         -0.002924   0.046657  -0.063   0.9500
LLL         -0.033175   0.046542  -0.713   0.4760
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360197   0.039079  -9.217   <2e-16 ***
BTB         -0.004988   0.039279  -0.127    0.899
LLL         -0.008558   0.039014  -0.219    0.826
```

Model: cbind(proximal, distal, In, anti) ~ BTB + CruralIndex

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494269   0.039528  12.504   <2e-16 ***
BTB          0.003208   0.039940   0.080    0.936
CruralIndex -0.021410   0.039729  -0.539    0.590
```

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.0837687  0.0466450   1.796   0.0725 .
BTB         -0.0004875  0.0470862  -0.010   0.9917
CruralIndex -0.0178666  0.0468911  -0.381   0.7032
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360232   0.039015  -9.233   <2e-16 ***
BTB         -0.005849   0.039508  -0.148    0.882
CruralIndex  0.007378   0.039200   0.188    0.851
```

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49420    0.03952  12.504   <2e-16 ***
Femur        0.01162    0.04136   0.281    0.779
Tibia       -0.01696    0.04136  -0.410    0.682

Equation for In vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083873   0.046359   1.809   0.0704 .
Femur       -0.006057   0.048526  -0.125   0.9007
Tibia       -0.037908   0.048547  -0.781   0.4349

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360196   0.039058  -9.222   <2e-16 ***
Femur       -0.008442   0.040772  -0.207    0.836
Tibia       -0.001512   0.040893  -0.037    0.971
```

Model: cbind(proximal, distal, In, anti) ~ Femur + LLL

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49420    0.03952  12.504   <2e-16 ***
Femur        0.03452    0.07876   0.438    0.661
LLL         -0.03231    0.07882  -0.410    0.682

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08387    0.04636   1.809   0.0704 .
Femur        0.04515    0.09244   0.488   0.6253
LLL         -0.07224    0.09251  -0.781   0.4349

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360196   0.039058  -9.222   <2e-16 ***
Femur       -0.006400   0.077799  -0.082    0.934
LLL         -0.002881   0.077925  -0.037    0.971
```

Model: cbind(proximal, distal, In, anti) ~ Femur + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49422    0.03948  12.518   <2e-16 ***
Femur       -0.01135    0.05102  -0.222    0.824
CruralIndex -0.02824    0.05097  -0.554    0.579
```

```
Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08387    0.04634   1.810   0.0703 .
Femur       -0.04801    0.05992  -0.801   0.4230
CruralIndex -0.04837    0.05987  -0.808   0.4191

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360209   0.039062  -9.221   <2e-16 ***
Femur       -0.007823   0.050403  -0.155    0.877
CruralIndex  0.001675   0.050432   0.033    0.974
```

Model: cbind(proximal, distal, In, anti) ~ Tibia + LLL

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49420    0.03952  12.504   <2e-16 ***
Tibia       -0.02556    0.05831  -0.438    0.661
LLL          0.01639    0.05835   0.281    0.779

Equation for In vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083873   0.046359   1.809   0.0704 .
Tibia       -0.033424   0.068434  -0.488   0.6253
LLL         -0.008545   0.068458  -0.125   0.9007

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360196   0.039058  -9.222   <2e-16 ***
Tibia        0.004738   0.057597   0.082    0.934
LLL         -0.011909   0.057520  -0.207    0.836
```

Model: cbind(proximal, distal, In, anti) ~ Tibia + CruralIndex

```
Equation for distal vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494194   0.039497  12.512   <2e-16 ***
Tibia       -0.002929   0.047007  -0.062    0.950
CruralIndex -0.019461   0.046954  -0.414    0.679

Equation for In vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083874   0.046361   1.809   0.0704 .
Tibia       -0.042467   0.055196  -0.769   0.4417
CruralIndex  0.005063   0.055122   0.092   0.9268

Equation for anti vs proximal:
```

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.36020    0.03904  -9.226   <2e-16 ***
Tibia       -0.01077    0.04643  -0.232    0.817
CruralIndex  0.01244    0.04632   0.269    0.788
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494207   0.039490  12.515   <2e-16 ***
LLL         -0.006065   0.040033  -0.151    0.880
CruralIndex -0.022048   0.039963  -0.552    0.581
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08387    0.04635   1.810   0.0704 .
LLL         -0.03711    0.04701  -0.790   0.4298
CruralIndex -0.02406    0.04693  -0.513   0.6081
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360202   0.039055  -9.223   <2e-16 ***
LLL         -0.007513   0.039543  -0.190    0.849
CruralIndex  0.005382   0.039502   0.136    0.892
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494223   0.039554  12.495   <2e-16 ***
BTB          0.002961   0.040054   0.074    0.941
Femur        0.011934   0.041629   0.287    0.774
Tibia       -0.017293   0.041642  -0.415    0.678
```

Equation for In vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.0838636  0.0464312   1.806   0.0709 .
BTB          0.0000292  0.0469730   0.001   0.9995
Femur       -0.0060477  0.0488769  -0.124   0.9015
Tibia       -0.0378991  0.0489067  -0.775   0.4384
```

Equation for anti vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.3602151  0.0390835  -9.217   <2e-16 ***
BTB         -0.0055936  0.0396656  -0.141    0.888
Femur       -0.0091115  0.0410566  -0.222    0.824
Tibia       -0.0008393  0.0411815  -0.020    0.984
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494223	0.039554	12.495	<2e-16	***
BTB	0.002961	0.040054	0.074	0.941	
Femur	0.035292	0.079534	0.444	0.657	
LLL	-0.032953	0.079353	-0.415	0.678	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838636	0.0464312	1.806	0.0709	.
BTB	0.0000292	0.0469730	0.001	0.9995	
Femur	0.0451448	0.0933954	0.483	0.6288	
LLL	-0.0722206	0.0931966	-0.775	0.4384	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360215	0.039083	-9.217	<2e-16	***
BTB	-0.005594	0.039666	-0.141	0.888	
Femur	-0.007978	0.078605	-0.101	0.919	
LLL	-0.001599	0.078476	-0.020	0.984	

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494238	0.039509	12.509	<2e-16	***
BTB	0.003093	0.039922	0.077	0.938	
Femur	-0.011343	0.051057	-0.222	0.824	
CruralIndex	-0.028586	0.051198	-0.558	0.577	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838571	0.0464152	1.807	0.0708	.
BTB	-0.0006828	0.0468561	-0.015	0.9884	
Femur	-0.0479966	0.0600130	-0.800	0.4238	
CruralIndex	-0.0482825	0.0601789	-0.802	0.4224	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360230	0.039087	-9.216	<2e-16	***
BTB	-0.005870	0.039580	-0.148	0.882	
Femur	-0.007869	0.050435	-0.156	0.876	
CruralIndex	0.002382	0.050674	0.047	0.963	

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + LLL

Equation for distal vs proximal:

```
             Estimate  Std. Error z value Pr(>|z|)
(Intercept)  0.494223   0.039554  12.495   <2e-16 ***
BTB          0.002961   0.040054   0.074    0.941
Tibia       -0.026128   0.058881  -0.444    0.657
LLL          0.016836   0.058729   0.287    0.774
```

Equation for In vs proximal:

```
              Estimate  Std. Error z value Pr(>|z|)
(Intercept)  0.0838636  0.0464312   1.806   0.0709 .
BTB          0.0000292  0.0469730   0.001   0.9995
Tibia       -0.0334219  0.0691431  -0.483   0.6288
LLL         -0.0085318  0.0689539  -0.124   0.9015
```

Equation for anti vs proximal:

```
             Estimate  Std. Error z value Pr(>|z|)
(Intercept) -0.360215   0.039083  -9.217   <2e-16 ***
BTB         -0.005594   0.039666  -0.141    0.888
Tibia        0.005906   0.058193   0.101    0.919
LLL         -0.012854   0.057921  -0.222    0.824
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + CruralIndex

Equation for distal vs proximal:

```
             Estimate  Std. Error z value Pr(>|z|)
(Intercept)  0.494214   0.039527  12.503   <2e-16 ***
BTB          0.003168   0.039948   0.079    0.937
Tibia       -0.003020   0.047053  -0.064    0.949
CruralIndex -0.019769   0.047169  -0.419    0.675
```

Equation for In vs proximal:

```
              Estimate  Std. Error z value Pr(>|z|)
(Intercept)  0.0838649  0.0464321   1.806   0.0709 .
BTB          0.0002959  0.0468821   0.006   0.9950
Tibia       -0.0424569  0.0552928  -0.768   0.4426
CruralIndex  0.0050266  0.0554120   0.091   0.9277
```

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360215	0.039072	-9.219	<2e-16	***
BTB	-0.005654	0.039572	-0.143	0.886	
Tibia	-0.010642	0.046469	-0.229	0.819	
CruralIndex	0.013081	0.046547	0.281	0.779	

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494228	0.039519	12.506	<2e-16	***
BTB	0.003167	0.039932	0.079	0.937	
LLL	-0.006096	0.040063	-0.152	0.879	
CruralIndex	-0.022410	0.040265	-0.557	0.578	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838612	0.0464215	1.807	0.0708	.
BTB	-0.0002361	0.0468625	-0.005	0.9960	
LLL	-0.0370962	0.0470818	-0.788	0.4307	
CruralIndex	-0.0240327	0.0473127	-0.508	0.6115	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360223	0.039081	-9.217	<2e-16	***
BTB	-0.005792	0.039574	-0.146	0.884	
LLL	-0.007481	0.039570	-0.189	0.850	
CruralIndex	0.006113	0.039823	0.154	0.878	

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + LLL

Error: singular matrix

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.49421	0.03919	12.612	<2e-16	***
Femur	-0.33695	0.32400	-1.040	0.298	
Tibia	0.30344	0.29839	1.017	0.309	
CruralIndex	-0.39907	0.36808	-1.084	0.278	

```
Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08384    0.04634   1.809   0.0704 .
Femur       -0.10185    0.38327  -0.266   0.7904
Tibia        0.05023    0.35293   0.142   0.8868
CruralIndex -0.10978    0.43536  -0.252   0.8009

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.36024    0.03898  -9.243   <2e-16 ***
Femur        0.15237    0.32147   0.474    0.636
Tibia       -0.14953    0.29627  -0.505    0.614
CruralIndex  0.18420    0.36534   0.504    0.614
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia</u>

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49421    0.03919  12.612   <2e-16 ***
LLL         -0.47536    0.45709  -1.040    0.298
Tibia        0.55290    0.53661   1.030    0.303
CruralIndex -0.39907    0.36808  -1.084    0.278

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08384    0.04634   1.809   0.0704 .
LLL         -0.14369    0.54070  -0.266   0.7904
Tibia        0.12563    0.63474   0.198   0.8431
CruralIndex -0.10978    0.43536  -0.252   0.8009

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.36024    0.03898  -9.243   <2e-16 ***
LLL          0.21496    0.45352   0.474    0.636
Tibia       -0.26233    0.53264  -0.493    0.622
CruralIndex  0.18420    0.36534   0.504    0.614
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.49421	0.03919	12.612	<2e-16	***
LLL	0.57824	0.56861	1.017	0.309	
CruralIndex	-0.39907	0.36808	-1.084	0.278	
Femur	-0.74683	0.72483	-1.030	0.303	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08384	0.04634	1.809	0.0704	.
LLL	0.09571	0.67254	0.142	0.8868	
CruralIndex	-0.10978	0.43536	-0.252	0.8009	
Femur	-0.16970	0.85737	-0.198	0.8431	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36024	0.03898	-9.243	<2e-16	***
LLL	-0.28494	0.56457	-0.505	0.614	
CruralIndex	0.18420	0.36534	0.504	0.614	
Femur	0.35435	0.71946	0.493	0.622	

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + Tibia + Femur + BTB</u>

Error: singular matrix

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + CruralIndex</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494202	0.039218	12.601	<2e-16	***
BTB	-0.003871	0.040190	-0.096	0.923	
Femur	-0.342195	0.328774	-1.041	0.298	
Tibia	0.308316	0.302849	1.018	0.309	
CruralIndex	-0.404578	0.372771	-1.085	0.278	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.083845	0.046406	1.807	0.0708	.
BTB	-0.001736	0.047514	-0.037	0.9709	
Femur	-0.104137	0.389196	-0.268	0.7890	
Tibia	0.052339	0.358461	0.146	0.8839	

CruralIndex -0.112166 0.441231 -0.254 0.7993

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360242	0.039006	-9.236	<2e-16	***
BTB	-0.002593	0.040049	-0.065	0.948	
Femur	0.148913	0.326136	0.457	0.648	
Tibia	-0.146316	0.300621	-0.487	0.626	
CruralIndex	0.180577	0.369878	0.488	0.625	

Model: cbind(proximal, distal, In, anti) ~ LLL + Femur + Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	4.942e-01	3.919e-02	12.612	<2e-16	***
Femur	1.350e+01	1.038e+05	0.000	1.000	
Tibia	1.054e+01	7.685e+04	0.000	1.000	
LLL	-1.951e+01	1.465e+05	0.000	1.000	
CruralIndex	-3.991e-01	3.681e-01	-1.084	0.278	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	8.384e-02	4.634e-02	1.809	0.0704	.
Femur	1.996e+02	1.189e+05	0.002	0.9987	
Tibia	1.479e+02	8.799e+04	0.002	0.9987	
LLL	-2.817e+02	1.677e+05	-0.002	0.9987	
CruralIndex	-1.098e-01	4.354e-01	-0.252	0.8009	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36024	0.03898	-9.243	<2e-16	***
Femur	-65.38564	NA	NA	NA	
Tibia	-48.66903	NA	NA	NA	
LLL	92.45884	NA	NA	NA	
CruralIndex	0.18420	0.36534	0.504	0.614	

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur + BTB

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494202	0.039218	12.601	<2e-16	***
LLL	0.587527	0.577110	1.018	0.309	
CruralIndex	-0.404578	0.372771	-1.085	0.278	

```
Femur       -0.758654   0.735667  -1.031    0.302
BTB         -0.003871   0.040190  -0.096    0.923
```

Equation for In vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083845   0.046406   1.807   0.0708 .
LLL          0.099737   0.683084   0.146   0.8839
CruralIndex -0.112166   0.441231  -0.254   0.7993
Femur       -0.174834   0.870806  -0.201   0.8409
BTB         -0.001736   0.047514  -0.037   0.9709
```

Equation for anti vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360242   0.039006  -9.236   <2e-16 ***
LLL         -0.278821   0.572864  -0.487    0.626
CruralIndex  0.180577   0.369878   0.488    0.625
Femur        0.346550   0.730032   0.475    0.635
BTB         -0.002593   0.040049  -0.065    0.948
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia + BTB

Equation for distal vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494202   0.039218  12.601   <2e-16 ***
LLL         -0.482757   0.463823  -1.041    0.298
CruralIndex -0.404578   0.372771  -1.085    0.278
Tibia        0.561652   0.544634   1.031    0.302
BTB         -0.003871   0.040190  -0.096    0.923
```

Equation for In vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083845   0.046406   1.807   0.0708 .
LLL         -0.146914   0.549065  -0.268   0.7890
CruralIndex -0.112166   0.441231  -0.254   0.7993
Tibia        0.129434   0.644681   0.201   0.8409
BTB         -0.001736   0.047514  -0.037   0.9709
```

Equation for anti vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360242   0.039006  -9.236   <2e-16 ***
LLL          0.210081   0.460102   0.457    0.648
```

CruralIndex	0.180577	0.369878	0.488	0.625
Tibia	-0.256560	0.540462	-0.475	0.635
BTB	-0.002593	0.040049	-0.065	0.948

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + LLL + CruralIndex

Error: singular matrix

4. Hip-Ankle Coordination

Proximal: hip-phase
Distal: ankle-phase
In: in-phase
Anti: anti-phase
cbind: a function to bundle proximal, distal, in and anti together

<u>Model: cbind(proximal, distal, In, anti) ~ BTB</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.53219	0.04283	-12.43	<2e-16 ***
BTB	0.05496	0.04294	1.28	0.201

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.26653	0.03753	-7.102	1.23e-12 ***
BTB	0.05009	0.03768	1.329	0.184

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.08898	0.06033	-1.475	0.14
BTB	-0.01456	0.06041	-0.241	0.81

<u>Model: cbind(proximal, distal, In, anti) ~ Femur</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.532300	0.043362	-12.276	<2e-16 ***
Femur	0.004436	0.043360	0.102	0.919

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.26654	0.03782	-7.047	1.83e-12 ***
Femur	-0.03504	0.03780	-0.927	0.354

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.08894	0.06030	-1.475	0.140
Femur	-0.02144	0.06024	-0.356	0.722

Model: cbind(proximal, distal, In, anti) ~ Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.53219	0.04316	-12.330	<2e-16 ***
Tibia	-0.03675	0.04321	-0.851	0.395

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.26649	0.03779	-7.053	1.76e-12 ***
Tibia	-0.03880	0.03779	-1.027	0.305

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.08895	0.06030	-1.475	0.140
Tibia	0.01804	0.06030	0.299	0.765

Model: cbind(proximal, distal, In, anti) ~ LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.53225	0.04334	-12.280	<2e-16 ***
LLL	-0.01613	0.04339	-0.372	0.71

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.26648	0.03767	-7.075	1.5e-12 ***
LLL	-0.04528	0.03768	-1.202	0.23

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.088941	0.060351	-1.474	0.141
LLL	-0.005723	0.060327	-0.095	0.924

Model: cbind(proximal, distal, In, anti) ~ CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.53227	0.04301	-12.374	<2e-16 ***
CruralIndex	-0.04451	0.04298	-1.036	0.3

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.266610   0.038064  -7.004 2.48e-12 ***
CruralIndex -0.008136   0.037992  -0.214     0.83
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08896    0.06025  -1.477    0.140
CruralIndex  0.02741    0.06020   0.455    0.649
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.532227   0.042812 -12.432   <2e-16 ***
BTB          0.055602   0.043053   1.291    0.197
Femur        0.008731   0.042940   0.203    0.839
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26647    0.03734  -7.137 9.57e-13 ***
BTB          0.04771    0.03760   1.269    0.205
Femur       -0.03142    0.03743  -0.840    0.401
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08896    0.06027  -1.476    0.140
BTB         -0.01633    0.06053  -0.270    0.787
Femur       -0.02268    0.06040  -0.376    0.707
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53209    0.04257 -12.498   <2e-16 ***
BTB          0.05831    0.04282   1.362    0.173
Tibia       -0.04142    0.04276  -0.969    0.333
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26637    0.03718  -7.165 7.78e-13 ***
BTB          0.05369    0.03746   1.433    0.152
Tibia       -0.04323    0.03730  -1.159    0.246
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08897    0.06027  -1.476    0.140
BTB         -0.01596    0.06053  -0.264    0.792
Tibia        0.01921    0.06045   0.318    0.751
```

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + LLL</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53217    0.04281 -12.430   <2e-16 ***
BTB          0.05474    0.04293   1.275    0.202
LLL         -0.01541    0.04286  -0.360    0.719
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26639    0.03714  -7.173 7.33e-13 ***
BTB          0.04962    0.03729   1.331    0.183
LLL         -0.04476    0.03716  -1.205    0.228
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.088955   0.060328  -1.475    0.140
BTB         -0.014630   0.060415  -0.242    0.809
LLL         -0.005931   0.060310  -0.098    0.922
```

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + CruralIndex</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53218    0.04236 -12.563   <2e-16 ***
BTB          0.06094    0.04276   1.425    0.154
CruralIndex -0.05150    0.04261  -1.209    0.227
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26652    0.03750  -7.107 1.19e-12 ***
BTB          0.05177    0.03791   1.366    0.172
CruralIndex -0.01411    0.03768  -0.374    0.708
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08898    0.06020  -1.478    0.139
BTB         -0.01783    0.06068  -0.294    0.769
CruralIndex  0.02938    0.06055   0.485    0.628
```

<u>Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia</u>

Equation for distal vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53223    0.04311 -12.345   <2e-16 ***
Femur        0.01677    0.04514   0.371    0.710
Tibia       -0.04170    0.04519  -0.923    0.356
```

Equation for In vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26647    0.03767  -7.073 1.51e-12 ***
Femur       -0.02582    0.03942  -0.655    0.512
Tibia       -0.03118    0.03945  -0.790    0.429
```

Equation for anti vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08894    0.06020  -1.477    0.140
Femur       -0.02949    0.06302  -0.468    0.640
Tibia        0.02683    0.06307   0.425    0.671
```

Model: cbind(proximal, distal, In, anti) ~ Femur + LLL

Equation for distal vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53223    0.04311 -12.345   <2e-16 ***
Femur        0.07310    0.08602   0.850    0.395
LLL         -0.07946    0.08612  -0.923    0.356
```

Equation for In vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26647    0.03767  -7.073 1.51e-12 ***
Femur        0.01630    0.07509   0.217    0.828
LLL         -0.05942    0.07517  -0.790    0.429
```

Equation for anti vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08894    0.06020  -1.477    0.140
Femur       -0.06573    0.12013  -0.547    0.584
LLL          0.05114    0.12019   0.425    0.671
```

Model: cbind(proximal, distal, In, anti) ~ Femur + CruralIndex

Equation for distal vs proximal:
```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53221    0.04288 -12.412   <2e-16 ***
Femur       -0.04008    0.05549  -0.722    0.470
CruralIndex -0.07000    0.05545  -1.262    0.207
```

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26645	0.03754	-7.098	1.26e-12	***
Femur	-0.06736	0.04855	-1.388	0.165	
CruralIndex	-0.05082	0.04849	-1.048	0.295	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.088937	0.060246	-1.476	0.140
Femur	-0.007019	0.077848	-0.090	0.928
CruralIndex	0.022857	0.077862	0.294	0.769

Model: cbind(proximal, distal, In, anti) ~ Tibia + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53223	0.04311	-12.345	<2e-16	***
Tibia	-0.05411	0.06368	-0.850	0.395	
LLL	0.02366	0.06368	0.371	0.710	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26647	0.03767	-7.073	1.51e-12	***
Tibia	-0.01207	0.05559	-0.217	0.828	
LLL	-0.03643	0.05562	-0.655	0.512	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.08894	0.06020	-1.477	0.140
Tibia	0.04866	0.08893	0.547	0.584
LLL	-0.04160	0.08890	-0.468	0.640

Model: cbind(proximal, distal, In, anti) ~ Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53225	0.04300	-12.378	<2e-16	***
Tibia	-0.01771	0.05124	-0.346	0.730	
CruralIndex	-0.03498	0.05114	-0.684	0.494	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26647	0.03775	-7.060	1.67e-12	***
Tibia	-0.04882	0.04494	-1.086	0.277	
CruralIndex	0.01834	0.04485	0.409	0.683	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)

```
(Intercept) -0.08895    0.06024  -1.476    0.140
Tibia        0.00455    0.07168   0.063    0.949
CruralIndex  0.02487    0.07163   0.347    0.728
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53223    0.04294 -12.393   <2e-16 ***
LLL         -0.02422    0.04359  -0.556    0.578
CruralIndex -0.04858    0.04351  -1.117    0.264
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26646    0.03763  -7.080 1.44e-12 ***
LLL         -0.04797    0.03818  -1.257    0.209
CruralIndex -0.01603    0.03809  -0.421    0.674
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.088943   0.060248  -1.476    0.140
LLL         -0.001329   0.061067  -0.022    0.983
CruralIndex  0.027098   0.061046   0.444    0.657
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53213    0.04248 -12.527   <2e-16 ***
BTB          0.06068    0.04297   1.412    0.158
Femur        0.02348    0.04473   0.525    0.600
Tibia       -0.04856    0.04479  -1.084    0.278
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26636    0.03711  -7.177  7.1e-13 ***
BTB          0.05167    0.03760   1.374    0.169
Femur       -0.02016    0.03905  -0.516    0.606
Tibia       -0.03712    0.03909  -0.950    0.342
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08896    0.06015  -1.479    0.139
BTB         -0.01916    0.06076  -0.315    0.753
Femur       -0.03156    0.06332  -0.498    0.618
Tibia        0.02888    0.06337   0.456    0.649
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53213	0.04248	-12.527	<2e-16	***
BTB	0.06068	0.04297	1.412	0.158	
Femur	0.08907	0.08550	1.042	0.298	
LLL	-0.09254	0.08535	-1.084	0.278	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26636	0.03711	-7.177	7.1e-13	***
BTB	0.05167	0.03760	1.374	0.169	
Femur	0.02997	0.07463	0.402	0.688	
LLL	-0.07073	0.07449	-0.950	0.342	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.08896	0.06015	-1.479	0.139
BTB	-0.01916	0.06076	-0.315	0.753
Femur	-0.07057	0.12106	-0.583	0.560
LLL	0.05502	0.12077	0.456	0.649

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53211	0.04223	-12.600	<2e-16	***
BTB	0.06077	0.04263	1.425	0.154	
Femur	-0.03967	0.05466	-0.726	0.468	
CruralIndex	-0.07673	0.05481	-1.400	0.162	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26635	0.03697	-7.205	5.79e-13	***
BTB	0.05161	0.03737	1.381	0.167	
Femur	-0.06718	0.04781	-1.405	0.160	
CruralIndex	-0.05667	0.04793	-1.182	0.237	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.088953	0.060199	-1.478	0.140
BTB	-0.017825	0.060675	-0.294	0.769
Femur	-0.007223	0.077789	-0.093	0.926
CruralIndex	0.024691	0.078072	0.316	0.752

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + LLL</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53213    0.04248 -12.527   <2e-16 ***
BTB          0.06068    0.04297   1.412    0.158
Tibia       -0.06594    0.06330  -1.042    0.298
LLL          0.03312    0.06310   0.525    0.600
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26636    0.03711  -7.177  7.1e-13 ***
BTB          0.05167    0.03760   1.374    0.169
Tibia       -0.02219    0.05525  -0.402    0.688
LLL         -0.02845    0.05509  -0.516    0.606
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08896    0.06015  -1.479    0.139
BTB         -0.01916    0.06076  -0.315    0.753
Tibia        0.05224    0.08962   0.583    0.560
LLL         -0.04453    0.08933  -0.498    0.618
```

<u>Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + CruralIndex</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53215    0.04235 -12.566   <2e-16 ***
BTB          0.06127    0.04275   1.433    0.152
Tibia       -0.01926    0.05048  -0.381    0.703
CruralIndex -0.04118    0.05055  -0.815    0.415
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26636    0.03716  -7.168 7.59e-13 ***
BTB          0.05277    0.03757   1.405    0.160
Tibia       -0.05029    0.04425  -1.136    0.256
CruralIndex  0.01304    0.04432   0.294    0.769
```

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.088965	0.060201	-1.478	0.139
BTB	-0.017866	0.060686	-0.294	0.768
Tibia	0.004908	0.071644	0.069	0.945
CruralIndex	0.026638	0.071843	0.371	0.711

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53213	0.04229	-12.582	<2e-16	***
BTB	0.06109	0.04269	1.431	0.152	
LLL	-0.02463	0.04293	-0.574	0.566	
CruralIndex	-0.05567	0.04313	-1.291	0.197	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26636	0.03705	-7.189	6.54e-13	***
BTB	0.05220	0.03746	1.393	0.163	
LLL	-0.04845	0.03759	-1.289	0.197	
CruralIndex	-0.02214	0.03775	-0.586	0.558	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.088959	0.060202	-1.478	0.139
BTB	-0.017779	0.060676	-0.293	0.770
LLL	-0.001282	0.061020	-0.021	0.983
CruralIndex	0.029063	0.061389	0.473	0.636

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + LLL

Error

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53233	0.04103	-12.975	<2e-16	***
Femur	-0.86261	0.33988	-2.538	0.0112	*
Tibia	0.76670	0.31294	2.450	0.0143	*
CruralIndex	-1.00686	0.38604	-2.608	0.0091	**

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26652	0.03658	-7.286	3.2e-13	***
Femur	-0.61079	0.30227	-2.021	0.0433	*
Tibia	0.50657	0.27825	1.821	0.0687	.
CruralIndex	-0.66978	0.34324	-1.951	0.0510	.

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.08899	0.05981	-1.488	0.137
Femur	-0.48508	0.49480	-0.980	0.327
Tibia	0.44564	0.45563	0.978	0.328
CruralIndex	-0.52168	0.56208	-0.928	0.353

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53233	0.04103	-12.975	<2e-16	***
LLL	-1.21694	0.47950	-2.538	0.0112	*
CruralIndex	-1.00686	0.38604	-2.608	0.0091	**
Tibia	1.40532	0.56285	2.497	0.0125	*

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26652	0.03658	-7.286	3.2e-13	***
LLL	-0.86168	0.42643	-2.021	0.0433	*
CruralIndex	-0.66978	0.34324	-1.951	0.0510	.
Tibia	0.95875	0.50049	1.916	0.0554	.

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.08899	0.05981	-1.488	0.137
LLL	-0.68434	0.69805	-0.980	0.327
CruralIndex	-0.52168	0.56208	-0.928	0.353
Tibia	0.80475	0.81945	0.982	0.326

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53233    0.04103 -12.975   <2e-16 ***
LLL          1.46103    0.59635   2.450   0.0143 *
CruralIndex -1.00686    0.38604  -2.608   0.0091 **
Femur       -1.89824    0.76028  -2.497   0.0125 *

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26652    0.03658  -7.286  3.2e-13 ***
LLL          0.96533    0.53023   1.821   0.0687 .
CruralIndex -0.66978    0.34324  -1.951   0.0510 .
Femur       -1.29504    0.67604  -1.916   0.0554 .

Equation for anti vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08899    0.05981  -1.488    0.137
LLL          0.84920    0.86825   0.978    0.328
CruralIndex -0.52168    0.56208  -0.928    0.353
Femur       -1.08703    1.10687  -0.982    0.326
```

Model: cbind(proximal, distal, In, anti) ~ LLL + Tibia + Femur + BTB

Error: singular matrix

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53224    0.04067 -13.087   <2e-16 ***
BTB          0.04489    0.04167   1.077   0.2813
Femur       -0.80045    0.34182  -2.342   0.0192 *
Tibia        0.70903    0.31479   2.252   0.0243 *
CruralIndex -0.94138    0.38746  -2.430   0.0151 *

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26642    0.03621  -7.357 1.88e-13 ***
BTB          0.04147    0.03714   1.117   0.2642
Femur       -0.55469    0.30340  -1.828   0.0675 .
Tibia        0.45437    0.27936   1.626   0.1039
CruralIndex -0.61074    0.34386  -1.776   0.0757 .
```

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.08901	0.05970	-1.491	0.136	
BTB	-0.02860	0.06104	-0.469	0.639	
Femur	-0.52417	0.50098	-1.046	0.295	
Tibia	0.48180	0.46139	1.044	0.296	
CruralIndex	-0.56287	0.56797	-0.991	0.322	

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + Femur + Tibia + CruralIndex</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-5.323e-01	4.103e-02	-12.975	<2e-16	***
LLL	-3.929e+01	1.466e+05	0.000	0.9998	
Femur	2.699e+01	1.039e+05	0.000	0.9998	
Tibia	2.139e+01	7.694e+04	0.000	0.9998	
CruralIndex	-1.007e+00	3.860e-01	-2.608	0.0091	**

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.26652	0.03658	-7.286	3.2e-13	***
LLL	77.96751	NA	NA	NA	
Femur	-55.87685	NA	NA	NA	
Tibia	-40.40834	NA	NA	NA	
CruralIndex	-0.66978	0.34324	-1.951	0.051	.

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.08899	0.05981	-1.488	0.137	
LLL	-109.30190	NA	NA	NA	
Femur	76.99187	NA	NA	NA	
Tibia	57.80385	NA	NA	NA	
CruralIndex	-0.52168	0.56208	-0.928	0.353	

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur + BTB</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53224	0.04067	-13.087	<2e-16	***
LLL	1.35113	0.59987	2.252	0.0243	*
CruralIndex	-0.94138	0.38746	-2.430	0.0151	*
Femur	-1.75818	0.76476	-2.299	0.0215	*

```
BTB          0.04489    0.04167   1.077   0.2813
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26642    0.03621  -7.357 1.88e-13 ***
LLL          0.86585    0.53235   1.626   0.1039
CruralIndex -0.61074    0.34386  -1.776   0.0757 .
Femur       -1.16843    0.67873  -1.721   0.0852 .
BTB          0.04147    0.03714   1.117   0.2642
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08901    0.05970  -1.491    0.136
LLL          0.91811    0.87922   1.044    0.296
CruralIndex -0.56287    0.56797  -0.991    0.322
Femur       -1.17496    1.12088  -1.048    0.295
BTB         -0.02860    0.06104  -0.469    0.639
```

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia + BTB</u>

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.53224    0.04067 -13.087   <2e-16 ***
LLL         -1.12925    0.48223  -2.342   0.0192 *
CruralIndex -0.94138    0.38746  -2.430   0.0151 *
Tibia        1.30163    0.56617   2.299   0.0215 *
BTB          0.04489    0.04167   1.077   0.2813
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.26642    0.03621  -7.357 1.88e-13 ***
LLL         -0.78253    0.42803  -1.828   0.0675 .
CruralIndex -0.61074    0.34386  -1.776   0.0757 .
Tibia        0.86502    0.50248   1.721   0.0852 .
BTB          0.04147    0.03714   1.117   0.2642
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.08901    0.05970  -1.491    0.136
LLL         -0.73948    0.70676  -1.046    0.295
CruralIndex -0.56287    0.56797  -0.991    0.322
```

Tibia	0.86985	0.82982	1.048	0.295
BTB	-0.02860	0.06104	-0.469	0.639

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + LLL + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.53224	0.04067	-13.087	<2e-16	***
BTB	0.04489	0.04167	1.077	0.2813	
Femur	45.63207	NA	NA	NA	
Tibia	35.08424	NA	NA	NA	
LLL	-65.50545	NA	NA	NA	
CruralIndex	-0.94138	0.38746	-2.430	0.0151	*

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-2.664e-01	3.621e-02	-7.357	1.88e-13	***
BTB	4.147e-02	3.714e-02	1.117	0.2642	
Femur	-1.907e+01	7.192e+04	0.000	0.9998	
Tibia	-1.325e+01	5.325e+04	0.000	0.9998	
LLL	2.612e+01	1.015e+05	0.000	0.9998	
CruralIndex	-6.107e-01	3.439e-01	-1.776	0.0757	.

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-8.901e-02	5.970e-02	-1.491	0.136
BTB	-2.860e-02	6.104e-02	-0.469	0.639
Femur	-4.703e+02	1.810e+05	-0.003	0.998
Tibia	-3.473e+02	1.340e+05	-0.003	0.998
LLL	6.628e+02	2.553e+05	0.003	0.998
CruralIndex	-5.629e-01	5.680e-01	-0.991	0.32

5. **Knee-Ankle Coordination**
   Proximal: knee-phase
   Distal: ankle-phase
   In: in-phase
   Anti: anti-phase
   cbind: a function to bundle proximal, distal, in and anti together

Model: cbind(proximal, distal, In, anti) ~ BTB

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.4942600	0.0396199	12.475	<2e-16	***
BTB	0.0007339	0.0397580	0.018	0.985	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.083770	0.046707	1.794	0.0729	.
BTB	-0.002533	0.046835	-0.054	0.9569	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360208	0.039013	-9.233	<2e-16	***
BTB	-0.004862	0.039210	-0.124	0.901	

Model: cbind(proximal, distal, In, anti) ~ Femur

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494207	0.039582	12.486	<2e-16	***
Femur	0.006556	0.039551	0.166	0.868	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08383	0.04658	1.800	0.0719	.
Femur	-0.01730	0.04656	-0.372	0.7102	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360191	0.039055	-9.223	<2e-16	***
Femur	-0.008884	0.038924	-0.228	0.819	

Model: cbind(proximal, distal, In, anti) ~ Tibia

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49423    0.03954  12.501   <2e-16 ***
Tibia       -0.01352    0.03951  -0.342    0.732
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08385    0.04636   1.809   0.0705 .
Tibia       -0.03968    0.04636  -0.856   0.3921
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360195   0.038996  -9.237   <2e-16 ***
Tibia       -0.004056   0.038981  -0.104    0.917
```

Model: cbind(proximal, distal, In, anti) ~ LLL

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494197   0.039579  12.486   <2e-16 ***
LLL         -0.002426   0.039576  -0.061    0.951
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08387    0.04645   1.806    0.071 .
LLL         -0.03315    0.04646  -0.713    0.476
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.36018    0.03905  -9.224   <2e-16 ***
LLL         -0.00848    0.03898  -0.218    0.828
```

Model: cbind(proximal, distal, In, anti) ~ CruralIndex

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49425    0.03950  12.513   <2e-16 ***
CruralIndex -0.02105    0.03943  -0.534    0.593
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08378    0.04657   1.799    0.072 .
CruralIndex -0.01792    0.04650  -0.385    0.700
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360212   0.038988  -9.239   <2e-16 ***
CruralIndex  0.006644   0.038880   0.171    0.864
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 0.494224   0.039620  12.474   <2e-16 ***
BTB         0.001210   0.039879   0.030    0.976
Femur       0.006636   0.039711   0.167    0.867
```

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083815   0.046655   1.796   0.0724 .
BTB         -0.003839   0.046924  -0.082   0.9348
Femur       -0.017582   0.046773  -0.376   0.7070
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360207   0.039074  -9.219   <2e-16 ***
BTB         -0.005676   0.039403  -0.144    0.885
Femur       -0.009359   0.039075  -0.240    0.811
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494243   0.039572  12.490   <2e-16 ***
BTB          0.001761   0.039841   0.044    0.965
Tibia       -0.013660   0.039674  -0.344    0.731
```

Equation for In vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.0838465  0.0464396   1.805    0.071 .
BTB          0.0006025  0.0467161   0.013    0.990
Tibia       -0.0397144  0.0465847  -0.853    0.394
```

Equation for anti vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360208   0.039043  -9.226   <2e-16 ***
```

```
BTB         -0.004545   0.039375  -0.115    0.908
Tibia       -0.003676   0.039162  -0.094    0.925
```

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.4942131  0.0396209  12.474   <2e-16 ***
BTB          0.0006261  0.0397622   0.016    0.987
LLL         -0.0024298  0.0396212  -0.061    0.951
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083857   0.046524   1.802   0.0715 .
BTB         -0.002924   0.046657  -0.063   0.9500
LLL         -0.033175   0.046542  -0.713   0.4760
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360197   0.039079  -9.217   <2e-16 ***
BTB         -0.004988   0.039279  -0.127    0.899
LLL         -0.008558   0.039014  -0.219    0.826
```

Model: cbind(proximal, distal, In, anti) ~ BTB + CruralIndex

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494269   0.039528  12.504   <2e-16 ***
BTB          0.003208   0.039940   0.080    0.936
CruralIndex -0.021410   0.039729  -0.539    0.590
```

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.0837687  0.0466450   1.796   0.0725 .
BTB         -0.0004875  0.0470862  -0.010   0.9917
CruralIndex -0.0178666  0.0468911  -0.381   0.7032
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360232   0.039015  -9.233   <2e-16 ***
BTB         -0.005849   0.039508  -0.148    0.882
CruralIndex  0.007378   0.039200   0.188    0.851
```

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49420    0.03952  12.504   <2e-16 ***
Femur        0.01162    0.04136   0.281    0.779
Tibia       -0.01696    0.04136  -0.410    0.682

Equation for In vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083873   0.046359   1.809   0.0704 .
Femur       -0.006057   0.048526  -0.125   0.9007
Tibia       -0.037908   0.048547  -0.781   0.4349

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360196   0.039058  -9.222   <2e-16 ***
Femur       -0.008442   0.040772  -0.207    0.836
Tibia       -0.001512   0.040893  -0.037    0.971
```

Model: cbind(proximal, distal, In, anti) ~ Femur + LLL

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49420    0.03952  12.504   <2e-16 ***
Femur        0.03452    0.07876   0.438    0.661
LLL         -0.03231    0.07882  -0.410    0.682

Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08387    0.04636   1.809   0.0704 .
Femur        0.04515    0.09244   0.488   0.6253
LLL         -0.07224    0.09251  -0.781   0.4349

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360196   0.039058  -9.222   <2e-16 ***
Femur       -0.006400   0.077799  -0.082    0.934
LLL         -0.002881   0.077925  -0.037    0.971
```

Model: cbind(proximal, distal, In, anti) ~ Femur + CruralIndex

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49422    0.03948  12.518   <2e-16 ***
Femur       -0.01135    0.05102  -0.222    0.824
CruralIndex -0.02824    0.05097  -0.554    0.579
```

```
Equation for In vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.08387    0.04634   1.810   0.0703 .
Femur       -0.04801    0.05992  -0.801   0.4230
CruralIndex -0.04837    0.05987  -0.808   0.4191

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360209   0.039062  -9.221   <2e-16 ***
Femur       -0.007823   0.050403  -0.155    0.877
CruralIndex  0.001675   0.050432   0.033    0.974
```

Model: cbind(proximal, distal, In, anti) ~ Tibia + LLL

```
Equation for distal vs proximal:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.49420    0.03952  12.504   <2e-16 ***
Tibia       -0.02556    0.05831  -0.438    0.661
LLL          0.01639    0.05835   0.281    0.779

Equation for In vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083873   0.046359   1.809   0.0704 .
Tibia       -0.033424   0.068434  -0.488   0.6253
LLL         -0.008545   0.068458  -0.125   0.9007

Equation for anti vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360196   0.039058  -9.222   <2e-16 ***
Tibia        0.004738   0.057597   0.082    0.934
LLL         -0.011909   0.057520  -0.207    0.836
```

Model: cbind(proximal, distal, In, anti) ~ Tibia + CruralIndex

```
Equation for distal vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494194   0.039497  12.512   <2e-16 ***
Tibia       -0.002929   0.047007  -0.062    0.950
CruralIndex -0.019461   0.046954  -0.414    0.679

Equation for In vs proximal:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083874   0.046361   1.809   0.0704 .
Tibia       -0.042467   0.055196  -0.769   0.4417
CruralIndex  0.005063   0.055122   0.092   0.9268
```

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36020	0.03904	-9.226	<2e-16	***
Tibia	-0.01077	0.04643	-0.232	0.817	
CruralIndex	0.01244	0.04632	0.269	0.788	

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494207	0.039490	12.515	<2e-16	***
LLL	-0.006065	0.040033	-0.151	0.880	
CruralIndex	-0.022048	0.039963	-0.552	0.581	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08387	0.04635	1.810	0.0704	.
LLL	-0.03711	0.04701	-0.790	0.4298	
CruralIndex	-0.02406	0.04693	-0.513	0.6081	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360202	0.039055	-9.223	<2e-16	***
LLL	-0.007513	0.039543	-0.190	0.849	
CruralIndex	0.005382	0.039502	0.136	0.892	

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494223	0.039554	12.495	<2e-16	***
BTB	0.002961	0.040054	0.074	0.941	
Femur	0.011934	0.041629	0.287	0.774	
Tibia	-0.017293	0.041642	-0.415	0.678	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838636	0.0464312	1.806	0.0709	.
BTB	0.0000292	0.0469730	0.001	0.9995	
Femur	-0.0060477	0.0488769	-0.124	0.9015	
Tibia	-0.0378991	0.0489067	-0.775	0.4384	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.3602151	0.0390835	-9.217	<2e-16	***
BTB	-0.0055936	0.0396656	-0.141	0.888	
Femur	-0.0091115	0.0410566	-0.222	0.824	
Tibia	-0.0008393	0.0411815	-0.020	0.984	

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + LLL

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494223	0.039554	12.495	<2e-16	***
BTB	0.002961	0.040054	0.074	0.941	
Femur	0.035292	0.079534	0.444	0.657	
LLL	-0.032953	0.079353	-0.415	0.678	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838636	0.0464312	1.806	0.0709	.
BTB	0.0000292	0.0469730	0.001	0.9995	
Femur	0.0451448	0.0933954	0.483	0.6288	
LLL	-0.0722206	0.0931966	-0.775	0.4384	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360215	0.039083	-9.217	<2e-16	***
BTB	-0.005594	0.039666	-0.141	0.888	
Femur	-0.007978	0.078605	-0.101	0.919	
LLL	-0.001599	0.078476	-0.020	0.984	

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494238	0.039509	12.509	<2e-16	***
BTB	0.003093	0.039922	0.077	0.938	
Femur	-0.011343	0.051057	-0.222	0.824	
CruralIndex	-0.028586	0.051198	-0.558	0.577	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838571	0.0464152	1.807	0.0708	.
BTB	-0.0006828	0.0468561	-0.015	0.9884	
Femur	-0.0479966	0.0600130	-0.800	0.4238	
CruralIndex	-0.0482825	0.0601789	-0.802	0.4224	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360230	0.039087	-9.216	<2e-16	***
BTB	-0.005870	0.039580	-0.148	0.882	
Femur	-0.007869	0.050435	-0.156	0.876	
CruralIndex	0.002382	0.050674	0.047	0.963	

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + LLL

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494223   0.039554  12.495   <2e-16 ***
BTB          0.002961   0.040054   0.074    0.941
Tibia       -0.026128   0.058881  -0.444    0.657
LLL          0.016836   0.058729   0.287    0.774
```

Equation for In vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.0838636  0.0464312   1.806   0.0709 .
BTB          0.0000292  0.0469730   0.001   0.9995
Tibia       -0.0334219  0.0691431  -0.483   0.6288
LLL         -0.0085318  0.0689539  -0.124   0.9015
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360215   0.039083  -9.217   <2e-16 ***
BTB         -0.005594   0.039666  -0.141    0.888
Tibia        0.005906   0.058193   0.101    0.919
LLL         -0.012854   0.057921  -0.222    0.824
```

Model: cbind(proximal, distal, In, anti) ~ BTB + Tibia + CruralIndex

Equation for distal vs proximal:

```
             Estimate Std. Error z value Pr(>|z|)
(Intercept)   0.494214   0.039527  12.503   <2e-16 ***
BTB           0.003168   0.039948   0.079    0.937
Tibia        -0.003020   0.047053  -0.064    0.949
CruralIndex  -0.019769   0.047169  -0.419    0.675
```

Equation for In vs proximal:

```
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.0838649  0.0464321   1.806   0.0709 .
BTB          0.0002959  0.0468821   0.006   0.9950
Tibia       -0.0424569  0.0552928  -0.768   0.4426
CruralIndex  0.0050266  0.0554120   0.091   0.9277
```

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360215	0.039072	-9.219	<2e-16	***
BTB	-0.005654	0.039572	-0.143	0.886	
Tibia	-0.010642	0.046469	-0.229	0.819	
CruralIndex	0.013081	0.046547	0.281	0.779	

Model: cbind(proximal, distal, In, anti) ~ BTB + LLL + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494228	0.039519	12.506	<2e-16	***
BTB	0.003167	0.039932	0.079	0.937	
LLL	-0.006096	0.040063	-0.152	0.879	
CruralIndex	-0.022410	0.040265	-0.557	0.578	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.0838612	0.0464215	1.807	0.0708	.
BTB	-0.0002361	0.0468625	-0.005	0.9960	
LLL	-0.0370962	0.0470818	-0.788	0.4307	
CruralIndex	-0.0240327	0.0473127	-0.508	0.6115	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360223	0.039081	-9.217	<2e-16	***
BTB	-0.005792	0.039574	-0.146	0.884	
LLL	-0.007481	0.039570	-0.189	0.850	
CruralIndex	0.006113	0.039823	0.154	0.878	

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + LLL

Error: singular matrix

Model: cbind(proximal, distal, In, anti) ~ Femur + Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.49421	0.03919	12.612	<2e-16	***
Femur	-0.33695	0.32400	-1.040	0.298	
Tibia	0.30344	0.29839	1.017	0.309	
CruralIndex	-0.39907	0.36808	-1.084	0.278	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08384	0.04634	1.809	0.0704	.
Femur	-0.10185	0.38327	-0.266	0.7904	
Tibia	0.05023	0.35293	0.142	0.8868	
CruralIndex	-0.10978	0.43536	-0.252	0.8009	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36024	0.03898	-9.243	<2e-16	***
Femur	0.15237	0.32147	0.474	0.636	
Tibia	-0.14953	0.29627	-0.505	0.614	
CruralIndex	0.18420	0.36534	0.504	0.614	

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.49421	0.03919	12.612	<2e-16	***
LLL	-0.47536	0.45709	-1.040	0.298	
CruralIndex	-0.39907	0.36808	-1.084	0.278	
Tibia	0.55290	0.53661	1.030	0.303	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08384	0.04634	1.809	0.0704	.
LLL	-0.14369	0.54070	-0.266	0.7904	
CruralIndex	-0.10978	0.43536	-0.252	0.8009	
Tibia	0.12563	0.63474	0.198	0.8431	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36024	0.03898	-9.243	<2e-16	***
LLL	0.21496	0.45352	0.474	0.636	
CruralIndex	0.18420	0.36534	0.504	0.614	
Tibia	-0.26233	0.53264	-0.493	0.622	

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.49421	0.03919	12.612	<2e-16	***
LLL	0.57824	0.56861	1.017	0.309	
CruralIndex	-0.39907	0.36808	-1.084	0.278	
Femur	-0.74683	0.72483	-1.030	0.303	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.08384	0.04634	1.809	0.0704	.
LLL	0.09571	0.67254	0.142	0.8868	
CruralIndex	-0.10978	0.43536	-0.252	0.8009	
Femur	-0.16970	0.85737	-0.198	0.8431	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36024	0.03898	-9.243	<2e-16	***
LLL	-0.28494	0.56457	-0.505	0.614	
CruralIndex	0.18420	0.36534	0.504	0.614	
Femur	0.35435	0.71946	0.493	0.622	

Model: cbind(proximal, distal, In, anti) ~ LLL + Tibia + Femur + BTB

Error: singular matrix

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + CruralIndex

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494202	0.039218	12.601	<2e-16	***
BTB	-0.003871	0.040190	-0.096	0.923	
Femur	-0.342195	0.328774	-1.041	0.298	
Tibia	0.308316	0.302849	1.018	0.309	
CruralIndex	-0.404578	0.372771	-1.085	0.278	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.083845	0.046406	1.807	0.0708	.
BTB	-0.001736	0.047514	-0.037	0.9709	
Femur	-0.104137	0.389196	-0.268	0.7890	
Tibia	0.052339	0.358461	0.146	0.8839	
CruralIndex	-0.112166	0.441231	-0.254	0.7993	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.360242	0.039006	-9.236	<2e-16	***
BTB	-0.002593	0.040049	-0.065	0.948	
Femur	0.148913	0.326136	0.457	0.648	
Tibia	-0.146316	0.300621	-0.487	0.626	
CruralIndex	0.180577	0.369878	0.488	0.625	

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + Femur + Tibia + CruralIndex</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	4.942e-01	3.919e-02	12.612	<2e-16	***
Femur	1.350e+01	1.038e+05	0.000	1.000	
Tibia	1.054e+01	7.685e+04	0.000	1.000	
LLL	-1.951e+01	1.465e+05	0.000	1.000	
CruralIndex	-3.991e-01	3.681e-01	-1.084	0.278	

Equation for In vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	8.384e-02	4.634e-02	1.809	0.0704	.
Femur	1.996e+02	1.189e+05	0.002	0.9987	
Tibia	1.479e+02	8.799e+04	0.002	0.9987	
LLL	-2.817e+02	1.677e+05	-0.002	0.9987	
CruralIndex	-1.098e-01	4.354e-01	-0.252	0.8009	

Equation for anti vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.36024	0.03898	-9.243	<2e-16	***
Femur	-65.38564	NA	NA	NA	
Tibia	-48.66903	NA	NA	NA	
LLL	92.45884	NA	NA	NA	
CruralIndex	0.18420	0.36534	0.504	0.614	

<u>Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Femur + BTB</u>

Equation for distal vs proximal:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.494202	0.039218	12.601	<2e-16	***
LLL	0.587527	0.577110	1.018	0.309	
CruralIndex	-0.404578	0.372771	-1.085	0.278	
Femur	-0.758654	0.735667	-1.031	0.302	

```
BTB        -0.003871   0.040190  -0.096    0.923
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083845   0.046406   1.807   0.0708 .
LLL          0.099737   0.683084   0.146   0.8839
CruralIndex -0.112166   0.441231  -0.254   0.7993
Femur       -0.174834   0.870806  -0.201   0.8409
BTB         -0.001736   0.047514  -0.037   0.9709
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360242   0.039006  -9.236   <2e-16 ***
LLL         -0.278821   0.572864  -0.487    0.626
CruralIndex  0.180577   0.369878   0.488    0.625
Femur        0.346550   0.730032   0.475    0.635
BTB         -0.002593   0.040049  -0.065    0.948
```

Model: cbind(proximal, distal, In, anti) ~ LLL + CruralIndex + Tibia + BTB

Equation for distal vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.494202   0.039218  12.601   <2e-16 ***
LLL         -0.482757   0.463823  -1.041    0.298
CruralIndex -0.404578   0.372771  -1.085    0.278
Tibia        0.561652   0.544634   1.031    0.302
BTB         -0.003871   0.040190  -0.096    0.923
```

Equation for In vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.083845   0.046406   1.807   0.0708 .
LLL         -0.146914   0.549065  -0.268   0.7890
CruralIndex -0.112166   0.441231  -0.254   0.7993
Tibia        0.129434   0.644681   0.201   0.8409
BTB         -0.001736   0.047514  -0.037   0.9709
```

Equation for anti vs proximal:

```
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.360242   0.039006  -9.236   <2e-16 ***
LLL          0.210081   0.460102   0.457    0.648
CruralIndex  0.180577   0.369878   0.488    0.625
```

Tibia	-0.256560	0.540462	-0.475	0.635
BTB	-0.002593	0.040049	-0.065	0.948

Model: cbind(proximal, distal, In, anti) ~ BTB + Femur + Tibia + LLL + CruralIndex

Error: singular matrix

Appendix C
(Similarity of Coordination between CWS and FWS)

1. Similarity of Thigh-Shank Coordination

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.25573)
Explanatory variable : coefficient/P-value
BTB :-0.030853/0.025017

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.25545)
Explanatory variable : coefficient/P-value
Tibia :0.016676/0.23267

Model: ccc ~Femur+(1|subject_id)(R-squared: 0.25535)
Explanatory variable : coefficient/P-value
Femur :-9.0754e-05/0.99484

Model: ccc ~LLL+(1|subject_id)(R-squared: 0.25539)
Explanatory variable : coefficient/P-value
LLL :0.0086756/0.5376

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.25545)
Explanatory variable : coefficient/P-value
cruralIndex :0.015397/0.26721

Model: ccc ~BL+(1|subject_id)(R-squared: 0.25567)
Explanatory variable : coefficient/P-value
BL :-0.029463/0.033073

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.25981)
Explanatory variable : coefficient/P-value
speed_diff :-0.020792/0.038888

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.25457)
Explanatory variable : coefficient/P-value
BTB :-0.032707/0.016154
Tibia :0.019681/0.14293

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.25453)
Explanatory variable : coefficient/P-value
BTB :-0.03105/0.024504
Femur :-0.0024773/0.85499

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.25454)

Explanatory variable : coefficient/P-value
BTB :-0.030794/0.024857
LLL :0.0084558/0.53264

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.25462)
Explanatory variable : coefficient/P-value
BTB :-0.033361/0.014547
cruralIndex :0.019493/0.14476

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.25454)
Explanatory variable : coefficient/P-value
BTB :-0.020082/0.3407
BL :-0.014193/0.5011

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.25892)
Explanatory variable : coefficient/P-value
speed_diff :-0.019062/0.055667
BTB :-0.028743/0.036241

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.25427)
Explanatory variable : coefficient/P-value
Tibia :0.018244/0.21108
Femur :-0.0053635/0.71143

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.25427)
Explanatory variable : coefficient/P-value
Tibia :0.022215/0.27785
LLL :-0.0075666/0.71143

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.25428)
Explanatory variable : coefficient/P-value
Tibia :0.011691/0.48137
cruralIndex :0.0090938/0.58072

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.25446)
Explanatory variable : coefficient/P-value
Tibia :0.0053522/0.72183
BL :-0.02718/0.074223

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.25872)
Explanatory variable : coefficient/P-value
speed_diff :-0.020574/0.04016
Tibia :0.016189/0.24191

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.25427)
Explanatory variable : coefficient/P-value

Femur :-0.030007/0.27785
LLL :0.034766/0.21108

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.25431)
Explanatory variable : coefficient/P-value
Femur :0.016497/0.35837
cruralIndex :0.025905/0.1483

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.25458)
Explanatory variable : coefficient/P-value
Femur :-0.027539/0.098019
BL :-0.046383/0.0062892

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.25861)
Explanatory variable : coefficient/P-value
speed_diff :-0.020828/0.038703
Femur :-0.0012469/0.92854

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.2543)
Explanatory variable : coefficient/P-value
LLL :0.01165/0.40916
cruralIndex :0.017361/0.21521

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.25454)
Explanatory variable : coefficient/P-value
LLL :-0.017787/0.31832
BL :-0.041186/0.022643

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.25864)
Explanatory variable : coefficient/P-value
speed_diff :-0.020583/0.040851
LLL :0.0076026/0.58561

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.25456)
Explanatory variable : coefficient/P-value
cruralIndex :0.021283/0.11463
BL :-0.033399/0.015451

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25874)
Explanatory variable : coefficient/P-value
speed_diff :-0.021025/0.036021
cruralIndex :0.016011/0.24324

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.25887)
Explanatory variable : coefficient/P-value
speed_diff :-0.019071/0.056004

BL :-0.027226/0.048355

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.2534)
Explanatory variable : coefficient/P-value
BTB :-0.033696/0.01347
Tibia :0.022443/0.10977
Femur :-0.0091466/0.51113

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.2534)
Explanatory variable : coefficient/P-value
BTB :-0.033696/0.01347
Tibia :0.029214/0.13896
LLL :-0.012904/0.51113

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.25341)
Explanatory variable : coefficient/P-value
BTB :-0.03369/0.013156
Tibia :0.012857/0.41756
cruralIndex :0.012607/0.42409

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.2534)
Explanatory variable : coefficient/P-value
BTB :-0.049779/0.086471
Tibia :0.030076/0.14398
BL :0.021205/0.50611

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.25776)
Explanatory variable : coefficient/P-value
speed_diff :-0.018639/0.059663
BTB :-0.03058/0.024254
Tibia :0.019038/0.15447

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.2534)
Explanatory variable : coefficient/P-value
BTB :-0.033696/0.01347
Femur :-0.039461/0.13896
LLL :0.042767/0.10977

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.25343)
Explanatory variable : coefficient/P-value
BTB :-0.03341/0.013686
Femur :0.016637/0.3321
cruralIndex :0.030104/0.080047

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.25337)
Explanatory variable : coefficient/P-value

BTB :0.010965/0.71879
Femur :-0.033967/0.16384
BL :-0.05867/0.12366

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.25772)
Explanatory variable : coefficient/P-value
speed_diff :-0.019148/0.054679
BTB :-0.029003/0.035019
Femur :-0.0033859/0.80165

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.25342)
Explanatory variable : coefficient/P-value
BTB :-0.033549/0.013399
LLL :0.012154/0.36726
cruralIndex :0.021572/0.10946

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.25332)
Explanatory variable : coefficient/P-value
BTB :0.024966/0.84736
LLL :-0.038634/0.72486
BL :-0.07391/0.66552

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.25772)
Explanatory variable : coefficient/P-value
speed_diff :-0.018842/0.058466
BTB :-0.028714/0.03598
LLL :0.0074828/0.57903

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.25341)
Explanatory variable : coefficient/P-value
BTB :-0.019505/0.34541
cruralIndex :0.021061/0.11593
BL :-0.018533/0.37462

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25784)
Explanatory variable : coefficient/P-value
speed_diff :-0.019168/0.052625
BTB :-0.031276/0.021492
cruralIndex :0.019795/0.13603

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.25772)
Explanatory variable : coefficient/P-value
speed_diff :-0.018826/0.058621
BTB :-0.01912/0.36186
BL :-0.012713/0.54487

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.25772)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.25328)
Explanatory variable : coefficient/P-value
Tibia :-0.13443/0.19586
Femur :0.16047/0.15457
cruralIndex :0.19008/0.13808

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.25338)
Explanatory variable : coefficient/P-value
Tibia :0.0065947/0.65418
Femur :-0.027911/0.093437
BL :-0.043801/0.014408

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.25755)
Explanatory variable : coefficient/P-value
speed_diff :-0.020738/0.038614
Tibia :0.018074/0.21052
Femur :-0.0064641/0.65249

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.25328)
Explanatory variable : coefficient/P-value
Tibia :-0.25323/0.17524
LLL :0.22638/0.15457
cruralIndex :0.19008/0.13808

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.25338)
Explanatory variable : coefficient/P-value
Tibia :0.027258/0.16566
LLL :-0.039375/0.093437
BL :-0.043801/0.014408

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.25755)
Explanatory variable : coefficient/P-value
speed_diff :-0.020738/0.038614
Tibia :0.02286/0.25912
LLL :-0.0091194/0.65249

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.25342)
Explanatory variable : coefficient/P-value
Tibia :-0.020919/0.304
cruralIndex :0.034567/0.063188
BL :-0.044781/0.010971

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25757)

Explanatory variable : coefficient/P-value
speed_diff :-0.0208/0.037912
Tibia :0.010518/0.52221
cruralIndex :0.010334/0.52603

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.25767)
Explanatory variable : coefficient/P-value
speed_diff :-0.019146/0.054968
Tibia :0.0059361/0.69122
BL :-0.024684/0.10404

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.25328)
Explanatory variable : coefficient/P-value
Femur :0.34205/0.17524
LLL :-0.25617/0.19586
cruralIndex :0.19008/0.13808

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.25338)
Explanatory variable : coefficient/P-value
Femur :-0.036818/0.16566
LLL :0.012567/0.65418
BL :-0.043801/0.014408

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.25755)
Explanatory variable : coefficient/P-value
speed_diff :-0.020738/0.038614
Femur :-0.030878/0.25912
LLL :0.034442/0.21052

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.25339)
Explanatory variable : coefficient/P-value
Femur :-0.017966/0.42447
cruralIndex :0.011464/0.52869
BL :-0.042625/0.017515

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25759)
Explanatory variable : coefficient/P-value
speed_diff :-0.020718/0.038481
Femur :0.015211/0.39234
cruralIndex :0.02569/0.14736

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.25778)
Explanatory variable : coefficient/P-value
speed_diff :-0.018777/0.057717
Femur :-0.027128/0.10127
BL :-0.043922/0.0094758

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.2534)
Explanatory variable : coefficient/P-value
LLL :-0.015896/0.36488
cruralIndex :0.020422/0.1285
BL :-0.043724/0.014182

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25758)
Explanatory variable : coefficient/P-value
speed_diff :-0.020754/0.038243
LLL :0.010642/0.44629
cruralIndex :0.017797/0.19911

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.25772)
Explanatory variable : coefficient/P-value
speed_diff :-0.018829/0.058496
LLL :-0.017034/0.33672
BL :-0.038479/0.03278

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25779)
Explanatory variable : coefficient/P-value
speed_diff :-0.019093/0.05372
cruralIndex :0.021449/0.1096
BL :-0.031184/0.023342

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.25779)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.25234)
Explanatory variable : coefficient/P-value
BTB :-0.031266/0.022012
Tibia :-0.09546/0.34552
Femur :0.11885/0.27858
cruralIndex :0.14642/0.23954

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.25219)
Explanatory variable : coefficient/P-value
BTB :-0.047755/0.72862
Tibia :0.029123/0.66179
Femur :-0.0011856/0.988
BL :0.018532/0.91824

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.25661)
Explanatory variable : coefficient/P-value
speed_diff :-0.018828/0.056828
BTB :-0.03163/0.020031

Tibia :0.022024/0.11453
Femur :-0.0099161/0.47392

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.25234)
Explanatory variable : coefficient/P-value
BTB :-0.031266/0.022012
Tibia :-0.18345/0.31309
LLL :0.16768/0.27858
cruralIndex :0.14642/0.23954

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.25219)
Explanatory variable : coefficient/P-value
BTB :-0.047755/0.72862
Tibia :0.030001/0.15659
LLL :-0.0016726/0.988
BL :0.018532/0.91824

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.25661)
Explanatory variable : coefficient/P-value
speed_diff :-0.018828/0.056828
BTB :-0.03163/0.020031
Tibia :0.029366/0.13471
LLL :-0.013989/0.47392

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.25221)
Explanatory variable : coefficient/P-value
BTB :0.082703/0.58598
Tibia :-0.10169/0.4969
cruralIndex :0.086795/0.37421
BL :-0.15176/0.44155

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25663)
Explanatory variable : coefficient/P-value
speed_diff :-0.018872/0.056076
BTB :-0.031606/0.019671
Tibia :0.011712/0.45795
cruralIndex :0.013518/0.38887

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.25661)
Explanatory variable : coefficient/P-value
speed_diff :-0.018822/0.056893
BTB :-0.048998/0.089722
Tibia :0.030258/0.13932
BL :0.022905/0.4703

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.25234)

Explanatory variable : coefficient/P-value
BTB :-0.031266/0.022012
Femur :0.2478/0.31309
LLL :-0.18191/0.34552
cruralIndex :0.14642/0.23954

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.25219)
Explanatory variable : coefficient/P-value
BTB :-0.047755/0.72862
Femur :-0.040524/0.15659
LLL :0.055497/0.66179
BL :0.018532/0.91824

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.25661)
Explanatory variable : coefficient/P-value
speed_diff :-0.018828/0.056828
BTB :-0.03163/0.020031
Femur :-0.039666/0.13471
LLL :0.04197/0.11453

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.25226)
Explanatory variable : coefficient/P-value
BTB :-0.072935/0.44867
Femur :0.059408/0.56987
cruralIndex :0.052923/0.35858
BL :0.052699/0.67835

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25664)
Explanatory variable : coefficient/P-value
speed_diff :-0.018817/0.056558
BTB :-0.031357/0.020328
Femur :0.015451/0.36529
cruralIndex :0.029643/0.083032

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.25659)
Explanatory variable : coefficient/P-value
speed_diff :-0.018858/0.05657
BTB :0.012227/0.68642
Femur :-0.034294/0.15746
BL :-0.057613/0.12843

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.25222)
Explanatory variable : coefficient/P-value
BTB :-0.04183/0.75585
LLL :0.019164/0.86663
cruralIndex :0.021846/0.12358

BL :0.010931/0.95067

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25663)
Explanatory variable : coefficient/P-value
speed_diff :-0.018839/0.056377
BTB :-0.031483/0.019964
LLL :0.0112/0.40364
cruralIndex :0.021705/0.10527

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.25651)
Explanatory variable : coefficient/P-value
speed_diff :-0.018856/0.05812
BTB :0.02819/0.82703
LLL :-0.040573/0.71016
BL :-0.075425/0.65736

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25663)
Explanatory variable : coefficient/P-value
speed_diff :-0.018849/0.056254
BTB :-0.018538/0.36723
cruralIndex :0.021235/0.1109
BL :-0.017081/0.41079

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.25663)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.25663)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.25663)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.25234)
Explanatory variable : coefficient/P-value
Tibia :-0.12093/0.22567
Femur :0.11252/0.30619
cruralIndex :0.15957/0.19656
BL :-0.041411/0.019822

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25656)
Explanatory variable : coefficient/P-value
speed_diff :-0.020691/0.037711
Tibia :-0.13434/0.19129
Femur :0.15908/0.15364
cruralIndex :0.18975/0.13447

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.25659)
Explanatory variable : coefficient/P-value
speed_diff :-0.018864/0.056419
Tibia :0.0071495/0.62531
Femur :-0.027529/0.096111
BL :-0.041111/0.021279

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.25234)
Explanatory variable : coefficient/P-value
Tibia :-0.20423/0.25731
LLL :0.15874/0.30619
cruralIndex :0.15957/0.19656
BL :-0.041411/0.019822

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25656)
Explanatory variable : coefficient/P-value
speed_diff :-0.020691/0.037711
Tibia :-0.2521/0.17243
LLL :0.22442/0.15364
cruralIndex :0.18975/0.13447

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.25659)
Explanatory variable : coefficient/P-value
speed_diff :-0.018864/0.056419
Tibia :0.02753/0.15909
LLL :-0.038837/0.096111
BL :-0.041111/0.021279

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25664)
Explanatory variable : coefficient/P-value
speed_diff :-0.018845/0.056161
Tibia :-0.020055/0.32172
cruralIndex :0.034181/0.064651
BL :-0.042122/0.016424

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.25234)
Explanatory variable : coefficient/P-value
Femur :0.27586/0.25731
LLL :-0.23044/0.22567
cruralIndex :0.15957/0.19656
BL :-0.041411/0.019822

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25656)
Explanatory variable : coefficient/P-value
speed_diff :-0.020691/0.037711
Femur :0.34053/0.17243

LLL :-0.25599/0.19129
cruralIndex :0.18975/0.13447

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.25659)
Explanatory variable : coefficient/P-value
speed_diff :-0.018864/0.056419
Femur :-0.037186/0.15909
LLL :0.013624/0.62531
BL :-0.041111/0.021279

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25661)
Explanatory variable : coefficient/P-value
speed_diff :-0.018899/0.0558
Femur :-0.016953/0.44851
cruralIndex :0.012181/0.50084
BL :-0.039911/0.025692

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25662)
Explanatory variable : coefficient/P-value
speed_diff :-0.018872/0.056001
LLL :-0.015123/0.38604
cruralIndex :0.020627/0.12255
BL :-0.04103/0.020996

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.25662)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.25662)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.25662)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.25112)
Explanatory variable : coefficient/P-value
BTB :0.048801/0.75338
Tibia :-0.16109/0.32048
Femur :0.10408/0.35741
cruralIndex :0.18102/0.1995
BL :-0.10479/0.60484

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25556)
Explanatory variable : coefficient/P-value
speed_diff :-0.018915/0.054572
BTB :-0.029143/0.032264
Tibia :-0.098027/0.32977

Femur :0.12041/0.2694
cruralIndex :0.14908/0.22826

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.2554)
Explanatory variable : coefficient/P-value
speed_diff :-0.018824/0.056868
BTB :-0.044822/0.74331
Tibia :0.028293/0.66911
Femur :-0.0024459/0.9751
BL :0.017389/0.92284

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.25112)
Explanatory variable : coefficient/P-value
BTB :0.048801/0.75338
Tibia :-0.23814/0.25685
LLL :0.14683/0.35741
cruralIndex :0.18102/0.1995
BL :-0.10479/0.60484

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25556)
Explanatory variable : coefficient/P-value
speed_diff :-0.018915/0.054572
BTB :-0.029143/0.032264
Tibia :-0.18717/0.30043
LLL :0.16987/0.2694
cruralIndex :0.14908/0.22826

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.2554)
Explanatory variable : coefficient/P-value
speed_diff :-0.018824/0.056868
BTB :-0.044822/0.74331
Tibia :0.030104/0.15284
LLL :-0.0034506/0.9751
BL :0.017389/0.92284

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25545)
Explanatory variable : coefficient/P-value
speed_diff :-0.018939/0.054703
BTB :0.088088/0.55954
Tibia :-0.10608/0.47591
cruralIndex :0.089807/0.35505
BL :-0.15605/0.42601

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.25112)
Explanatory variable : coefficient/P-value
BTB :0.048801/0.75338

Femur :0.32167/0.25685
LLL :-0.30697/0.32048
cruralIndex :0.18102/0.1995
BL :-0.10479/0.60484

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25556)
Explanatory variable : coefficient/P-value
speed_diff :-0.018915/0.054572
BTB :-0.029143/0.032264
Femur :0.25282/0.30043
LLL :-0.1868/0.32977
cruralIndex :0.14908/0.22826

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.2554)
Explanatory variable : coefficient/P-value
speed_diff :-0.018824/0.056868
BTB :-0.044822/0.74331
Femur :-0.040663/0.15284
LLL :0.053915/0.66911
BL :0.017389/0.92284

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25547)
Explanatory variable : coefficient/P-value
speed_diff :-0.01883/0.056257
BTB :-0.071653/0.45408
Femur :0.059057/0.56992
cruralIndex :0.052907/0.35593
BL :0.053729/0.67064

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25543)
Explanatory variable : coefficient/P-value
speed_diff :-0.018837/0.0564
BTB :-0.038979/0.77076
LLL :0.017546/0.87711
cruralIndex :0.021953/0.11961
BL :0.0098939/0.95509

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.25543)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25543)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.25543)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25556)
Explanatory variable : coefficient/P-value
speed_diff :-0.018903/0.054558
Tibia :-0.12174/0.21974
Femur :0.1144/0.2952
cruralIndex :0.16128/0.1891
BL :-0.038684/0.029033

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25556)
Explanatory variable : coefficient/P-value
speed_diff :-0.018903/0.054558
Tibia :-0.20643/0.24929
LLL :0.1614/0.2952
cruralIndex :0.16128/0.1891
BL :-0.038684/0.029033

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25556)
Explanatory variable : coefficient/P-value
speed_diff :-0.018903/0.054558
Femur :0.27884/0.24929
LLL :-0.23198/0.21974
cruralIndex :0.16128/0.1891
BL :-0.038684/0.029033

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.25556)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.25556)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.25556)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25436)
Explanatory variable : coefficient/P-value
speed_diff :-0.018957/0.053812
BTB :0.053841/0.72729
Tibia :-0.16605/0.30286
Femur :0.1051/0.3497
cruralIndex :0.18494/0.1872
BL :-0.1086/0.58948

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25436)
Explanatory variable : coefficient/P-value

speed_diff :-0.018957/0.053812
BTB :0.053841/0.72729
Tibia :-0.24385/0.24271
LLL :0.14827/0.3497
cruralIndex :0.18494/0.1872
BL :-0.1086/0.58948

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25436)
Explanatory variable : coefficient/P-value
speed_diff :-0.018957/0.053812
BTB :0.053841/0.72729
Femur :0.32939/0.24271
LLL :-0.31642/0.30286
cruralIndex :0.18494/0.1872
BL :-0.1086/0.58948

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25436)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.25436)
Error: singular matrix

2. Similarity of Shank-Foot Coordination

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.29333)
Explanatory variable : coefficient/P-value
BTB :0.0074882/0.71839

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.29347)
Explanatory variable : coefficient/P-value
Tibia :-0.017858/0.38349

Model: ccc ~Femur+(1|subject_id)(R-squared: 0.29361)
Explanatory variable : coefficient/P-value
Femur :-0.027346/0.1767

Model: ccc ~LLL+(1|subject_id)(R-squared: 0.29368)
Explanatory variable : coefficient/P-value
LLL :-0.028921/0.15455

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.29329)
Explanatory variable : coefficient/P-value

cruralIndex :0.0081678/0.68903

Model: ccc ~BL+(1|subject_id)(R-squared: 0.29366)
Explanatory variable : coefficient/P-value
BL :0.025758/0.21116

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.2931)
Explanatory variable : coefficient/P-value
speed_diff :-0.0040823/0.77513

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.2924)
Explanatory variable : coefficient/P-value
BTB :0.0091679/0.65845
Tibia :-0.01867/0.36363

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.29251)
Explanatory variable : coefficient/P-value
BTB :0.005338/0.79534
Femur :-0.026936/0.18446

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.29259)
Explanatory variable : coefficient/P-value
BTB :0.0072203/0.72451
LLL :-0.02886/0.15514

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.2922)
Explanatory variable : coefficient/P-value
BTB :0.0065639/0.75352
cruralIndex :0.0073736/0.71982

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.29267)
Explanatory variable : coefficient/P-value
BTB :-0.028724/0.36209
BL :0.047613/0.13141

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.29199)
Explanatory variable : coefficient/P-value
speed_diff :-0.0045075/0.75303
BTB :0.0079793/0.70108

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.29254)
Explanatory variable : coefficient/P-value
Tibia :-0.010747/0.61253
Femur :-0.024229/0.25128

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.29254)

Explanatory variable : coefficient/P-value
Tibia :0.0071909/0.80927
LLL :-0.034182/0.25128

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.29252)
Explanatory variable : coefficient/P-value
Tibia :-0.031679/0.19118
cruralIndex :0.025259/0.29351

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.29256)
Explanatory variable : coefficient/P-value
Tibia :-0.0085941/0.70213
BL :0.022081/0.33092

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.29214)
Explanatory variable : coefficient/P-value
speed_diff :-0.0043343/0.76123
Tibia :-0.017956/0.38012

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.29254)
Explanatory variable : coefficient/P-value
Femur :-0.0097131/0.80927
LLL :-0.020479/0.61253

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.29256)
Explanatory variable : coefficient/P-value
Femur :-0.037311/0.15492
cruralIndex :-0.015581/0.55126

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.29259)
Explanatory variable : coefficient/P-value
Femur :-0.018947/0.45366
BL :0.014172/0.58096

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.29225)
Explanatory variable : coefficient/P-value
speed_diff :-0.0049646/0.72716
Femur :-0.027616/0.17183

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.29254)
Explanatory variable : coefficient/P-value
LLL :-0.02834/0.16905
cruralIndex :0.0034052/0.86771

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.29262)
Explanatory variable : coefficient/P-value

LLL :-0.021407/0.42279
BL :0.011672/0.66539

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.29232)
Explanatory variable : coefficient/P-value
speed_diff :-0.0049627/0.72711
LLL :-0.029174/0.15035

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.29252)
Explanatory variable : coefficient/P-value
cruralIndex :0.0037932/0.85352
BL :0.025072/0.2309

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29196)
Explanatory variable : coefficient/P-value
speed_diff :-0.0042141/0.76801
cruralIndex :0.0082915/0.68412

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.29225)
Explanatory variable : coefficient/P-value
speed_diff :-0.0056636/0.69154
BL :0.02641/0.2001

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.29145)
Explanatory variable : coefficient/P-value
BTB :0.0066553/0.74766
Tibia :-0.011556/0.58843
Femur :-0.023483/0.26876

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.29145)
Explanatory variable : coefficient/P-value
BTB :0.0066553/0.74766
Tibia :0.0058287/0.84632
LLL :-0.033129/0.26876

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.29143)
Explanatory variable : coefficient/P-value
BTB :0.0072869/0.72448
Tibia :-0.031911/0.18781
cruralIndex :0.024502/0.3098

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.29154)
Explanatory variable : coefficient/P-value
BTB :-0.039717/0.36776
Tibia :0.011145/0.72169
BL :0.060745/0.21068

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.29104)
Explanatory variable : coefficient/P-value
speed_diff :-0.0048694/0.73344
BTB :0.0097139/0.63982
Tibia :-0.018828/0.35869

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.29145)
Explanatory variable : coefficient/P-value
BTB :0.0066553/0.74766
Femur :-0.0078732/0.84632
LLL :-0.022022/0.58843

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.29146)
Explanatory variable : coefficient/P-value
BTB :0.0065668/0.75016
Femur :-0.037318/0.15462
cruralIndex :-0.016381/0.53267

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.29152)
Explanatory variable : coefficient/P-value
BTB :-0.024591/0.59515
Femur :-0.0045199/0.90293
BL :0.041703/0.47071

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.29112)
Explanatory variable : coefficient/P-value
speed_diff :-0.0052707/0.71176
BTB :0.0058932/0.77467
Femur :-0.02718/0.17969

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.29145)
Explanatory variable : coefficient/P-value
BTB :0.0069035/0.73805
LLL :-0.028427/0.16752
cruralIndex :0.0025542/0.90127

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.29166)
Explanatory variable : coefficient/P-value
BTB :-0.14295/0.46062
LLL :0.097978/0.55015
BL :0.19899/0.43576

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.2912)
Explanatory variable : coefficient/P-value
speed_diff :-0.005387/0.70554

BTB :0.0078062/0.70329
LLL :-0.029129/0.15056

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.29152)
Explanatory variable : coefficient/P-value
BTB :-0.028624/0.36373
cruralIndex :0.0034473/0.866
BL :0.046912/0.14046

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29085)
Explanatory variable : coefficient/P-value
speed_diff :-0.004577/0.74927
BTB :0.0070529/0.73603
cruralIndex :0.0074487/0.71657

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.29127)
Explanatory variable : coefficient/P-value
speed_diff :-0.005429/0.70316
BTB :-0.028443/0.36569
BL :0.048024/0.12738

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.29127)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.29142)
Explanatory variable : coefficient/P-value
Tibia :0.092923/0.54424
Femur :-0.13684/0.41038
cruralIndex :-0.12906/0.49459

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.29147)
Explanatory variable : coefficient/P-value
Tibia :-0.0077627/0.72906
Femur :-0.018504/0.46448
BL :0.011121/0.68179

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.29117)
Explanatory variable : coefficient/P-value
speed_diff :-0.0050207/0.72403
Tibia :-0.010783/0.61051
Femur :-0.024493/0.24539

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.29142)
Explanatory variable : coefficient/P-value
Tibia :0.19423/0.48071
LLL :-0.19304/0.41038

cruralIndex :-0.12906/0.49459

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.29147)
Explanatory variable : coefficient/P-value
Tibia :0.0059362/0.84273
LLL :-0.026105/0.46448
BL :0.011121/0.68179

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.29117)
Explanatory variable : coefficient/P-value
speed_diff :-0.0050207/0.72403
Tibia :0.0073493/0.80473
LLL :-0.034553/0.24539

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.29146)
Explanatory variable : coefficient/P-value
Tibia :-0.022141/0.47694
cruralIndex :0.017835/0.5306
BL :0.013053/0.62652

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29115)
Explanatory variable : coefficient/P-value
speed_diff :-0.0049484/0.728
Tibia :-0.03195/0.18667
cruralIndex :0.02555/0.2872

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.29115)
Explanatory variable : coefficient/P-value
speed_diff :-0.0055688/0.6964
Tibia :-0.0084205/0.70717
BL :0.022796/0.31582

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.29142)
Explanatory variable : coefficient/P-value
Femur :-0.26235/0.48071
LLL :0.17707/0.54424
cruralIndex :-0.12906/0.49459

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.29147)
Explanatory variable : coefficient/P-value
Femur :-0.0080184/0.84273
LLL :-0.014793/0.72906
BL :0.011121/0.68179

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.29117)
Explanatory variable : coefficient/P-value

speed_diff :-0.0050207/0.72403
Femur :-0.0099271/0.80473
LLL :-0.020548/0.61051

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.29148)
Explanatory variable : coefficient/P-value
Femur :-0.029047/0.39656
cruralIndex :-0.012099/0.66264
BL :0.010186/0.70819

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29118)
Explanatory variable : coefficient/P-value
speed_diff :-0.0050361/0.72314
Femur :-0.037615/0.15089
cruralIndex :-0.015627/0.54916

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.29118)
Explanatory variable : coefficient/P-value
speed_diff :-0.0055813/0.69537
Femur :-0.018827/0.45532
BL :0.014886/0.56204

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.29147)
Explanatory variable : coefficient/P-value
LLL :-0.02116/0.42928
cruralIndex :0.0026293/0.89797
BL :0.011358/0.67508

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29117)
Explanatory variable : coefficient/P-value
speed_diff :-0.0050015/0.72507
LLL :-0.028576/0.16481
cruralIndex :0.0035117/0.86331

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.29122)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054725/0.70102
LLL :-0.021188/0.42645
BL :0.012445/0.64478

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.29111)
Explanatory variable : coefficient/P-value
speed_diff :-0.0056841/0.69046
cruralIndex :0.0038466/0.85108
BL :0.025716/0.21931

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.29111)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.29031)
Explanatory variable : coefficient/P-value
BTB :0.0045977/0.82561
Tibia :0.087177/0.57481
Femur :-0.13069/0.43802
cruralIndex :-0.12261/0.52131

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.29056)
Explanatory variable : coefficient/P-value
BTB :-0.18269/0.38078
Tibia :0.078438/0.43666
Femur :0.083759/0.48281
BL :0.24954/0.36136

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.29005)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054027/0.70469
BTB :0.0072377/0.72651
Tibia :-0.011667/0.58395
Femur :-0.023701/0.2633

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.29031)
Explanatory variable : coefficient/P-value
BTB :0.0045977/0.82561
Tibia :0.18393/0.51022
LLL :-0.18437/0.43802
cruralIndex :-0.12261/0.52131

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.29056)
Explanatory variable : coefficient/P-value
BTB :-0.18269/0.38078
Tibia :0.016429/0.60869
LLL :0.11816/0.48281
BL :0.24954/0.36136

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.29005)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054027/0.70469
BTB :0.0072377/0.72651
Tibia :0.0058796/0.84461
LLL :-0.033436/0.2633

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.29076)

Explanatory variable : coefficient/P-value
BTB :-0.3459/0.13152
Tibia :0.31569/0.16257
cruralIndex :-0.2006/0.17382
BL :0.46037/0.12215

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29003)
Explanatory variable : coefficient/P-value
speed_diff :-0.0053678/0.70667
BTB :0.0078691/0.70358
Tibia :-0.032224/0.1827
cruralIndex :0.024757/0.30376

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.29013)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054642/0.70123
BTB :-0.039491/0.36928
Tibia :0.011202/0.71962
BL :0.061226/0.20606

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.29031)
Explanatory variable : coefficient/P-value
BTB :0.0045977/0.82561
Femur :-0.24844/0.51022
LLL :0.16612/0.57481
cruralIndex :-0.12261/0.52131

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.29056)
Explanatory variable : coefficient/P-value
BTB :-0.18269/0.38078
Femur :-0.022192/0.60869
LLL :0.14947/0.43666
BL :0.24954/0.36136

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.29005)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054027/0.70469
BTB :0.0072377/0.72651
Femur :-0.0079419/0.84461
LLL :-0.022232/0.58395

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.29041)
Explanatory variable : coefficient/P-value
BTB :-0.054757/0.70969
Femur :0.029069/0.85566
cruralIndex :0.019036/0.82893

BL :0.081749/0.67371

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29006)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054132/0.70406
BTB :0.007147/0.72899
Femur :-0.037646/0.15022
cruralIndex :-0.016502/0.52862

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.29011)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054436/0.70239
BTB :-0.024212/0.59995
Femur :-0.0046258/0.90041
BL :0.041977/0.4667

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.29054)
Explanatory variable : coefficient/P-value
BTB :-0.16848/0.40997
LLL :0.12008/0.48878
cruralIndex :0.0083624/0.69827
BL :0.23144/0.38868

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29005)
Explanatory variable : coefficient/P-value
speed_diff :-0.0053983/0.70494
BTB :0.0074852/0.71698
LLL :-0.028689/0.16282
cruralIndex :0.0025971/0.89936

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.29026)
Explanatory variable : coefficient/P-value
speed_diff :-0.0053718/0.70593
BTB :-0.14194/0.46271
LLL :0.097347/0.55172
BL :0.19843/0.43591

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.29012)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054486/0.70212
BTB :-0.028341/0.36738
cruralIndex :0.003502/0.86354
BL :0.047314/0.13632

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.29012)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.29012)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.29012)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.29033)
Explanatory variable : coefficient/P-value
Tibia :0.089888/0.55789
Femur :-0.12608/0.4559
cruralIndex :-0.12219/0.51996
BL :0.009252/0.73364

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29004)
Explanatory variable : coefficient/P-value
speed_diff :-0.0050718/0.72097
Tibia :0.092966/0.54311
Femur :-0.13719/0.40809
cruralIndex :-0.12916/0.49325

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.29007)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054974/0.6997
Tibia :-0.0075967/0.734
Femur :-0.018396/0.46593
BL :0.01189/0.66117

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.29033)
Explanatory variable : coefficient/P-value
Tibia :0.18323/0.50855
LLL :-0.17787/0.4559
cruralIndex :-0.12219/0.51996
BL :0.009252/0.73364

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29004)
Explanatory variable : coefficient/P-value
speed_diff :-0.0050718/0.72097
Tibia :0.19453/0.479
LLL :-0.19354/0.40809
cruralIndex :-0.12916/0.49325

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.29007)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054974/0.6997
Tibia :0.0060224/0.84006

LLL :-0.025953/0.46593
BL :0.01189/0.66117

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.29006)
Explanatory variable : coefficient/P-value
speed_diff :-0.0055118/0.69906
Tibia :-0.021887/0.48096
cruralIndex :0.017726/0.53207
BL :0.013816/0.60658

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.29033)
Explanatory variable : coefficient/P-value
Femur :-0.2475/0.50855
LLL :0.17129/0.55789
cruralIndex :-0.12219/0.51996
BL :0.009252/0.73364

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.29004)
Explanatory variable : coefficient/P-value
speed_diff :-0.0050718/0.72097
Femur :-0.26276/0.479
LLL :0.17716/0.54311
cruralIndex :-0.12916/0.49325

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.29007)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054974/0.6997
Femur :-0.0081348/0.84006
LLL :-0.014476/0.734
BL :0.01189/0.66117

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.29007)
Explanatory variable : coefficient/P-value
speed_diff :-0.005474/0.70086
Femur :-0.028753/0.40024
cruralIndex :-0.011886/0.66744
BL :0.010957/0.6873

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.29007)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054892/0.70015
LLL :-0.020934/0.43313
cruralIndex :0.0026933/0.89523
BL :0.012126/0.65455

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.29007)

Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.29007)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.29007)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.2896)
Explanatory variable : coefficient/P-value
BTB :-0.32305/0.17047
Tibia :0.35599/0.14829
Femur :-0.070474/0.68165
cruralIndex :-0.26444/0.21732
BL :0.42868/0.16289

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.28891)
Explanatory variable : coefficient/P-value
speed_diff :-0.0053439/0.70744
BTB :0.0051861/0.8038
Tibia :0.086488/0.5769
Femur :-0.13027/0.43832
cruralIndex :-0.12189/0.52273

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.28915)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054119/0.70363
BTB :-0.18175/0.38206
Tibia :0.078156/0.43715
Femur :0.083337/0.48392
BL :0.24907/0.36105

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.2896)
Explanatory variable : coefficient/P-value
BTB :-0.32305/0.17047
Tibia :0.40816/0.20091
LLL :-0.099423/0.68165
cruralIndex :-0.26444/0.21732
BL :0.42868/0.16289

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.28891)
Explanatory variable : coefficient/P-value
speed_diff :-0.0053439/0.70744
BTB :0.0051861/0.8038
Tibia :0.18293/0.51146
LLL :-0.18378/0.43832

cruralIndex :-0.12189/0.52273

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.28915)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054119/0.70363
BTB :-0.18175/0.38206
Tibia :0.01646/0.6071
LLL :0.11757/0.48392
BL :0.24907/0.36105

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28937)
Explanatory variable : coefficient/P-value
speed_diff :-0.0053002/0.70847
BTB :-0.34433/0.13239
Tibia :0.31439/0.16331
cruralIndex :-0.19971/0.17473
BL :0.45906/0.12231

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.2896)
Explanatory variable : coefficient/P-value
BTB :-0.32305/0.17047
Femur :-0.55132/0.20091
LLL :0.67837/0.14829
cruralIndex :-0.26444/0.21732
BL :0.42868/0.16289

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.28891)
Explanatory variable : coefficient/P-value
speed_diff :-0.0053439/0.70744
BTB :0.0051861/0.8038
Femur :-0.2471/0.51146
LLL :0.16481/0.5769
cruralIndex :-0.12189/0.52273

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.28915)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054119/0.70363
BTB :-0.18175/0.38206
Femur :-0.022233/0.6071
LLL :0.14893/0.43715
BL :0.24907/0.36105

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.289)
Explanatory variable : coefficient/P-value
speed_diff :-0.005444/0.70235
BTB :-0.054316/0.71122

Femur :0.028892/0.85616
cruralIndex :0.018996/0.82885
BL :0.081939/0.67221

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28914)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054059/0.70403
BTB :-0.16756/0.41137
LLL :0.11953/0.48968
cruralIndex :0.008394/0.69645
BL :0.231/0.38838

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.28914)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.28914)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.28914)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28892)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054727/0.70064
Tibia :0.089681/0.55776
Femur :-0.12556/0.45658
cruralIndex :-0.12173/0.52046
BL :0.010025/0.7124

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28892)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054727/0.70064
Tibia :0.18264/0.5088
LLL :-0.17714/0.45658
cruralIndex :-0.12173/0.52046
BL :0.010025/0.7124

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28892)
Explanatory variable : coefficient/P-value
speed_diff :-0.0054727/0.70064
Femur :-0.2467/0.5088
LLL :0.1709/0.55776
cruralIndex :-0.12173/0.52046
BL :0.010025/0.7124

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.28892)

Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.28892)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.28892)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28821)
Explanatory variable : coefficient/P-value
speed_diff :-0.005291/0.70881
BTB :-0.32155/0.17147
Tibia :0.35455/0.14897
Femur :-0.070227/0.68195
cruralIndex :-0.26332/0.21816
BL :0.42749/0.16306

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28821)
Explanatory variable : coefficient/P-value
speed_diff :-0.005291/0.70881
BTB :-0.32155/0.17147
Tibia :0.40654/0.20162
LLL :-0.099074/0.68195
cruralIndex :-0.26332/0.21816
BL :0.42749/0.16306

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28821)
Explanatory variable : coefficient/P-value
speed_diff :-0.005291/0.70881
BTB :-0.32155/0.17147
Femur :-0.54913/0.20162
LLL :0.67562/0.14897
cruralIndex :-0.26332/0.21816
BL :0.42749/0.16306

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28821)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.28821)
Error: singular matrix

3. Similarity of Hip-Knee Coordination

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.0030127)
Explanatory variable : coefficient/P-value
BTB :-0.0095135/0.089697

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.0033878)
Explanatory variable : coefficient/P-value
Tibia :0.0097405/0.077618

Model: ccc ~Femur+(1|subject_id)(R-squared: -0.00090254)
Explanatory variable : coefficient/P-value
Femur :-0.0035878/0.50711

Model: ccc ~LLL+(1|subject_id)(R-squared: -0.001293)
Explanatory variable : coefficient/P-value
LLL :0.0024513/0.65696

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.00557)
Explanatory variable : coefficient/P-value
cruralIndex :0.011299/0.034323

Model: ccc ~BL+(1|subject_id)(R-squared: 0.002934)
Explanatory variable : coefficient/P-value
BL :-0.0095119/0.092479

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.015846)
Explanatory variable : coefficient/P-value
speed_diff :-0.017725/0.00093886

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.0076451)
Explanatory variable : coefficient/P-value
BTB :-0.010776/0.055466
Tibia :0.010946/0.048221

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.0024339)
Explanatory variable : coefficient/P-value
BTB :-0.0098678/0.079177
Femur :-0.0043367/0.423

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.0017288)
Explanatory variable : coefficient/P-value
BTB :-0.0095201/0.089428
LLL :0.0024756/0.65304

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.010482)
Explanatory variable : coefficient/P-value
BTB :-0.011398/0.043251
cruralIndex :0.01282/0.017117

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.002002)
Explanatory variable : coefficient/P-value
BTB :-0.0055598/0.51612
BL :-0.00527/0.54164

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.017028)
Explanatory variable : coefficient/P-value
speed_diff :-0.016876/0.0017299
BTB :-0.007411/0.18568

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.0040076)
Explanatory variable : coefficient/P-value
Tibia :0.011537/0.043794
Femur :-0.0065982/0.23832

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.0040076)
Explanatory variable : coefficient/P-value
Tibia :0.016422/0.03795
LLL :-0.0093085/0.23832

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.0048015)
Explanatory variable : coefficient/P-value
Tibia :0.0047628/0.46986
cruralIndex :0.0087654/0.16956

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.0036087)
Explanatory variable : coefficient/P-value
Tibia :0.0071751/0.23265
BL :-0.0065761/0.2854

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.018583)
Explanatory variable : coefficient/P-value
speed_diff :-0.017388/0.0011512
Tibia :0.0090595/0.098059

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.0040076)
Explanatory variable : coefficient/P-value
Femur :-0.022182/0.03795
LLL :0.021986/0.043794

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.005398)

Explanatory variable : coefficient/P-value
 Femur :0.0067266/0.34398
 cruralIndex :0.015636/0.026333

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.0085003)
 Explanatory variable : coefficient/P-value
 Femur :-0.014335/0.034132
 BL :-0.018586/0.0087232

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.015482)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.018019/0.00078464
 Femur :-0.0047225/0.37928

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.0051208)
 Explanatory variable : coefficient/P-value
 LLL :0.0047534/0.39545
 cruralIndex :0.012145/0.025298

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.0024728)
 Explanatory variable : coefficient/P-value
 LLL :-0.0061073/0.39768
 BL :-0.013564/0.067255

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.014344)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.017644/0.0010147
 LLL :0.0012695/0.8169

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.0114)
 Explanatory variable : coefficient/P-value
 cruralIndex :0.01365/0.011998
 BL :-0.012408/0.030812

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.022005)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.018009/0.0007437
 cruralIndex :0.011729/0.026686

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.016782)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.016816/0.0018337
 BL :-0.0071461/0.20656

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.0092143)
 Explanatory variable : coefficient/P-value

BTB :-0.011684/0.038849
Tibia :0.013204/0.021944
Femur :-0.0079199/0.15834

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.0092143)
Explanatory variable : coefficient/P-value
BTB :-0.011684/0.038849
Tibia :0.019068/0.017061
LLL :-0.011173/0.15834

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.0099419)
Explanatory variable : coefficient/P-value
BTB :-0.011601/0.039752
Tibia :0.0053623/0.41472
cruralIndex :0.0099949/0.11773

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.0087558)
Explanatory variable : coefficient/P-value
BTB :-0.024383/0.039745
Tibia :0.019057/0.022179
BL :0.016889/0.19203

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.020712)
Explanatory variable : coefficient/P-value
speed_diff :-0.016362/0.002348
BTB :-0.0086363/0.12477
Tibia :0.010066/0.067546

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.0092143)
Explanatory variable : coefficient/P-value
BTB :-0.011684/0.038849
Femur :-0.025756/0.017061
LLL :0.025162/0.021944

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.010423)
Explanatory variable : coefficient/P-value
BTB :-0.011491/0.04145
Femur :0.0069697/0.3253
cruralIndex :0.017327/0.014227

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.0096066)
Explanatory variable : coefficient/P-value
BTB :0.016214/0.19232
Femur :-0.023677/0.016338
BL :-0.03687/0.019053

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.016953)
Explanatory variable : coefficient/P-value
speed_diff :-0.017158/0.0014579
BTB :-0.0078055/0.16414
Femur :-0.0052606/0.32791

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.010207)
Explanatory variable : coefficient/P-value
BTB :-0.011547/0.040543
LLL :0.0050863/0.36181
cruralIndex :0.013745/0.011981

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.0029958)
Explanatory variable : coefficient/P-value
BTB :0.061386/0.24857
LLL :-0.057209/0.20239
BL :-0.094301/0.18027

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.015536)
Explanatory variable : coefficient/P-value
speed_diff :-0.016788/0.0018686
BTB :-0.0074254/0.18483
LLL :0.0013458/0.80586

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.010389)
Explanatory variable : coefficient/P-value
BTB :-0.0051717/0.54387
cruralIndex :0.01359/0.012364
BL :-0.0084495/0.33068

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.024712)
Explanatory variable : coefficient/P-value
speed_diff :-0.016973/0.0015474
BTB :-0.0093016/0.09847
cruralIndex :0.012946/0.015231

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.015701)
Explanatory variable : coefficient/P-value
speed_diff :-0.01673/0.0019371
BTB :-0.0048148/0.57107
BL :-0.0034846/0.68487

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.015701)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.006537)

Explanatory variable : coefficient/P-value
Tibia :-0.05351/0.18993
Femur :0.063696/0.14813
cruralIndex :0.080833/0.1077

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.0094724)
Explanatory variable : coefficient/P-value
Tibia :0.0076171/0.20372
Femur :-0.014627/0.030535
BL :-0.015654/0.03532

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.019955)
Explanatory variable : coefficient/P-value
speed_diff :-0.017786/0.00088597
Tibia :0.011116/0.050065
Femur :-0.0076082/0.17084

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.006537)
Explanatory variable : coefficient/P-value
Tibia :-0.10067/0.16902
LLL :0.089861/0.14813
cruralIndex :0.080833/0.1077

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.0094724)
Explanatory variable : coefficient/P-value
Tibia :0.018446/0.020274
LLL :-0.020636/0.030535
BL :-0.015654/0.03532

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.019955)
Explanatory variable : coefficient/P-value
speed_diff :-0.017786/0.00088597
Tibia :0.016748/0.032752
LLL :-0.010733/0.17084

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.010809)
Explanatory variable : coefficient/P-value
Tibia :-0.0066737/0.42642
cruralIndex :0.017887/0.018809
BL :-0.016038/0.028899

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.020853)
Explanatory variable : coefficient/P-value
speed_diff :-0.017838/0.00085099
Tibia :0.0034146/0.60177
cruralIndex :0.0099091/0.11778

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.017685)
Explanatory variable : coefficient/P-value
speed_diff :-0.016929/0.0016877
Tibia :0.0074918/0.20916
BL :-0.0040648/0.50916

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.006537)
Explanatory variable : coefficient/P-value
Femur :0.13598/0.16902
LLL :-0.10197/0.18993
cruralIndex :0.080833/0.1077

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.0094724)
Explanatory variable : coefficient/P-value
Femur :-0.024916/0.020274
LLL :0.014515/0.20372
BL :-0.015654/0.03532

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.019955)
Explanatory variable : coefficient/P-value
speed_diff :-0.017786/0.00088597
Femur :-0.022623/0.032752
LLL :0.021183/0.050065

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.010304)
Explanatory variable : coefficient/P-value
Femur :-0.0051677/0.57449
cruralIndex :0.010823/0.14365
BL :-0.01508/0.043315

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.021301)
Explanatory variable : coefficient/P-value
speed_diff :-0.017762/0.00089257
Femur :0.0052679/0.45544
cruralIndex :0.01512/0.03025

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.021902)
Explanatory variable : coefficient/P-value
speed_diff :-0.016559/0.0020816
Femur :-0.013855/0.039129
BL :-0.015952/0.024238

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.010516)
Explanatory variable : coefficient/P-value
LLL :-0.0048253/0.50298

cruralIndex :0.013387/0.01395
BL :-0.015553/0.036153

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.021087)
Explanatory variable : coefficient/P-value
speed_diff :-0.017795/0.00087482
LLL :0.0036035/0.51648
cruralIndex :0.012366/0.021593

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.016118)
Explanatory variable : coefficient/P-value
speed_diff :-0.0167/0.0019689
LLL :-0.0054812/0.44447
BL :-0.010799/0.14477

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.025213)
Explanatory variable : coefficient/P-value
speed_diff :-0.016777/0.0017801
cruralIndex :0.013602/0.011634
BL :-0.010038/0.080727

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.025213)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.010344)
Explanatory variable : coefficient/P-value
BTB :-0.010531/0.065343
Tibia :-0.040414/0.32796
Femur :0.049976/0.2618
cruralIndex :0.066426/0.19014

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.0080041)
Explanatory variable : coefficient/P-value
BTB :0.016661/0.77146
Tibia :-0.00022086/0.99362
Femur :-0.023926/0.4647
BL :-0.03746/0.61952

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.022894)
Explanatory variable : coefficient/P-value
speed_diff :-0.0167/0.0018828
BTB :-0.009581/0.089905
Tibia :0.012509/0.028798
Femur :-0.0086304/0.12171

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.010344)

Explanatory variable : coefficient/P-value
BTB :-0.010531/0.065343
Tibia :-0.077413/0.29584
LLL :0.070505/0.2618
cruralIndex :0.066426/0.19014

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.0080041)
Explanatory variable : coefficient/P-value
BTB :0.016661/0.77146
Tibia :0.017493/0.041851
LLL :-0.033755/0.4647
BL :-0.03746/0.61952

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.022894)
Explanatory variable : coefficient/P-value
speed_diff :-0.0167/0.0018828
BTB :-0.009581/0.089905
Tibia :0.018898/0.017195
LLL :-0.012175/0.12171

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.012132)
Explanatory variable : coefficient/P-value
BTB :0.086348/0.17497
Tibia :-0.090955/0.14692
cruralIndex :0.072397/0.076851
BL :-0.12797/0.12251

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.023717)
Explanatory variable : coefficient/P-value
speed_diff :-0.016753/0.001815
BTB :-0.00948/0.092539
Tibia :0.0039865/0.542
cruralIndex :0.010844/0.087499

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.022403)
Explanatory variable : coefficient/P-value
speed_diff :-0.016684/0.0019081
BTB :-0.023545/0.045414
Tibia :0.018961/0.021827
BL :0.018558/0.14898

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.010344)
Explanatory variable : coefficient/P-value
BTB :-0.010531/0.065343
Femur :0.10457/0.29584
LLL :-0.077014/0.32796

cruralIndex :0.066426/0.19014

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.0080041)
Explanatory variable : coefficient/P-value
BTB :0.016661/0.77146
Femur :-0.023628/0.041851
LLL :-0.00042088/0.99362
BL :-0.03746/0.61952

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.022894)
Explanatory variable : coefficient/P-value
speed_diff :-0.0167/0.0018828
BTB :-0.009581/0.089905
Femur :-0.025526/0.017195
LLL :0.023836/0.028798

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.0088218)
Explanatory variable : coefficient/P-value
BTB :-0.010877/0.78459
Femur :0.006309/0.8833
cruralIndex :0.016974/0.47368
BL :-0.00082113/0.98757

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.024109)
Explanatory variable : coefficient/P-value
speed_diff :-0.016701/0.0018677
BTB :-0.0094093/0.094577
Femur :0.0055541/0.43044
cruralIndex :0.016535/0.018438

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.023248)
Explanatory variable : coefficient/P-value
speed_diff :-0.01668/0.0019045
BTB :0.016848/0.17226
Femur :-0.023559/0.01605
BL :-0.034932/0.025274

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.009125)
Explanatory variable : coefficient/P-value
BTB :0.020378/0.71662
LLL :-0.021855/0.64521
cruralIndex :0.012695/0.027727
BL :-0.042252/0.56766

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.023928)
Explanatory variable : coefficient/P-value

speed_diff :-0.016722/0.0018471
BTB :-0.0094485/0.093369
LLL :0.0039452/0.47683
cruralIndex :0.013662/0.011837

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.016694)
Explanatory variable : coefficient/P-value
speed_diff :-0.016716/0.0019272
BTB :0.061812/0.24168
LLL :-0.056937/0.20107
BL :-0.092094/0.18728

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.024066)
Explanatory variable : coefficient/P-value
speed_diff :-0.016699/0.0018738
BTB :-0.0044292/0.60049
cruralIndex :0.013551/0.011945
BL :-0.0066584/0.44075

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.024066)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.024066)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.024066)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.010977)
Explanatory variable : coefficient/P-value
Tibia :-0.048745/0.23182
Femur :0.04715/0.29158
cruralIndex :0.070385/0.16231
BL :-0.014545/0.05142

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.022499)
Explanatory variable : coefficient/P-value
speed_diff :-0.017778/0.00086851
Tibia :-0.053816/0.18351
Femur :0.062562/0.15183
cruralIndex :0.08069/0.10521

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.023103)
Explanatory variable : coefficient/P-value
speed_diff :-0.016674/0.001913
Tibia :0.0079148/0.18329

Femur :-0.014155/0.034928
BL :-0.012888/0.082804

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.010977)
Explanatory variable : coefficient/P-value
Tibia :-0.083651/0.2549
LLL :0.066518/0.29158
cruralIndex :0.070385/0.16231
BL :-0.014545/0.05142

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.022499)
Explanatory variable : coefficient/P-value
speed_diff :-0.017778/0.00086851
Tibia :-0.10013/0.1675
LLL :0.08826/0.15183
cruralIndex :0.08069/0.10521

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.023103)
Explanatory variable : coefficient/P-value
speed_diff :-0.016674/0.001913
Tibia :0.018394/0.019668
LLL :-0.01997/0.034928
BL :-0.012888/0.082804

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.024446)
Explanatory variable : coefficient/P-value
speed_diff :-0.016676/0.0018959
Tibia :-0.0059878/0.47218
cruralIndex :0.017404/0.021259
BL :-0.013309/0.069503

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.010977)
Explanatory variable : coefficient/P-value
Femur :0.11299/0.2549
LLL :-0.092888/0.23182
cruralIndex :0.070385/0.16231
BL :-0.014545/0.05142

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.022499)
Explanatory variable : coefficient/P-value
speed_diff :-0.017778/0.00086851
Femur :0.13525/0.1675
LLL :-0.10255/0.18351
cruralIndex :0.08069/0.10521

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.023103)

Explanatory variable : coefficient/P-value
speed_diff :-0.016674/0.001913
Femur :-0.024846/0.019668
LLL :0.015082/0.18329
BL :-0.012888/0.082804

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.02399)
Explanatory variable : coefficient/P-value
speed_diff :-0.016704/0.0018691
Femur :-0.0043406/0.63473
cruralIndex :0.011228/0.12639
BL :-0.012292/0.099171

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.024177)
Explanatory variable : coefficient/P-value
speed_diff :-0.016689/0.0018834
LLL :-0.0042009/0.55689
cruralIndex :0.013373/0.01332
BL :-0.012788/0.084592

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.024177)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.024177)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.024177)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.01139)
Explanatory variable : coefficient/P-value
BTB :0.07407/0.26011
Tibia :-0.10926/0.10532
Femur :0.033944/0.46216
cruralIndex :0.10244/0.076565
BL :-0.11098/0.19674

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.024285)
Explanatory variable : coefficient/P-value
speed_diff :-0.016832/0.0017089
BTB :-0.0083625/0.14293
Tibia :-0.043401/0.28983
Femur :0.051728/0.24178
cruralIndex :0.069257/0.16866

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.021665)

Explanatory variable : coefficient/P-value
speed_diff :-0.01668/0.0019046
BTB :0.017314/0.76099
Tibia :-0.00023018/0.9933
Femur :-0.023819/0.46326
BL :-0.035547/0.63491

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.01139)
Explanatory variable : coefficient/P-value
BTB :0.07407/0.26011
Tibia :-0.13439/0.11883
LLL :0.047887/0.46216
cruralIndex :0.10244/0.076565
BL :-0.11098/0.19674

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.024285)
Explanatory variable : coefficient/P-value
speed_diff :-0.016832/0.0017089
BTB :-0.0083625/0.14293
Tibia :-0.081696/0.26625
LLL :0.072976/0.24178
cruralIndex :0.069257/0.16866

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.021665)
Explanatory variable : coefficient/P-value
speed_diff :-0.01668/0.0019046
BTB :0.017314/0.76099
Tibia :0.017403/0.041318
LLL :-0.033602/0.46326
BL :-0.035547/0.63491

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.025992)
Explanatory variable : coefficient/P-value
speed_diff :-0.016786/0.0017421
BTB :0.089236/0.15777
Tibia :-0.093083/0.13465
cruralIndex :0.073733/0.069379
BL :-0.12897/0.11674

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.01139)
Explanatory variable : coefficient/P-value
BTB :0.07407/0.26011
Femur :0.18152/0.11883
LLL :-0.2082/0.10532
cruralIndex :0.10244/0.076565
BL :-0.11098/0.19674

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.024285)
Explanatory variable : coefficient/P-value
speed_diff :-0.016832/0.0017089
BTB :-0.0083625/0.14293
Femur :0.11035/0.26625
LLL :-0.082705/0.28983
cruralIndex :0.069257/0.16866

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.021665)
Explanatory variable : coefficient/P-value
speed_diff :-0.01668/0.0019046
BTB :0.017314/0.76099
Femur :-0.023508/0.041318
LLL :-0.00043863/0.9933
BL :-0.035547/0.63491

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.02253)
Explanatory variable : coefficient/P-value
speed_diff :-0.016705/0.0018664
BTB :-0.010992/0.7807
Femur :0.007258/0.86487
cruralIndex :0.017444/0.45804
BL :0.0021182/0.96769

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.022817)
Explanatory variable : coefficient/P-value
speed_diff :-0.016696/0.0018742
BTB :0.020904/0.70746
LLL :-0.021671/0.64545
cruralIndex :0.012663/0.026916
BL :-0.040176/0.58394

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.022817)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.022817)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.022817)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.0248)
Explanatory variable : coefficient/P-value
speed_diff :-0.016767/0.0017747
Tibia :-0.049954/0.21687

Femur :0.049279/0.26667
cruralIndex :0.072269/0.14821
BL :-0.011733/0.11569

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.0248)
Explanatory variable : coefficient/P-value
speed_diff :-0.016767/0.0017747
Tibia :-0.086437/0.2358
LLL :0.069521/0.26667
cruralIndex :0.072269/0.14821
BL :-0.011733/0.11569

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.0248)
Explanatory variable : coefficient/P-value
speed_diff :-0.016767/0.0017747
Femur :0.11675/0.2358
LLL :-0.095193/0.21687
cruralIndex :0.072269/0.14821
BL :-0.011733/0.11569

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.0248)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.0248)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.0248)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.025362)
Explanatory variable : coefficient/P-value
speed_diff :-0.016836/0.0016808
BTB :0.07634/0.2421
Tibia :-0.11233/0.093344
Femur :0.035677/0.43604
cruralIndex :0.10531/0.066543
BL :-0.11111/0.19268

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.025362)
Explanatory variable : coefficient/P-value
speed_diff :-0.016836/0.0016808
BTB :0.07634/0.2421
Tibia :-0.13874/0.10466

LLL :0.050332/0.43604
cruralIndex :0.10531/0.066543
BL :-0.11111/0.19268

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.025362)
Explanatory variable : coefficient/P-value
speed_diff :-0.016836/0.0016808
BTB :0.07634/0.2421
Femur :0.1874/0.10466
LLL :-0.21405/0.093344
cruralIndex :0.10531/0.066543
BL :-0.11111/0.19268

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.025362)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.025362)
Error: singular matrix

4. Similarity of Knee-Ankle Coordination

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.22799)
Explanatory variable : coefficient/P-value
BTB :0.0019365/0.84187

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.22794)
Explanatory variable : coefficient/P-value
Tibia :0.00059/0.95101

Model: ccc ~Femur+(1|subject_id)(R-squared: 0.22801)
Explanatory variable : coefficient/P-value
Femur :-0.0043068/0.65142

Model: ccc ~LLL+(1|subject_id)(R-squared: 0.228)
Explanatory variable : coefficient/P-value
LLL :-0.0027785/0.77216

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.22795)
Explanatory variable : coefficient/P-value
cruralIndex :0.004251/0.65454

Model: ccc ~BL+(1|subject_id)(R-squared: 0.22805)
Explanatory variable : coefficient/P-value
BL :0.0036276/0.7088

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.23317)
Explanatory variable : coefficient/P-value
speed_diff :-0.028685/2.7145e-05

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.22674)
Explanatory variable : coefficient/P-value
BTB :0.0018976/0.84565
Tibia :0.00041725/0.96549

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.22679)
Explanatory variable : coefficient/P-value
BTB :0.0016033/0.86903
Femur :-0.0041839/0.66168

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.22679)
Explanatory variable : coefficient/P-value
BTB :0.0019157/0.84348
LLL :-0.0027646/0.77325

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.22673)
Explanatory variable : coefficient/P-value
BTB :0.0014147/0.88484
cruralIndex :0.0040776/0.67021

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.22681)
Explanatory variable : coefficient/P-value
BTB :-0.0019361/0.89679
BL :0.0051006/0.73286

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.23193)
Explanatory variable : coefficient/P-value
speed_diff :-0.029075/2.2151e-05
BTB :0.0051113/0.55844

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.22674)
Explanatory variable : coefficient/P-value
Tibia :0.0020165/0.84044
Femur :-0.0048872/0.62348

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.22674)
Explanatory variable : coefficient/P-value
Tibia :0.0056346/0.68839

LLL :-0.0068947/0.62348

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.22674)
Explanatory variable : coefficient/P-value
Tibia :-0.0024739/0.82857
cruralIndex :0.0055844/0.62178

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.22679)
Explanatory variable : coefficient/P-value
Tibia :0.0025563/0.80906
BL :0.0047173/0.65949

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.23193)
Explanatory variable : coefficient/P-value
speed_diff :-0.028685/2.725e-05
Tibia :-7.1026e-06/0.99934

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.22674)
Explanatory variable : coefficient/P-value
Femur :-0.007611/0.68839
LLL :0.0038427/0.84044

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.22674)
Explanatory variable : coefficient/P-value
Femur :-0.0026732/0.82915
cruralIndex :0.002548/0.83653

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.22679)
Explanatory variable : coefficient/P-value
Femur :-0.0033921/0.77636
BL :0.0015463/0.8988

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.23196)
Explanatory variable : coefficient/P-value
speed_diff :-0.028948/2.2564e-05
Femur :-0.0059099/0.48856

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.22674)
Explanatory variable : coefficient/P-value
LLL :-0.0021082/0.82837
cruralIndex :0.0038953/0.68613

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.2268)
Explanatory variable : coefficient/P-value
LLL :-0.00077591/0.95102
BL :0.0031166/0.80746

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.23197)
Explanatory variable : coefficient/P-value
speed_diff :-0.028853/2.4396e-05
LLL :-0.0042493/0.62161

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.22678)
Explanatory variable : coefficient/P-value
cruralIndex :0.0037336/0.69896
BL :0.0029402/0.76558

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2319)
Explanatory variable : coefficient/P-value
speed_diff :-0.028822/2.4277e-05
cruralIndex :0.0051488/0.54464

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.23197)
Explanatory variable : coefficient/P-value
speed_diff :-0.029268/1.9347e-05
BL :0.0070125/0.4221

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.22552)
Explanatory variable : coefficient/P-value
BTB :0.0013877/0.88728
Tibia :0.0018446/0.85492
Femur :-0.0047313/0.63664

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.22552)
Explanatory variable : coefficient/P-value
BTB :0.0013877/0.88728
Tibia :0.0053473/0.7064
LLL :-0.0066748/0.63664

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.22552)
Explanatory variable : coefficient/P-value
BTB :0.001477/0.87984
Tibia :-0.0025239/0.82522
cruralIndex :0.0054304/0.63279

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.22555)
Explanatory variable : coefficient/P-value
BTB :-0.0087417/0.67514
Tibia :0.0068951/0.64106
BL :0.013218/0.56435

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.23069)

Explanatory variable : coefficient/P-value
speed_diff :-0.029086/2.2167e-05
BTB :0.0051604/0.55654
Tibia :-0.0004978/0.95404

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.22552)
Explanatory variable : coefficient/P-value
BTB :0.0013877/0.88728
Femur :-0.007223/0.7064
LLL :0.0035151/0.85492

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.22552)
Explanatory variable : coefficient/P-value
BTB :0.0014199/0.8844
Femur :-0.0026777/0.82886
cruralIndex :0.0023711/0.84846

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.22553)
Explanatory variable : coefficient/P-value
BTB :0.0025115/0.90866
Femur :-0.004864/0.78135
BL :-0.0012675/0.96306

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.23071)
Explanatory variable : coefficient/P-value
speed_diff :-0.029293/1.8909e-05
BTB :0.0046905/0.59101
Femur :-0.00557/0.51398

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.22552)
Explanatory variable : coefficient/P-value
BTB :0.0014452/0.88237
LLL :-0.0021288/0.82673
cruralIndex :0.0037147/0.70221

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.22563)
Explanatory variable : coefficient/P-value
BTB :-0.039168/0.66998
LLL :0.031929/0.6814
BL :0.054456/0.65307

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.23071)
Explanatory variable : coefficient/P-value
speed_diff :-0.029244/1.9871e-05
BTB :0.0051037/0.55828
LLL :-0.0042388/0.62142

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.22554)
Explanatory variable : coefficient/P-value
BTB :-0.0018319/0.9022
cruralIndex :0.0037122/0.70062
BL :0.0043378/0.77323

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.23067)
Explanatory variable : coefficient/P-value
speed_diff :-0.029153/2.0618e-05
BTB :0.0045202/0.60675
cruralIndex :0.0045984/0.59057

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.23073)
Explanatory variable : coefficient/P-value
speed_diff :-0.029262/1.9551e-05
BTB :-0.00043375/0.97407
BL :0.0073417/0.58302

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.23073)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.22549)
Explanatory variable : coefficient/P-value
Tibia :-0.0015827/0.98259
Femur :-0.00097847/0.99007
cruralIndex :0.0044807/0.96004

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.22553)
Explanatory variable : coefficient/P-value
Tibia :0.0027119/0.79776
Femur :-0.003544/0.76677
BL :0.0026092/0.83899

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.2307)
Explanatory variable : coefficient/P-value
speed_diff :-0.028944/2.2555e-05
Tibia :0.0018569/0.83586
Femur :-0.0064396/0.46952

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.22549)
Explanatory variable : coefficient/P-value
Tibia :-0.00085834/0.99475
LLL :-0.0013804/0.99007
cruralIndex :0.0044807/0.96004

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.22553)
Explanatory variable : coefficient/P-value
Tibia :0.0053357/0.70563
LLL :-0.0049997/0.76677
BL :0.0026092/0.83899

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.2307)
Explanatory variable : coefficient/P-value
speed_diff :-0.028944/2.2555e-05
Tibia :0.0066243/0.59782
LLL :-0.0090848/0.46952

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.22553)
Explanatory variable : coefficient/P-value
Tibia :-0.00054765/0.97027
cruralIndex :0.0040811/0.76109
BL :0.0026427/0.83498

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2307)
Explanatory variable : coefficient/P-value
speed_diff :-0.028941/2.2577e-05
Tibia :-0.004046/0.69278
cruralIndex :0.0073309/0.46913

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.2307)
Explanatory variable : coefficient/P-value
speed_diff :-0.02934/1.8333e-05
Tibia :0.0035015/0.71057
BL :0.0085087/0.37594

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.22549)
Explanatory variable : coefficient/P-value
Femur :0.0011594/0.99475
LLL :-0.003016/0.98259
cruralIndex :0.0044807/0.96004

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.22553)
Explanatory variable : coefficient/P-value
Femur :-0.0072072/0.70563
LLL :0.0051679/0.79776
BL :0.0026092/0.83899

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.2307)
Explanatory variable : coefficient/P-value
speed_diff :-0.028944/2.2555e-05
Femur :-0.0089478/0.59782

LLL :0.0035385/0.83586

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.22553)
Explanatory variable : coefficient/P-value
Femur :-0.00050254/0.97524
cruralIndex :0.0034588/0.79176
BL :0.0026824/0.83518

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2307)
Explanatory variable : coefficient/P-value
speed_diff :-0.028944/2.2554e-05
Femur :-0.0044022/0.69165
cruralIndex :0.0023451/0.8319

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.23073)
Explanatory variable : coefficient/P-value
speed_diff :-0.029249/1.9522e-05
Femur :-0.0028113/0.79206
BL :0.0052783/0.62921

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22553)
Explanatory variable : coefficient/P-value
LLL :-0.00043008/0.97287
cruralIndex :0.0037101/0.70149
BL :0.0026612/0.83563

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2307)
Explanatory variable : coefficient/P-value
speed_diff :-0.028943/2.2554e-05
LLL :-0.0034612/0.69124
cruralIndex :0.0045658/0.59613

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.23073)
Explanatory variable : coefficient/P-value
speed_diff :-0.029274/1.9381e-05
LLL :0.00039151/0.97233
BL :0.0072715/0.52684

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.23071)
Explanatory variable : coefficient/P-value
speed_diff :-0.029314/1.8454e-05
cruralIndex :0.0040526/0.63771
BL :0.0062589/0.48013

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.23071)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.22427)
Explanatory variable : coefficient/P-value
BTB :0.0014979/0.87982
Tibia :-0.0034513/0.96258
Femur :0.0010175/0.98982
cruralIndex :0.0065759/0.94207

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.22439)
Explanatory variable : coefficient/P-value
BTB :-0.060568/0.5399
Tibia :0.031285/0.51273
Femur :0.030351/0.59158
BL :0.081668/0.52865

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.029279/1.9117e-05
BTB :0.0045355/0.60605
Tibia :0.0012823/0.88684
Femur :-0.005947/0.50564

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.22427)
Explanatory variable : coefficient/P-value
BTB :0.0014979/0.87982
Tibia :-0.0042046/0.97463
LLL :0.0014355/0.98982
cruralIndex :0.0065759/0.94207

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.22439)
Explanatory variable : coefficient/P-value
BTB :-0.060568/0.5399
Tibia :0.008816/0.56163
LLL :0.042818/0.59158
BL :0.081668/0.52865

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.029279/1.9117e-05
BTB :0.0045355/0.60605
Tibia :0.005685/0.6534
LLL :-0.0083898/0.50564

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.2244)
Explanatory variable : coefficient/P-value
BTB :-0.069681/0.52518

Tibia :0.067501/0.53234
cruralIndex :-0.039917/0.57143
BL :0.092767/0.5148

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.029289/1.8986e-05
BTB :0.0046462/0.59652
Tibia :-0.0042321/0.67887
cruralIndex :0.0068654/0.49839

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.22948)
Explanatory variable : coefficient/P-value
speed_diff :-0.029314/1.847e-05
BTB :-0.0076146/0.68253
Tibia :0.0072734/0.58115
BL :0.015899/0.43707

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.22427)
Explanatory variable : coefficient/P-value
BTB :0.0014979/0.87982
Femur :0.0056794/0.97463
LLL :-0.0065768/0.96258
cruralIndex :0.0065759/0.94207

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.22439)
Explanatory variable : coefficient/P-value
BTB :-0.060568/0.5399
Femur :-0.011908/0.56163
LLL :0.059617/0.51273
BL :0.081668/0.52865

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.029279/1.9117e-05
BTB :0.0045355/0.60605
Femur :-0.007679/0.6534
LLL :0.0024435/0.88684

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.22434)
Explanatory variable : coefficient/P-value
BTB :-0.030071/0.66535
Femur :0.0314/0.67752
cruralIndex :0.020552/0.6215
BL :0.041989/0.64734

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.029279/1.909e-05
BTB :0.0045487/0.60406
Femur :-0.0044471/0.68799
cruralIndex :0.0017625/0.87361

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Explanatory variable : coefficient/P-value
speed_diff :-0.029294/1.8961e-05
BTB :0.0045978/0.81398
Femur :-0.0055006/0.72484
BL :0.00012967/0.99577

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22439)
Explanatory variable : coefficient/P-value
BTB :-0.056416/0.56032
LLL :0.046855/0.56852
cruralIndex :0.0056313/0.58104
BL :0.076374/0.5483

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.029284/1.9035e-05
BTB :0.0045918/0.60069
LLL :-0.003551/0.68302
cruralIndex :0.0039914/0.64504

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.22956)
Explanatory variable : coefficient/P-value
speed_diff :-0.029251/1.9508e-05
BTB :-0.033844/0.68047
LLL :0.028642/0.68034
BL :0.051645/0.63364

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22947)
Explanatory variable : coefficient/P-value
speed_diff :-0.02931/1.8633e-05
BTB :-0.00032083/0.98078
cruralIndex :0.0040489/0.63807
BL :0.006503/0.62913

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.22947)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.22947)

Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.22947)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.22428)
Explanatory variable : coefficient/P-value
Tibia :-0.0024678/0.9729
Femur :0.0021605/0.97847
cruralIndex :0.006481/0.94254
BL :0.0027079/0.83391

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.028943/2.2559e-05
Tibia :-0.001418/0.98255
Femur :-0.0028847/0.96725
cruralIndex :0.0040763/0.95932

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Explanatory variable : coefficient/P-value
speed_diff :-0.029322/1.8467e-05
Tibia :0.0036291/0.70066
Femur :-0.0030071/0.77789
BL :0.006708/0.5608

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22428)
Explanatory variable : coefficient/P-value
Tibia :-0.0040672/0.97527
LLL :0.0030479/0.97847
cruralIndex :0.006481/0.94254
BL :0.0027079/0.83391

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.028943/2.2559e-05
Tibia :0.00071763/0.99508
LLL :-0.0040696/0.96725
cruralIndex :0.0040763/0.95932

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Explanatory variable : coefficient/P-value
speed_diff :-0.029322/1.8467e-05
Tibia :0.0058553/0.64189
LLL :-0.0042423/0.77789
BL :0.006708/0.5608

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Explanatory variable : coefficient/P-value
speed_diff :-0.029325/1.8423e-05
Tibia :0.00080078/0.95135
cruralIndex :0.0035443/0.76731
BL :0.0066956/0.55671

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22428)
Explanatory variable : coefficient/P-value
Femur :0.0054938/0.97527
LLL :-0.0047026/0.9729
cruralIndex :0.006481/0.94254
BL :0.0027079/0.83391

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22945)
Explanatory variable : coefficient/P-value
speed_diff :-0.028943/2.2559e-05
Femur :-0.00096935/0.99508
LLL :-0.0027021/0.98255
cruralIndex :0.0040763/0.95932

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Explanatory variable : coefficient/P-value
speed_diff :-0.029322/1.8467e-05
Femur :-0.0079091/0.64189
LLL :0.0069156/0.70066
BL :0.006708/0.5608

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Explanatory variable : coefficient/P-value
speed_diff :-0.029328/1.8396e-05
Femur :0.0010691/0.94104
cruralIndex :0.0046371/0.69143
BL :0.0068097/0.5564

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Explanatory variable : coefficient/P-value
speed_diff :-0.029326/1.8408e-05
LLL :0.00077345/0.94539
cruralIndex :0.0040947/0.63506
BL :0.0067627/0.5571

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.22946)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.22946)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.22946)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.22315)
Explanatory variable : coefficient/P-value
BTB :-0.07459/0.50873
Tibia :0.058919/0.61691
Femur :0.01505/0.85464
cruralIndex :-0.026299/0.79742
BL :0.099571/0.49863

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2282)
Explanatory variable : coefficient/P-value
speed_diff :-0.029291/1.8964e-05
BTB :0.0047156/0.59616
Tibia :-0.0072852/0.91158
Femur :0.0033481/0.96242
cruralIndex :0.010636/0.8951

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.22833)
Explanatory variable : coefficient/P-value
speed_diff :-0.029312/1.8129e-05
BTB :-0.055953/0.52629
Tibia :0.030018/0.48198
Femur :0.028296/0.57549
BL :0.079761/0.49117

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22315)
Explanatory variable : coefficient/P-value
BTB :-0.07459/0.50873
Tibia :0.047777/0.75412
LLL :0.021232/0.85464
cruralIndex :-0.026299/0.79742
BL :0.099571/0.49863

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2282)
Explanatory variable : coefficient/P-value
speed_diff :-0.029291/1.8964e-05
BTB :0.0047156/0.59616
Tibia :-0.0097639/0.93397
LLL :0.0047234/0.96242
cruralIndex :0.010636/0.8951

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.22833)
Explanatory variable : coefficient/P-value
speed_diff :-0.029312/1.8129e-05
BTB :-0.055953/0.52629
Tibia :0.0090691/0.50297
LLL :0.03992/0.57549
BL :0.079761/0.49117

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22834)
Explanatory variable : coefficient/P-value
speed_diff :-0.02928/1.8557e-05
BTB :-0.061312/0.53172
Tibia :0.06067/0.53005
cruralIndex :-0.035167/0.57696
BL :0.086008/0.49937

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22315)
Explanatory variable : coefficient/P-value
BTB :-0.07459/0.50873
Femur :-0.064534/0.75412
LLL :0.11228/0.61691
cruralIndex :-0.026299/0.79742
BL :0.099571/0.49863

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2282)
Explanatory variable : coefficient/P-value
speed_diff :-0.029291/1.8964e-05
BTB :0.0047156/0.59616
Femur :0.013189/0.93397
LLL :-0.013883/0.91158
cruralIndex :0.010636/0.8951

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.22833)
Explanatory variable : coefficient/P-value
speed_diff :-0.029312/1.8129e-05
BTB :-0.055953/0.52629
Femur :-0.01225/0.50297
LLL :0.057202/0.48198
BL :0.079761/0.49117

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22828)
Explanatory variable : coefficient/P-value
speed_diff :-0.029326/1.8194e-05
BTB :-0.027931/0.65267
Femur :0.030686/0.64876
cruralIndex :0.020506/0.58084

BL :0.043328/0.59705

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22832)
Explanatory variable : coefficient/P-value
speed_diff :-0.029315/1.8141e-05
BTB :-0.051872/0.549
LLL :0.044237/0.5467
cruralIndex :0.0058606/0.51936
BL :0.074554/0.51204

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22832)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22832)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.22832)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22821)
Explanatory variable : coefficient/P-value
speed_diff :-0.02933/1.8375e-05
Tibia :-0.0036423/0.95513
Femur :0.0049978/0.94412
cruralIndex :0.0090969/0.9096
BL :0.0068477/0.55486

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22821)
Explanatory variable : coefficient/P-value
speed_diff :-0.02933/1.8375e-05
Tibia :-0.0073423/0.94993
LLL :0.0070507/0.94412
cruralIndex :0.0090969/0.9096
BL :0.0068477/0.55486

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22821)
Explanatory variable : coefficient/P-value
speed_diff :-0.02933/1.8375e-05
Femur :0.0099176/0.94993
LLL :-0.0069408/0.95513
cruralIndex :0.0090969/0.9096
BL :0.0068477/0.55486

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.22821)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.22821)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.22821)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22709)
Explanatory variable : coefficient/P-value
speed_diff :-0.029294/1.8336e-05
BTB :-0.066771/0.50824
Tibia :0.051263/0.62582
Femur :0.016577/0.82087
cruralIndex :-0.020197/0.82498
BL :0.093575/0.47705

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22709)
Explanatory variable : coefficient/P-value
speed_diff :-0.029294/1.8336e-05
BTB :-0.066771/0.50824
Tibia :0.038991/0.77431
LLL :0.023386/0.82087
cruralIndex :-0.020197/0.82498
BL :0.093575/0.47705

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22709)
Explanatory variable : coefficient/P-value
speed_diff :-0.029294/1.8336e-05
BTB :-0.066771/0.50824
Femur :-0.052668/0.77431
LLL :0.097688/0.62582
cruralIndex :-0.020197/0.82498
BL :0.093575/0.47705

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22709)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.22709)
Error: singular matrix

Appendix D
(Similarity of Coordination between CWS and SWS)

1. **Similarity of Thigh-Shank Coordination**

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.19598)
  Explanatory variable : coefficient/P-value
   BTB :-0.020102/0.14786

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.19613)
  Explanatory variable : coefficient/P-value
   Tibia :0.013778/0.32053

Model: ccc ~Femur+(1|subject_id)(R-squared: 0.19577)
  Explanatory variable : coefficient/P-value
   Femur :0.0096117/0.48646

Model: ccc ~LLL+(1|subject_id)(R-squared: 0.19609)
  Explanatory variable : coefficient/P-value
   LLL :0.014113/0.30838

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.19558)
  Explanatory variable : coefficient/P-value
   cruralIndex :0.0028063/0.83889

Model: ccc ~BL+(1|subject_id)(R-squared: 0.19661)
  Explanatory variable : coefficient/P-value
   BL :-0.024863/0.072248

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.19061)
  Explanatory variable : coefficient/P-value
   speed_diff :-0.023212/0.041401

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.19537)
  Explanatory variable : coefficient/P-value
   BTB :-0.021577/0.11924
   Tibia :0.015691/0.25167

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.19488)
  Explanatory variable : coefficient/P-value
   BTB :-0.019459/0.1617
   Femur :0.0080882/0.55353

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.19523)
  Explanatory variable : coefficient/P-value

BTB :-0.020003/0.14747
LLL :0.013922/0.30751

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.19476)
Explanatory variable : coefficient/P-value
BTB :-0.020787/0.13733
cruralIndex :0.0053394/0.69646

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.19529)
Explanatory variable : coefficient/P-value
BTB :-0.0029239/0.89035
BL :-0.022638/0.28665

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.18974)
Explanatory variable : coefficient/P-value
speed_diff :-0.02489/0.027224
BTB :-0.022071/0.10052

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.1949)
Explanatory variable : coefficient/P-value
Tibia :0.011979/0.40773
Femur :0.0061623/0.66811

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.1949)
Explanatory variable : coefficient/P-value
Tibia :0.0074171/0.71464
LLL :0.0086935/0.66811

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.1949)
Explanatory variable : coefficient/P-value
Tibia :0.017382/0.29253
cruralIndex :-0.0065687/0.68782

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.19541)
Explanatory variable : coefficient/P-value
Tibia :0.0041065/0.78474
BL :-0.023113/0.12933

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.18978)
Explanatory variable : coefficient/P-value
speed_diff :-0.02156/0.064407
Tibia :0.0089106/0.51984

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.1949)
Explanatory variable : coefficient/P-value
Femur :-0.010019/0.71464

LLL :0.022828/0.40773

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.1949)
Explanatory variable : coefficient/P-value
Femur :0.019279/0.28139
cruralIndex :0.015083/0.39775

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.19532)
Explanatory variable : coefficient/P-value
Femur :-0.008048/0.63487
BL :-0.029802/0.084896

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.18948)
Explanatory variable : coefficient/P-value
speed_diff :-0.022672/0.047053
Femur :0.007161/0.59349

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.1949)
Explanatory variable : coefficient/P-value
LLL :0.015029/0.28481
cruralIndex :0.0053363/0.70138

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.19528)
Explanatory variable : coefficient/P-value
LLL :-0.0033053/0.85383
BL :-0.02704/0.13722

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.18977)
Explanatory variable : coefficient/P-value
speed_diff :-0.021726/0.060026
LLL :0.0098501/0.47145

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.19546)
Explanatory variable : coefficient/P-value
cruralIndex :0.0074042/0.58909
BL :-0.026228/0.061762

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.1893)
Explanatory variable : coefficient/P-value
speed_diff :-0.023122/0.042759
cruralIndex :0.0014183/0.91568

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.19045)
Explanatory variable : coefficient/P-value
speed_diff :-0.022059/0.050239
BL :-0.022932/0.088175

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.19411)
Explanatory variable : coefficient/P-value
BTB :-0.021171/0.1285
Tibia :0.014556/0.30985
Femur :0.0037669/0.791

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.19411)
Explanatory variable : coefficient/P-value
BTB :-0.021171/0.1285
Tibia :0.011768/0.55925
LLL :0.0053141/0.791

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.19411)
Explanatory variable : coefficient/P-value
BTB :-0.021241/0.12646
Tibia :0.018039/0.26678
cruralIndex :-0.0043314/0.78832

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.19412)
Explanatory variable : coefficient/P-value
BTB :-0.013672/0.6446
Tibia :0.010881/0.60449
BL :-0.0098211/0.76302

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.18903)
Explanatory variable : coefficient/P-value
speed_diff :-0.022968/0.046293
BTB :-0.022867/0.089169
Tibia :0.010544/0.43797

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.19411)
Explanatory variable : coefficient/P-value
BTB :-0.021171/0.1285
Femur :-0.015895/0.55925
LLL :0.027739/0.30985

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.19408)
Explanatory variable : coefficient/P-value
BTB :-0.020832/0.1338
Femur :0.019281/0.27342
cruralIndex :0.017626/0.31744

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.19414)
Explanatory variable : coefficient/P-value
BTB :0.0095338/0.75891

Femur :-0.013631/0.58349
BL :-0.040484/0.29766

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.18856)
Explanatory variable : coefficient/P-value
speed_diff :-0.024454/0.030767
BTB :-0.0216/0.10914
Femur :0.0052459/0.69101

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.1941)
Explanatory variable : coefficient/P-value
BTB :-0.021014/0.13044
LLL :0.015278/0.26899
cruralIndex :0.0079421/0.56476

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.19403)
Explanatory variable : coefficient/P-value
BTB :0.035351/0.78676
LLL :-0.032821/0.76659
BL :-0.073384/0.67015

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.18889)
Explanatory variable : coefficient/P-value
speed_diff :-0.023464/0.04042
BTB :-0.02185/0.10352
LLL :0.0092235/0.49152

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.19413)
Explanatory variable : coefficient/P-value
BTB :-0.0027259/0.89757
cruralIndex :0.0073719/0.59066
BL :-0.024147/0.25912

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18849)
Explanatory variable : coefficient/P-value
speed_diff :-0.024669/0.02891
BTB :-0.022572/0.095355
cruralIndex :0.0040408/0.75965

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.18892)
Explanatory variable : coefficient/P-value
speed_diff :-0.0233/0.042559
BTB :-0.010822/0.60617
BL :-0.014602/0.48622

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.18892)

Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.19359)
Explanatory variable : coefficient/P-value
Tibia :-0.0072127/0.94507
Femur :0.027/0.81197
cruralIndex :0.02389/0.85316

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.19413)
Explanatory variable : coefficient/P-value
Tibia :0.0044593/0.76659
Femur :-0.0082943/0.6249
BL :-0.028053/0.12461

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.1885)
Explanatory variable : coefficient/P-value
speed_diff :-0.021445/0.06581
Tibia :0.0074292/0.60581
Femur :0.0051648/0.7113

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.19359)
Explanatory variable : coefficient/P-value
Tibia :-0.027202/0.88504
LLL :0.038091/0.81197
cruralIndex :0.02389/0.85316

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.19413)
Explanatory variable : coefficient/P-value
Tibia :0.0106/0.59699
LLL :-0.011701/0.6249
BL :-0.028053/0.12461

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.1885)
Explanatory variable : coefficient/P-value
speed_diff :-0.021445/0.06581
Tibia :0.0036056/0.85628
LLL :0.0072863/0.7113

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.19413)
Explanatory variable : coefficient/P-value
Tibia :-0.0029701/0.88683
cruralIndex :0.0092887/0.626
BL :-0.02784/0.1229

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18849)
Explanatory variable : coefficient/P-value

speed_diff :-0.021375/0.067078
Tibia :0.011467/0.48575
cruralIndex :-0.0045758/0.77349

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.18908)
Explanatory variable : coefficient/P-value
speed_diff :-0.022239/0.053813
Tibia :-0.0010773/0.94261
BL :-0.023376/0.11409

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.19359)
Explanatory variable : coefficient/P-value
Femur :0.036743/0.88504
LLL :-0.013744/0.94507
cruralIndex :0.02389/0.85316

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.19413)
Explanatory variable : coefficient/P-value
Femur :-0.014318/0.59699
LLL :0.0084976/0.76659
BL :-0.028053/0.12461

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.1885)
Explanatory variable : coefficient/P-value
speed_diff :-0.021445/0.06581
Femur :-0.0048703/0.85628
LLL :0.014157/0.60581

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.19413)
Explanatory variable : coefficient/P-value
Femur :-0.0034238/0.88163
cruralIndex :0.0055317/0.76609
BL :-0.027984/0.12703

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18854)
Explanatory variable : coefficient/P-value
speed_diff :-0.021481/0.063581
Femur :0.014074/0.42614
cruralIndex :0.010569/0.54889

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.18911)
Explanatory variable : coefficient/P-value
speed_diff :-0.022517/0.045637
Femur :-0.010083/0.5399
BL :-0.029109/0.082936

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.19413)
Explanatory variable : coefficient/P-value
LLL :-0.0026344/0.88337
cruralIndex :0.0072601/0.59716
BL :-0.027936/0.12572

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18852)
Explanatory variable : coefficient/P-value
speed_diff :-0.021413/0.065373
LLL :0.010511/0.45067
cruralIndex :0.0033794/0.80403

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18895)
Explanatory variable : coefficient/P-value
speed_diff :-0.023146/0.042959
LLL :-0.0090604/0.60832
BL :-0.028822/0.10304

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18926)
Explanatory variable : coefficient/P-value
speed_diff :-0.021629/0.055686
cruralIndex :0.0058303/0.66279
BL :-0.024059/0.078766

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.18926)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.19281)
Explanatory variable : coefficient/P-value
BTB :-0.021266/0.13131
Tibia :0.019158/0.85444
Femur :-0.0012276/0.99134
cruralIndex :-0.0057136/0.96452

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.19284)
Explanatory variable : coefficient/P-value
BTB :0.011091/0.93717
Tibia :-0.00077234/0.99094
Femur :-0.014501/0.85713
BL :-0.042533/0.81777

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.18771)
Explanatory variable : coefficient/P-value
speed_diff :-0.022893/0.047128
BTB :-0.022583/0.095284
Tibia :0.0097984/0.48957

Femur :0.0025327/0.85382

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.19281)
Explanatory variable : coefficient/P-value
BTB :-0.021266/0.13131
Tibia :0.020067/0.91483
LLL :-0.0017319/0.99134
cruralIndex :-0.0057136/0.96452

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.19284)
Explanatory variable : coefficient/P-value
BTB :0.011091/0.93717
Tibia :0.0099631/0.64481
LLL :-0.020457/0.85713
BL :-0.042533/0.81777

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.18771)
Explanatory variable : coefficient/P-value
speed_diff :-0.022893/0.047128
BTB :-0.022583/0.095284
Tibia :0.0079233/0.68708
LLL :0.0035731/0.85382

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.19283)
Explanatory variable : coefficient/P-value
BTB :0.01412/0.92797
Tibia :-0.016759/0.91332
cruralIndex :0.018204/0.85619
BL :-0.046105/0.8202

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18771)
Explanatory variable : coefficient/P-value
speed_diff :-0.022874/0.047623
BTB :-0.022699/0.09301
Tibia :0.011673/0.46874
cruralIndex :-0.0020406/0.89611

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.18772)
Explanatory variable : coefficient/P-value
speed_diff :-0.022855/0.047722
BTB :-0.018396/0.52286
Tibia :0.0078575/0.70098
BL :-0.0055405/0.8606

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.19281)
Explanatory variable : coefficient/P-value

BTB :-0.021266/0.13131
Femur :-0.027106/0.91483
LLL :0.036508/0.85444
cruralIndex :-0.0057136/0.96452

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.19284)
Explanatory variable : coefficient/P-value
BTB :0.011091/0.93717
Femur :-0.013458/0.64481
LLL :-0.0014718/0.99094
BL :-0.042533/0.81777

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.18771)
Explanatory variable : coefficient/P-value
speed_diff :-0.022893/0.047128
BTB :-0.022583/0.095284
Femur :-0.010703/0.68708
LLL :0.018672/0.48957

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.19283)
Explanatory variable : coefficient/P-value
BTB :0.0077049/0.93787
Femur :-0.011596/0.91397
cruralIndex :0.0011532/0.98445
BL :-0.038056/0.7706

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18772)
Explanatory variable : coefficient/P-value
speed_diff :-0.023054/0.044273
BTB :-0.022449/0.09641
Femur :0.013596/0.4325
cruralIndex :0.012873/0.45764

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.18772)
Explanatory variable : coefficient/P-value
speed_diff :-0.022779/0.049284
BTB :-0.0029501/0.92417
Femur :-0.008382/0.73001
BL :-0.025797/0.50427

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.19284)
Explanatory variable : coefficient/P-value
BTB :0.01456/0.91592
LLL :-0.014837/0.89906
cruralIndex :0.0067647/0.64119
BL :-0.046963/0.79543

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18772)
Explanatory variable : coefficient/P-value
speed_diff :-0.022958/0.045885
BTB :-0.022564/0.094794
LLL :0.010378/0.44702
cruralIndex :0.0059821/0.65593

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18759)
Explanatory variable : coefficient/P-value
speed_diff :-0.023262/0.044769
BTB :-0.0077175/0.95196
LLL :-0.00265/0.9804
BL :-0.018715/0.91168

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18773)
Explanatory variable : coefficient/P-value
speed_diff :-0.02285/0.047592
BTB :-0.010482/0.61754
cruralIndex :0.0055604/0.67675
BL :-0.015939/0.4522

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.18773)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.18773)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.18773)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.19283)
Explanatory variable : coefficient/P-value
Tibia :0.0017843/0.98619
Femur :-0.0053488/0.96244
cruralIndex :0.0033467/0.97908
BL :-0.028002/0.12743

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18702)
Explanatory variable : coefficient/P-value
speed_diff :-0.02318/0.051868
Tibia :-0.059394/0.56955
Femur :0.077174/0.49231
cruralIndex :0.082645/0.51848

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.18774)

Explanatory variable : coefficient/P-value
speed_diff :-0.022646/0.049459
Tibia :-0.00077568/0.95855
Femur :-0.010053/0.54127
BL :-0.02941/0.097713

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.19283)
Explanatory variable : coefficient/P-value
Tibia :0.0057442/0.97539
LLL :-0.007546/0.96244
cruralIndex :0.0033467/0.97908
BL :-0.028002/0.12743

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18702)
Explanatory variable : coefficient/P-value
speed_diff :-0.02318/0.051868
Tibia :-0.11653/0.53334
LLL :0.10887/0.49231
cruralIndex :0.082645/0.51848

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18774)
Explanatory variable : coefficient/P-value
speed_diff :-0.022646/0.049459
Tibia :0.006667/0.73366
LLL :-0.014183/0.54127
BL :-0.02941/0.097713

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18772)
Explanatory variable : coefficient/P-value
speed_diff :-0.022946/0.046898
Tibia :-0.010853/0.60026
cruralIndex :0.012558/0.49762
BL :-0.029824/0.089172

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.19283)
Explanatory variable : coefficient/P-value
Femur :-0.007759/0.97539
LLL :0.0034002/0.98619
cruralIndex :0.0033467/0.97908
BL :-0.028002/0.12743

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18702)
Explanatory variable : coefficient/P-value
speed_diff :-0.02318/0.051868
Femur :0.1574/0.53334
LLL :-0.11318/0.56955

cruralIndex :0.082645/0.51848

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18774)
Explanatory variable : coefficient/P-value
speed_diff :-0.022646/0.049459
Femur :-0.0090054/0.73366
LLL :-0.0014781/0.95855
BL :-0.02941/0.097713

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18778)
Explanatory variable : coefficient/P-value
speed_diff :-0.022474/0.049678
Femur :-0.0097523/0.66667
cruralIndex :0.00038994/0.98305
BL :-0.028982/0.10398

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18775)
Explanatory variable : coefficient/P-value
speed_diff :-0.022683/0.048414
LLL :-0.0084252/0.63492
cruralIndex :0.0052395/0.69554
BL :-0.029422/0.097147

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.18775)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.18775)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.18775)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.19153)
Explanatory variable : coefficient/P-value
BTB :0.016824/0.91668
Tibia :-0.012057/0.94269
Femur :-0.0082605/0.94368
cruralIndex :0.010736/0.94132
BL :-0.049852/0.81206

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18625)
Explanatory variable : coefficient/P-value
speed_diff :-0.023996/0.041892
BTB :-0.021749/0.11103
Tibia :-0.034084/0.74252
Femur :0.049814/0.65543

cruralIndex :0.054157/0.66952

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.18636)
Explanatory variable : coefficient/P-value
speed_diff :-0.02294/0.048292
BTB :-0.027099/0.84362
Tibia :0.011932/0.85683
Femur :0.005085/0.94834
BL :0.0059495/0.97365

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.19153)
Explanatory variable : coefficient/P-value
BTB :0.016824/0.91668
Tibia :-0.0059416/0.97817
LLL :-0.011654/0.94368
cruralIndex :0.010736/0.94132
BL :-0.049852/0.81206

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18625)
Explanatory variable : coefficient/P-value
speed_diff :-0.023996/0.041892
BTB :-0.021749/0.11103
Tibia :-0.070962/0.70257
LLL :0.070276/0.65543
cruralIndex :0.054157/0.66952

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18636)
Explanatory variable : coefficient/P-value
speed_diff :-0.02294/0.048292
BTB :-0.027099/0.84362
Tibia :0.0081673/0.69751
LLL :0.0071737/0.94834
BL :0.0059495/0.97365

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18638)
Explanatory variable : coefficient/P-value
speed_diff :-0.022991/0.04653
BTB :0.021101/0.88894
Tibia :-0.031477/0.83282
cruralIndex :0.025886/0.79003
BL :-0.057126/0.77103

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.19153)
Explanatory variable : coefficient/P-value
BTB :0.016824/0.91668
Femur :0.0080256/0.97817

LLL :-0.022976/0.94269
cruralIndex :0.010736/0.94132
BL :-0.049852/0.81206

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18625)
Explanatory variable : coefficient/P-value
speed_diff :-0.023996/0.041892
BTB :-0.021749/0.11103
Femur :0.095852/0.70257
LLL :-0.06495/0.74252
cruralIndex :0.054157/0.66952

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18636)
Explanatory variable : coefficient/P-value
speed_diff :-0.02294/0.048292
BTB :-0.027099/0.84362
Femur :-0.011032/0.69751
LLL :0.022737/0.85683
BL :0.0059495/0.97365

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18632)
Explanatory variable : coefficient/P-value
speed_diff :-0.023377/0.045632
BTB :-0.035628/0.71546
Femur :0.027739/0.79227
cruralIndex :0.020388/0.7246
BL :0.017545/0.8917

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18637)
Explanatory variable : coefficient/P-value
speed_diff :-0.022998/0.047427
BTB :-0.026055/0.84675
LLL :0.013321/0.90691
cruralIndex :0.0060936/0.6655
BL :0.004605/0.97924

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.18637)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18637)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18637)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18627)

Explanatory variable : coefficient/P-value
speed_diff :-0.023964/0.042132
Tibia :-0.051791/0.61367
Femur :0.045625/0.68381
cruralIndex :0.063388/0.61536
BL :-0.028537/0.10874

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18627)
Explanatory variable : coefficient/P-value
speed_diff :-0.023964/0.042132
Tibia :-0.085569/0.64295
LLL :0.064367/0.68381
cruralIndex :0.063388/0.61536
BL :-0.028537/0.10874

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18627)
Explanatory variable : coefficient/P-value
speed_diff :-0.023964/0.042132
Femur :0.11558/0.64295
LLL :-0.098694/0.61367
cruralIndex :0.063388/0.61536
BL :-0.028537/0.10874

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.18627)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.18627)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.18627)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18492)
Explanatory variable : coefficient/P-value
speed_diff :-0.023951/0.042303
BTB :0.0067737/0.96522
Tibia :-0.05733/0.7255
Femur :0.04442/0.70027
cruralIndex :0.066324/0.64279
BL :-0.037336/0.85376

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18492)
Explanatory variable : coefficient/P-value
speed_diff :-0.023951/0.042303

BTB :0.0067737/0.96522
Tibia :-0.090215/0.67209
LLL :0.062666/0.70027
cruralIndex :0.066324/0.64279
BL :-0.037336/0.85376

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18492)
Explanatory variable : coefficient/P-value
speed_diff :-0.023951/0.042303
BTB :0.0067737/0.96522
Femur :0.12186/0.67209
LLL :-0.10925/0.7255
cruralIndex :0.066324/0.64279
BL :-0.037336/0.85376

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18492)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.18492)
Error: singular matrix

2. Similarity of Shank-Foot Coordination

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.36089)
Explanatory variable : coefficient/P-value
BTB :0.037539/0.08214

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.36068)
Explanatory variable : coefficient/P-value
Tibia :-0.020215/0.35202

Model: ccc ~Femur+(1|subject_id)(R-squared: 0.36068)
Explanatory variable : coefficient/P-value
Femur :-0.020817/0.33565

Model: ccc ~LLL+(1|subject_id)(R-squared: 0.36068)
Explanatory variable : coefficient/P-value
LLL :-0.025474/0.23895

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.36067)
Explanatory variable : coefficient/P-value
cruralIndex :-0.0026157/0.90416

Model: ccc ~BL+(1|subject_id)(R-squared: 0.36084)
Explanatory variable : coefficient/P-value
BL :0.044092/0.039566

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.37162)
Explanatory variable : coefficient/P-value
speed_diff :-0.033696/0.038481

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.35983)
Explanatory variable : coefficient/P-value
BTB :0.039643/0.064898
Tibia :-0.023696/0.26541

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.35986)
Explanatory variable : coefficient/P-value
BTB :0.036117/0.093596
Femur :-0.018055/0.39554

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.35984)
Explanatory variable : coefficient/P-value
BTB :0.037306/0.080767
LLL :-0.025158/0.23451

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.35986)
Explanatory variable : coefficient/P-value
BTB :0.038431/0.07707
cruralIndex :-0.0072217/0.73572

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.35984)
Explanatory variable : coefficient/P-value
BTB :0.0095057/0.77291
BL :0.036852/0.26375

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.37069)
Explanatory variable : coefficient/P-value
speed_diff :-0.031732/0.049649
BTB :0.03501/0.10755

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.35965)
Explanatory variable : coefficient/P-value
Tibia :-0.015421/0.49541
Femur :-0.016325/0.46862

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.35965)
Explanatory variable : coefficient/P-value

Tibia :-0.0033346/0.91644
LLL :-0.023031/0.46862

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.35964)
Explanatory variable : coefficient/P-value
Tibia :-0.026654/0.30212
cruralIndex :0.011777/0.64629

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.35981)
Explanatory variable : coefficient/P-value
Tibia :-0.0020539/0.93007
BL :0.043212/0.067677

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.37068)
Explanatory variable : coefficient/P-value
speed_diff :-0.037811/0.021997
Tibia :-0.02862/0.19536

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.35965)
Explanatory variable : coefficient/P-value
Femur :0.0045043/0.91644
LLL :-0.029386/0.49541

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.35966)
Explanatory variable : coefficient/P-value
Femur :-0.037878/0.17413
cruralIndex :-0.026706/0.33679

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.35982)
Explanatory variable : coefficient/P-value
Femur :0.0083347/0.75212
BL :0.049171/0.066336

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.37064)
Explanatory variable : coefficient/P-value
speed_diff :-0.035169/0.030549
Femur :-0.024809/0.25229

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.35965)
Explanatory variable : coefficient/P-value
LLL :-0.026675/0.22381
cruralIndex :-0.0070826/0.74513

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.35983)
Explanatory variable : coefficient/P-value
LLL :0.0050629/0.85596

BL :0.047417/0.092525

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.37068)
Explanatory variable : coefficient/P-value
speed_diff :-0.037579/0.021679
LLL :-0.032872/0.13221

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.35981)
Explanatory variable : coefficient/P-value
cruralIndex :-0.010589/0.61996
BL :0.045989/0.034252

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.37059)
Explanatory variable : coefficient/P-value
speed_diff :-0.033889/0.037753
cruralIndex :-0.0040872/0.85142

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.3708)
Explanatory variable : coefficient/P-value
speed_diff :-0.035664/0.026132
BL :0.046923/0.028481

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.3588)
Explanatory variable : coefficient/P-value
BTB :0.03837/0.075026
Tibia :-0.02005/0.36772
Femur :-0.01205/0.58625

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.3588)
Explanatory variable : coefficient/P-value
BTB :0.03837/0.075026
Tibia :-0.011129/0.7227
LLL :-0.016999/0.58625

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.35879)
Explanatory variable : coefficient/P-value
BTB :0.039056/0.069841
Tibia :-0.027886/0.26913
cruralIndex :0.0077546/0.75784

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.35879)
Explanatory variable : coefficient/P-value
BTB :0.022627/0.62344
Tibia :-0.013311/0.68426
BL :0.021158/0.67664

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.36975)
Explanatory variable : coefficient/P-value
speed_diff :-0.036189/0.026918
BTB :0.037331/0.082364
Tibia :-0.031428/0.14737

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.3588)
Explanatory variable : coefficient/P-value
BTB :0.03837/0.075026
Femur :0.015033/0.7227
LLL :-0.038207/0.36772

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.35881)
Explanatory variable : coefficient/P-value
BTB :0.038431/0.072802
Femur :-0.037909/0.16386
cruralIndex :-0.031343/0.25069

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.3588)
Explanatory variable : coefficient/P-value
BTB :0.0040663/0.93305
Femur :0.005947/0.87813
BL :0.044619/0.46033

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.36971)
Explanatory variable : coefficient/P-value
speed_diff :-0.033154/0.040318
BTB :0.033115/0.1264
Femur :-0.022022/0.30291

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.3588)
Explanatory variable : coefficient/P-value
BTB :0.03875/0.071164
LLL :-0.027154/0.20492
cruralIndex :-0.011816/0.58151

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.35884)
Explanatory variable : coefficient/P-value
BTB :0.13673/0.49918
LLL :-0.10915/0.52393
BL :-0.13172/0.62117

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.36976)
Explanatory variable : coefficient/P-value
speed_diff :-0.035604/0.02854
BTB :0.034294/0.10922

LLL :-0.032102/0.1343

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.35879)
Explanatory variable : coefficient/P-value
BTB :0.009193/0.77981
cruralIndex :-0.010474/0.62363
BL :0.038968/0.24043

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36966)
Explanatory variable : coefficient/P-value
speed_diff :-0.032073/0.047494
BTB :0.035992/0.10005
cruralIndex :-0.0082362/0.70216

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.36976)
Explanatory variable : coefficient/P-value
speed_diff :-0.035906/0.027709
BTB :-0.0027119/0.93546
BL :0.049007/0.1433

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.36976)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.35889)
Explanatory variable : coefficient/P-value
Tibia :0.31683/0.046445
Femur :-0.37738/0.028845
cruralIndex :-0.41372/0.035017

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.35878)
Explanatory variable : coefficient/P-value
Tibia :-0.0024409/0.91699
Femur :0.0084761/0.74835
BL :0.048212/0.088612

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.36964)
Explanatory variable : coefficient/P-value
speed_diff :-0.038161/0.020538
Tibia :-0.023306/0.30933
Femur :-0.018351/0.413

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.35889)
Explanatory variable : coefficient/P-value
Tibia :0.59622/0.037136
LLL :-0.5324/0.028845
cruralIndex :-0.41372/0.035017

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.35878)
Explanatory variable : coefficient/P-value
Tibia :-0.008716/0.78049
LLL :0.011958/0.74835
BL :0.048212/0.088612

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.36964)
Explanatory variable : coefficient/P-value
speed_diff :-0.038161/0.020538
Tibia :-0.0097206/0.76038
LLL :-0.025889/0.413

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.3588)
Explanatory variable : coefficient/P-value
Tibia :0.011522/0.72218
cruralIndex :-0.017892/0.54577
BL :0.052234/0.061436

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36964)
Explanatory variable : coefficient/P-value
speed_diff :-0.03832/0.02027
Tibia :-0.037268/0.15505
cruralIndex :0.015599/0.5417

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.36975)
Explanatory variable : coefficient/P-value
speed_diff :-0.037024/0.023311
Tibia :-0.010471/0.66003
BL :0.042549/0.071166

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.35889)
Explanatory variable : coefficient/P-value
Femur :-0.80535/0.037136
LLL :0.60376/0.046445
cruralIndex :-0.41372/0.035017

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.35878)
Explanatory variable : coefficient/P-value
Femur :0.011773/0.78049
LLL :-0.0046513/0.91699
BL :0.048212/0.088612

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.36964)
Explanatory variable : coefficient/P-value
speed_diff :-0.038161/0.020538

Femur :0.01313/0.76038
LLL :-0.044412/0.30933

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.35877)
Explanatory variable : coefficient/P-value
Femur :-0.00091809/0.97951
cruralIndex :-0.011091/0.70179
BL :0.04552/0.10888

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36965)
Explanatory variable : coefficient/P-value
speed_diff :-0.038199/0.019594
Femur :-0.047226/0.093063
cruralIndex :-0.034568/0.21771

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.36976)
Explanatory variable : coefficient/P-value
speed_diff :-0.035499/0.027067
Femur :0.0047047/0.85854
BL :0.04978/0.062807

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.35878)
Explanatory variable : coefficient/P-value
LLL :0.0040836/0.88369
cruralIndex :-0.010362/0.62832
BL :0.048631/0.08515

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36964)
Explanatory variable : coefficient/P-value
speed_diff :-0.038314/0.019695
LLL :-0.034807/0.11653
cruralIndex :-0.010363/0.63447

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36976)
Explanatory variable : coefficient/P-value
speed_diff :-0.036027/0.026605
LLL :-0.0038972/0.89024
BL :0.04439/0.11546

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36976)
Explanatory variable : coefficient/P-value
speed_diff :-0.036403/0.023416
cruralIndex :-0.012902/0.54609
BL :0.049305/0.023242

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.36976)

Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.35799)
Explanatory variable : coefficient/P-value
BTB :0.032227/0.12955
Tibia :0.27641/0.08142
Femur :-0.33409/0.052191
cruralIndex :-0.36824/0.059222

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.3578)
Explanatory variable : coefficient/P-value
BTB :0.1832/0.39957
Tibia :-0.0889/0.39826
Femur :-0.09409/0.45
BL :-0.19085/0.50331

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.36872)
Explanatory variable : coefficient/P-value
speed_diff :-0.036529/0.025378
BTB :0.035788/0.096846
Tibia :-0.027181/0.22902
Femur :-0.014278/0.51816

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.35799)
Explanatory variable : coefficient/P-value
BTB :0.032227/0.12955
Tibia :0.52374/0.066263
LLL :-0.47132/0.052191
cruralIndex :-0.36824/0.059222

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.3578)
Explanatory variable : coefficient/P-value
BTB :0.1832/0.39957
Tibia :-0.019243/0.56601
LLL :-0.13274/0.45
BL :-0.19085/0.50331

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.36872)
Explanatory variable : coefficient/P-value
speed_diff :-0.036529/0.025378
BTB :0.035788/0.096846
Tibia :-0.016611/0.59807
LLL :-0.020143/0.51816

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.35776)
Explanatory variable : coefficient/P-value

BTB :-0.12957/0.59183
Tibia :0.13807/0.56221
cruralIndex :-0.099716/0.52121
BL :0.21978/0.4836

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036616/0.025294
BTB :0.036409/0.09106
Tibia :-0.037842/0.1406
cruralIndex :0.011687/0.64192

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036663/0.025012
BTB :0.014126/0.7593
Tibia :-0.017398/0.59601
BL :0.028801/0.56977

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.35799)
Explanatory variable : coefficient/P-value
BTB :0.032227/0.12955
Femur :-0.70745/0.066263
LLL :0.52672/0.08142
cruralIndex :-0.36824/0.059222

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.3578)
Explanatory variable : coefficient/P-value
BTB :0.1832/0.39957
Femur :0.025992/0.56601
LLL :-0.16941/0.39826
BL :-0.19085/0.50331

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.36872)
Explanatory variable : coefficient/P-value
speed_diff :-0.036529/0.025378
BTB :0.035788/0.096846
Femur :0.022437/0.59807
LLL :-0.051797/0.22902

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.35788)
Explanatory variable : coefficient/P-value
BTB :0.21844/0.14921
Femur :-0.23284/0.15717
cruralIndex :-0.13534/0.13583
BL :-0.23992/0.22989

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36872)
Explanatory variable : coefficient/P-value
speed_diff :-0.036403/0.024953
BTB :0.035569/0.097048
Femur :-0.046694/0.090282
cruralIndex :-0.038345/0.16451

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036566/0.025889
BTB :-0.01551/0.75371
Femur :0.013706/0.72507
BL :0.067167/0.27505

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.3578)
Explanatory variable : coefficient/P-value
BTB :0.18778/0.37761
LLL :-0.15337/0.39573
cruralIndex :-0.016756/0.45614
BL :-0.19665/0.48152

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36872)
Explanatory variable : coefficient/P-value
speed_diff :-0.036552/0.024884
BTB :0.03597/0.094056
LLL :-0.034786/0.10947
cruralIndex :-0.014525/0.49922

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36872)
Explanatory variable : coefficient/P-value
speed_diff :-0.035211/0.031977
BTB :0.069004/0.73581
LLL :-0.061309/0.72225
BL :-0.045939/0.86449

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036715/0.024691
BTB :-0.0034331/0.91817
cruralIndex :-0.01298/0.54389
BL :0.051958/0.12363

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.36871)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.36871)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.35799)
Explanatory variable : coefficient/P-value
Tibia :0.30276/0.05324
Femur :-0.32787/0.057584
cruralIndex :-0.382/0.048875
BL :0.042419/0.12567

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36864)
Explanatory variable : coefficient/P-value
speed_diff :-0.032711/0.049212
Tibia :0.24456/0.13602
Femur :-0.30778/0.082047
cruralIndex :-0.3319/0.099319

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036867/0.024052
Tibia :-0.010662/0.6544
Femur :0.0051863/0.84413
BL :0.04562/0.10672

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.35799)
Explanatory variable : coefficient/P-value
Tibia :0.54549/0.053923
LLL :-0.46254/0.057584
cruralIndex :-0.382/0.048875
BL :0.042419/0.12567

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36864)
Explanatory variable : coefficient/P-value
speed_diff :-0.032711/0.049212
Tibia :0.47241/0.1083
LLL :-0.4342/0.082047
cruralIndex :-0.3319/0.099319

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036867/0.024052
Tibia :-0.014502/0.64431
LLL :0.0073167/0.84413

BL :0.04562/0.10672

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036499/0.025683
Tibia :-0.0010116/0.97553
cruralIndex :-0.012272/0.67893
BL :0.048767/0.080901

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.35799)
Explanatory variable : coefficient/P-value
Femur :-0.73683/0.053923
LLL :0.57695/0.05324
cruralIndex :-0.382/0.048875
BL :0.042419/0.12567

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36864)
Explanatory variable : coefficient/P-value
speed_diff :-0.032711/0.049212
Femur :-0.63811/0.1083
LLL :0.46603/0.13602
cruralIndex :-0.3319/0.099319

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036867/0.024052
Femur :0.019588/0.64431
LLL :-0.020317/0.6544
BL :0.04562/0.10672

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.037183/0.022036
Femur :-0.011606/0.74769
cruralIndex :-0.019349/0.50885
BL :0.043446/0.12516

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Explanatory variable : coefficient/P-value
speed_diff :-0.036931/0.023413
LLL :-0.0054356/0.84752
cruralIndex :-0.013265/0.53633
BL :0.045841/0.10425

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.36871)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.36871)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.36871)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.35695)
Explanatory variable : coefficient/P-value
BTB :-0.025487/0.9164
Tibia :0.32376/0.20254
Femur :-0.32348/0.068587
cruralIndex :-0.39322/0.075807
BL :0.075509/0.8114

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.031881/0.053541
BTB :0.031293/0.14445
Tibia :0.20702/0.20551
Femur :-0.26729/0.1297
cruralIndex :-0.28956/0.14832

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.035843/0.029108
BTB :0.11897/0.58669
Tibia :-0.066554/0.52823
Femur :-0.061338/0.62409
BL :-0.10956/0.70247

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.35695)
Explanatory variable : coefficient/P-value
BTB :-0.025487/0.9164
Tibia :0.56324/0.087551
LLL :-0.45636/0.068587
cruralIndex :-0.39322/0.075807
BL :0.075509/0.8114

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.031881/0.053541
BTB :0.031293/0.14445
Tibia :0.40489/0.16735
LLL :-0.37708/0.1297
cruralIndex :-0.28956/0.14832

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.035843/0.029108
BTB :0.11897/0.58669
Tibia :-0.021144/0.52962
LLL :-0.086534/0.62409
BL :-0.10956/0.70247

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.036313/0.02632
BTB :-0.12635/0.60022
Tibia :0.12247/0.60669
cruralIndex :-0.092085/0.5528
BL :0.21218/0.49792

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.35695)
Explanatory variable : coefficient/P-value
BTB :-0.025487/0.9164
Femur :-0.7608/0.087551
LLL :0.61696/0.20254
cruralIndex :-0.39322/0.075807
BL :0.075509/0.8114

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.031881/0.053541
BTB :0.031293/0.14445
Femur :-0.54691/0.16735
LLL :0.39449/0.20551
cruralIndex :-0.28956/0.14832

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.035843/0.029108
BTB :0.11897/0.58669
Femur :0.02856/0.52962
LLL :-0.12683/0.52823
BL :-0.10956/0.70247

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.034106/0.038305
BTB :0.15372/0.32036
Femur :-0.17382/0.2983

cruralIndex :-0.10596/0.24883
BL :-0.15723/0.44056

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.035774/0.029165
BTB :0.12063/0.57384
LLL :-0.10626/0.55819
cruralIndex :-0.017252/0.44411
BL :-0.11164/0.69158

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.36767)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36767)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.031915/0.053219
Tibia :0.23245/0.15039
Femur :-0.26091/0.14037
cruralIndex :-0.30266/0.12849
BL :0.041403/0.13826

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.031915/0.053219
Tibia :0.42561/0.14381
LLL :-0.36808/0.14037
cruralIndex :-0.30266/0.12849
BL :0.041403/0.13826

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Explanatory variable : coefficient/P-value
speed_diff :-0.031915/0.053219
Femur :-0.57489/0.14381
LLL :0.44296/0.15039
cruralIndex :-0.30266/0.12849
BL :0.041403/0.13826

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.36767)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.36767)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.36767)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36663)
Explanatory variable : coefficient/P-value
speed_diff :-0.031987/0.052722
BTB :-0.046149/0.85028
Tibia :0.27029/0.29389
Femur :-0.2528/0.16495
cruralIndex :-0.32278/0.1529
BL :0.10132/0.75051

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36663)
Explanatory variable : coefficient/P-value
speed_diff :-0.031987/0.052722
BTB :-0.046149/0.85028
Tibia :0.45745/0.17394
LLL :-0.35664/0.16495
cruralIndex :-0.32278/0.1529
BL :0.10132/0.75051

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36663)
Explanatory variable : coefficient/P-value
speed_diff :-0.031987/0.052722
BTB :-0.046149/0.85028
Femur :-0.6179/0.17394
LLL :0.51507/0.29389
cruralIndex :-0.32278/0.1529
BL :0.10132/0.75051

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36663)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.36663)
Error: singular matrix

3. Similarity of Hip-Knee Coordination

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.18418)
Explanatory variable : coefficient/P-value
BTB :-0.0073308/0.48346

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.18417)
Explanatory variable : coefficient/P-value
Tibia :0.0017479/0.86632

Model: ccc ~Femur+(1|subject_id)(R-squared: 0.18463)
Explanatory variable : coefficient/P-value
Femur :0.010488/0.30636

Model: ccc ~LLL+(1|subject_id)(R-squared: 0.18458)
Explanatory variable : coefficient/P-value
LLL :0.0084437/0.41445

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.1842)
Explanatory variable : coefficient/P-value
cruralIndex :-0.0083892/0.41205

Model: ccc ~BL+(1|subject_id)(R-squared: 0.18464)
Explanatory variable : coefficient/P-value
BL :-0.011324/0.27822

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.18061)
Explanatory variable : coefficient/P-value
speed_diff :-0.024908/0.0029647

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.18297)
Explanatory variable : coefficient/P-value
BTB :-0.0075599/0.47187
Tibia :0.0024326/0.81486

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.18337)
Explanatory variable : coefficient/P-value
BTB :-0.0065379/0.53101
Femur :0.0099787/0.33039

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.18335)
Explanatory variable : coefficient/P-value
BTB :-0.0072733/0.48554
LLL :0.0083826/0.41609

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.18297)

Explanatory variable : coefficient/P-value
BTB :-0.0063526/0.54523
cruralIndex :-0.007606/0.45937

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.18341)
Explanatory variable : coefficient/P-value
BTB :0.002981/0.85249
BL :-0.013592/0.39734

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.17937)
Explanatory variable : coefficient/P-value
speed_diff :-0.025506/0.0023418
BTB :-0.0082973/0.40158

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.18327)
Explanatory variable : coefficient/P-value
Tibia :-0.0014417/0.89354
Femur :0.010901/0.30859

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.18327)
Explanatory variable : coefficient/P-value
Tibia :-0.0095117/0.52893
LLL :0.015378/0.30859

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.18335)
Explanatory variable : coefficient/P-value
Tibia :0.0090025/0.46368
cruralIndex :-0.013238/0.27648

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.18326)
Explanatory variable : coefficient/P-value
Tibia :-0.00362/0.74971
BL :-0.012863/0.26323

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.17904)
Explanatory variable : coefficient/P-value
speed_diff :-0.025636/0.0028379
Tibia :-0.0037571/0.70814

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.18327)
Explanatory variable : coefficient/P-value
Femur :0.012848/0.52893
LLL :-0.0027473/0.89354

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.18326)
Explanatory variable : coefficient/P-value

Femur :0.0086342/0.51701
cruralIndex :-0.0028854/0.82797

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.18346)
Explanatory variable : coefficient/P-value
Femur :0.0059525/0.64229
BL :-0.0076642/0.55749

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.17973)
Explanatory variable : coefficient/P-value
speed_diff :-0.024271/0.0038347
Femur :0.0082619/0.39449

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.1833)
Explanatory variable : coefficient/P-value
LLL :0.0071941/0.49154
cruralIndex :-0.0071722/0.48869

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.18338)
Explanatory variable : coefficient/P-value
LLL :0.0020128/0.88204
BL :-0.0099974/0.46705

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.17954)
Explanatory variable : coefficient/P-value
speed_diff :-0.024254/0.0044289
LLL :0.0041914/0.67335

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.18338)
Explanatory variable : coefficient/P-value
cruralIndex :-0.0066038/0.52312
BL :-0.010095/0.34017

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17935)
Explanatory variable : coefficient/P-value
speed_diff :-0.025589/0.0022052
cruralIndex :-0.0099262/0.30247

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.17976)
Explanatory variable : coefficient/P-value
speed_diff :-0.024418/0.0035579
BL :-0.0087595/0.37602

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.18204)
Explanatory variable : coefficient/P-value
BTB :-0.0064624/0.53873

Tibia :-0.00064085/0.95278
Femur :0.010168/0.34376

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.18204)
Explanatory variable : coefficient/P-value
BTB :-0.0064624/0.53873
Tibia :-0.0081685/0.59149
LLL :0.014345/0.34376

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.18211)
Explanatory variable : coefficient/P-value
BTB :-0.0065867/0.5297
Tibia :0.0092192/0.45186
cruralIndex :-0.012543/0.30301

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.18215)
Explanatory variable : coefficient/P-value
BTB :0.012824/0.56654
Tibia :-0.0099823/0.529
BL :-0.025325/0.30317

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.17783)
Explanatory variable : coefficient/P-value
speed_diff :-0.026103/0.0023461
BTB :-0.008059/0.41575
Tibia :-0.0031558/0.75269

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.18204)
Explanatory variable : coefficient/P-value
BTB :-0.0064624/0.53873
Femur :0.011034/0.59149
LLL :-0.0012212/0.95278

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.18202)
Explanatory variable : coefficient/P-value
BTB :-0.0063747/0.54314
Femur :0.0086489/0.51512
cruralIndex :-0.0020898/0.8752

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.18208)
Explanatory variable : coefficient/P-value
BTB :-0.0053158/0.82085
Femur :0.0090639/0.62948
BL :-0.0017067/0.95365

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.17845)

Explanatory variable : coefficient/P-value
speed_diff :-0.02487/0.0030803
BTB :-0.0076151/0.44175
Femur :0.007592/0.43345

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.18206)
Explanatory variable : coefficient/P-value
BTB :-0.0064628/0.5375
LLL :0.0072814/0.4851
cruralIndex :-0.0063602/0.54129

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.18217)
Explanatory variable : coefficient/P-value
BTB :0.024074/0.80756
LLL :-0.018086/0.82877
BL :-0.041557/0.74978

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.17829)
Explanatory variable : coefficient/P-value
speed_diff :-0.024877/0.0035201
BTB :-0.0082018/0.40717
LLL :0.0039722/0.68796

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.18214)
Explanatory variable : coefficient/P-value
BTB :0.0027853/0.86166
cruralIndex :-0.0065715/0.52528
BL :-0.01222/0.44919

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.1781)
Explanatory variable : coefficient/P-value
speed_diff :-0.026052/0.0018337
BTB :-0.0071686/0.46868
cruralIndex :-0.0090775/0.34722

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.17829)
Explanatory variable : coefficient/P-value
speed_diff :-0.024856/0.0036701
BTB :-0.0038049/0.80595
BL :-0.0058315/0.70627

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.17829)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.18216)
Explanatory variable : coefficient/P-value

Tibia :0.045841/0.55581
Femur :-0.040448/0.6316
cruralIndex :-0.058865/0.53952

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.18207)
Explanatory variable : coefficient/P-value
Tibia :-0.0038892/0.73176
Femur :0.0061644/0.63043
BL :-0.0091874/0.50515

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.17811)
Explanatory variable : coefficient/P-value
speed_diff :-0.025425/0.0029621
Tibia :-0.0066424/0.52205
Femur :0.010021/0.31842

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.18216)
Explanatory variable : coefficient/P-value
Tibia :0.075785/0.58785
LLL :-0.057063/0.6316
cruralIndex :-0.058865/0.53952

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.18207)
Explanatory variable : coefficient/P-value
Tibia :-0.0084529/0.57665
LLL :0.0086965/0.63043
BL :-0.0091874/0.50515

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.17811)
Explanatory variable : coefficient/P-value
speed_diff :-0.025425/0.0029621
Tibia :-0.014062/0.32674
LLL :0.014138/0.31842

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.18213)
Explanatory variable : coefficient/P-value
Tibia :0.0027148/0.86317
cruralIndex :-0.008327/0.56272
BL :-0.0086197/0.52657

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17815)
Explanatory variable : coefficient/P-value
speed_diff :-0.02519/0.003282
Tibia :0.0025084/0.83245
cruralIndex :-0.011234/0.32635

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.17813)
Explanatory variable : coefficient/P-value
speed_diff :-0.025974/0.0023597
Tibia :-0.0090603/0.40763
BL :-0.012468/0.24864

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.18216)
Explanatory variable : coefficient/P-value
Femur :-0.10237/0.58785
LLL :0.087354/0.55581
cruralIndex :-0.058865/0.53952

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.18207)
Explanatory variable : coefficient/P-value
Femur :0.011418/0.57665
LLL :-0.0074113/0.73176
BL :-0.0091874/0.50515

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.17811)
Explanatory variable : coefficient/P-value
speed_diff :-0.025425/0.0029621
Femur :0.018994/0.32674
LLL :-0.012658/0.52205

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.18208)
Explanatory variable : coefficient/P-value
Femur :0.00078795/0.96379
cruralIndex :-0.0061731/0.66006
BL :-0.0096903/0.4836

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17816)
Explanatory variable : coefficient/P-value
speed_diff :-0.025217/0.0030194
Femur :0.003043/0.81143
cruralIndex :-0.0079436/0.53223

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.17852)
Explanatory variable : coefficient/P-value
speed_diff :-0.02421/0.0038996
Femur :0.0048477/0.68954
BL :-0.0057799/0.64058

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.1821)
Explanatory variable : coefficient/P-value
LLL :0.0013956/0.918
cruralIndex :-0.0065279/0.529

BL :-0.0091892/0.50431

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17816)
Explanatory variable : coefficient/P-value
speed_diff :-0.025201/0.0031379
LLL :0.0022838/0.82019
cruralIndex :-0.0094964/0.33322

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.17832)
Explanatory variable : coefficient/P-value
speed_diff :-0.02474/0.0036702
LLL :-0.0026832/0.83705
BL :-0.010505/0.42041

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17843)
Explanatory variable : coefficient/P-value
speed_diff :-0.025103/0.0027251
cruralIndex :-0.0086135/0.37862
BL :-0.0070644/0.4804

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.17843)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.18098)
Explanatory variable : coefficient/P-value
BTB :-0.0076275/0.47205
Tibia :0.055288/0.48206
Femur :-0.050545/0.5531
cruralIndex :-0.069449/0.47275

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.18097)
Explanatory variable : coefficient/P-value
BTB :0.051792/0.62574
Tibia :-0.02832/0.58133
Femur :-0.022819/0.70735
BL :-0.0768/0.58145

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.17686)
Explanatory variable : coefficient/P-value
speed_diff :-0.02585/0.0025137
BTB :-0.0070256/0.47857
Tibia :-0.0058808/0.57152
Femur :0.0092005/0.36087

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.18098)
Explanatory variable : coefficient/P-value

BTB :-0.0076275/0.47205
Tibia :0.092708/0.51178
LLL :-0.071307/0.5531
cruralIndex :-0.069449/0.47275

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.18097)
Explanatory variable : coefficient/P-value
BTB :0.051792/0.62574
Tibia :-0.011426/0.48358
LLL :-0.032193/0.70735
BL :-0.0768/0.58145

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.17686)
Explanatory variable : coefficient/P-value
speed_diff :-0.02585/0.0025137
BTB :-0.0070256/0.47857
Tibia :-0.012692/0.37851
LLL :0.01298/0.36087

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.18081)
Explanatory variable : coefficient/P-value
BTB :0.0030601/0.97929
Tibia :-0.00027341/0.99812
cruralIndex :-0.0063948/0.93279
BL :-0.012578/0.93454

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17691)
Explanatory variable : coefficient/P-value
speed_diff :-0.025639/0.002765
BTB :-0.0071971/0.46716
Tibia :0.0025974/0.82593
cruralIndex :-0.010428/0.36242

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.17694)
Explanatory variable : coefficient/P-value
speed_diff :-0.025681/0.0027103
BTB :0.0091842/0.66329
Tibia :-0.01353/0.36691
BL :-0.021365/0.35542

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.18098)
Explanatory variable : coefficient/P-value
BTB :-0.0076275/0.47205
Femur :-0.12523/0.51178
LLL :0.10536/0.48206
cruralIndex :-0.069449/0.47275

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.18097)
 Explanatory variable : coefficient/P-value
 BTB :0.051792/0.62574
 Femur :0.015434/0.48358
 LLL :-0.053966/0.58133
 BL :-0.0768/0.58145

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.17686)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.02585/0.0025137
 BTB :-0.0070256/0.47857
 Femur :0.017144/0.37851
 LLL :-0.011206/0.57152

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.18106)
 Explanatory variable : coefficient/P-value
 BTB :0.045214/0.54392
 Femur :-0.047175/0.5598
 cruralIndex :-0.03187/0.47486
 BL :-0.068797/0.48433

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.1769)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.025693/0.0025208
 BTB :-0.0071424/0.47051
 Femur :0.0029142/0.81855
 cruralIndex :-0.0071817/0.57209

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.17683)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.025871/0.0026118
 BTB :-0.018306/0.42049
 Femur :0.015385/0.38727
 BL :0.014788/0.60153

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.18099)
 Explanatory variable : coefficient/P-value
 BTB :0.049158/0.63654
 LLL :-0.039804/0.65189
 cruralIndex :-0.0082002/0.45391
 BL :-0.073427/0.59101

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.1769)
 Explanatory variable : coefficient/P-value
 speed_diff :-0.025666/0.0026291

BTB :-0.0071672/0.46896
LLL :0.0022603/0.8213
cruralIndex :-0.008652/0.37938

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.17685)
Explanatory variable : coefficient/P-value
speed_diff :-0.025116/0.0036037
BTB :-0.0246/0.79451
LLL :0.017745/0.82343
BL :0.021716/0.86141

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17692)
Explanatory variable : coefficient/P-value
speed_diff :-0.02562/0.0027572
BTB :-0.0043911/0.77545
cruralIndex :-0.0087257/0.3721
BL :-0.0036623/0.81377

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.17692)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.17692)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.17692)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.181)
Explanatory variable : coefficient/P-value
Tibia :0.049107/0.52711
Femur :-0.0522/0.54172
cruralIndex :-0.066312/0.49024
BL :-0.010197/0.46085

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17673)
Explanatory variable : coefficient/P-value
speed_diff :-0.025557/0.0035937
Tibia :-0.011627/0.87766
Femur :0.015392/0.84975
cruralIndex :0.006165/0.94689

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.1769)
Explanatory variable : coefficient/P-value
speed_diff :-0.02578/0.0025637
Tibia :-0.009225/0.39899
Femur :0.0051828/0.66707

BL :-0.0093484/0.47214

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.181)
Explanatory variable : coefficient/P-value
Tibia :0.087752/0.53154
LLL :-0.073642/0.54172
cruralIndex :-0.066312/0.49024
BL :-0.010197/0.46085

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17673)
Explanatory variable : coefficient/P-value
speed_diff :-0.025557/0.0035937
Tibia :-0.023022/0.86486
LLL :0.021715/0.84975
cruralIndex :0.006165/0.94689

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.1769)
Explanatory variable : coefficient/P-value
speed_diff :-0.02578/0.0025637
Tibia :-0.013062/0.36271
LLL :0.0073118/0.66707
BL :-0.0093484/0.47214

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17692)
Explanatory variable : coefficient/P-value
speed_diff :-0.025663/0.0027438
Tibia :-0.0045707/0.7635
cruralIndex :-0.0057791/0.67024
BL :-0.0094924/0.46038

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.181)
Explanatory variable : coefficient/P-value
Femur :-0.11853/0.53154
LLL :0.093578/0.52711
cruralIndex :-0.066312/0.49024
BL :-0.010197/0.46085

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17673)
Explanatory variable : coefficient/P-value
speed_diff :-0.025557/0.0035937
Femur :0.031098/0.86486
LLL :-0.022157/0.87766
cruralIndex :0.006165/0.94689

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.1769)
Explanatory variable : coefficient/P-value

speed_diff :-0.02578/0.0025637
Femur :0.017644/0.36271
LLL :-0.017579/0.39899
BL :-0.0093484/0.47214

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17696)
Explanatory variable : coefficient/P-value
speed_diff :-0.025513/0.0026598
Femur :-0.0046832/0.77771
cruralIndex :-0.011225/0.40409
BL :-0.009429/0.4701

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17694)
Explanatory variable : coefficient/P-value
speed_diff :-0.025583/0.0026916
LLL :-0.0037993/0.77021
cruralIndex :-0.0088791/0.36545
BL :-0.0094833/0.46546

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.17694)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.17694)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.17694)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.17973)
Explanatory variable : coefficient/P-value
BTB :0.021326/0.86026
Tibia :0.031563/0.80271
Femur :-0.055893/0.52572
cruralIndex :-0.056948/0.60418
BL :-0.037895/0.81039

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17551)
Explanatory variable : coefficient/P-value
speed_diff :-0.025785/0.003254
BTB :-0.0070743/0.48012
Tibia :-0.0033195/0.96525
Femur :0.006441/0.93736
cruralIndex :-0.003161/0.97293

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.17557)
Explanatory variable : coefficient/P-value

speed_diff :-0.025702/0.0028625
BTB :0.0071157/0.94367
Tibia :-0.012562/0.79556
Femur :0.0012083/0.98324
BL :-0.018634/0.88779

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.17973)
Explanatory variable : coefficient/P-value
BTB :0.021326/0.86026
Tibia :0.072942/0.6556
LLL :-0.078852/0.52572
cruralIndex :-0.056948/0.60418
BL :-0.037895/0.81039

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17551)
Explanatory variable : coefficient/P-value
speed_diff :-0.025785/0.003254
BTB :-0.0070743/0.48012
Tibia :-0.008088/0.95274
LLL :0.0090867/0.93736
cruralIndex :-0.003161/0.97293

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.17557)
Explanatory variable : coefficient/P-value
speed_diff :-0.025702/0.0028625
BTB :0.0071157/0.94367
Tibia :-0.013456/0.38225
LLL :0.0017046/0.98324
BL :-0.018634/0.88779

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17558)
Explanatory variable : coefficient/P-value
speed_diff :-0.025684/0.0027322
BTB :0.010098/0.92739
Tibia :-0.01444/0.89496
cruralIndex :0.000599/0.9933
BL :-0.022559/0.87549

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.17973)
Explanatory variable : coefficient/P-value
BTB :0.021326/0.86026
Femur :-0.098527/0.6556
LLL :0.060147/0.80271
cruralIndex :-0.056948/0.60418
BL :-0.037895/0.81039

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17551)
Explanatory variable : coefficient/P-value
speed_diff :-0.025785/0.003254
BTB :-0.0070743/0.48012
Femur :0.010925/0.95274
LLL :-0.0063257/0.96525
cruralIndex :-0.003161/0.97293

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.17557)
Explanatory variable : coefficient/P-value
speed_diff :-0.025702/0.0028625
BTB :0.0071157/0.94367
Femur :0.018176/0.38225
LLL :-0.023937/0.79556
BL :-0.018634/0.88779

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17557)
Explanatory variable : coefficient/P-value
speed_diff :-0.025593/0.0032058
BTB :-0.0031452/0.96503
Femur :-0.0013742/0.98581
cruralIndex :-0.0094602/0.82368
BL :-0.0053215/0.95513

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17559)
Explanatory variable : coefficient/P-value
speed_diff :-0.025557/0.0029917
BTB :0.0021107/0.98297
LLL :-0.0055607/0.94694
cruralIndex :-0.0089483/0.38656
BL :-0.01224/0.92487

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.17559)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17559)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.17559)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17554)
Explanatory variable : coefficient/P-value
speed_diff :-0.025775/0.0032633
Tibia :-0.0090564/0.90433
Femur :0.0049989/0.95154

cruralIndex :-0.00020944/0.9982
BL :-0.0093513/0.47412

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17554)
Explanatory variable : coefficient/P-value
speed_diff :-0.025775/0.0032633
Tibia :-0.012757/0.92502
LLL :0.0070523/0.95154
cruralIndex :-0.00020944/0.9982
BL :-0.0093513/0.47412

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17554)
Explanatory variable : coefficient/P-value
speed_diff :-0.025775/0.0032633
Femur :0.017232/0.92502
LLL :-0.017258/0.90433
cruralIndex :-0.00020944/0.9982
BL :-0.0093513/0.47412

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.17554)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.17554)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.17554)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17419)
Explanatory variable : coefficient/P-value
speed_diff :-0.025758/0.0032947
BTB :0.0089997/0.93716
Tibia :-0.016411/0.89116
Femur :0.0033933/0.96806
cruralIndex :0.0036859/0.972
BL :-0.021042/0.88758

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17419)
Explanatory variable : coefficient/P-value
speed_diff :-0.025758/0.0032947
BTB :0.0089997/0.93716
Tibia :-0.018923/0.90377
LLL :0.0047872/0.96806
cruralIndex :0.0036859/0.972

BL :-0.021042/0.88758

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17419)
Explanatory variable : coefficient/P-value
speed_diff :-0.025758/0.0032947
BTB :0.0089997/0.93716
Femur :0.025561/0.90377
LLL :-0.031273/0.89116
cruralIndex :0.0036859/0.972
BL :-0.021042/0.88758

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17419)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.17419)
Error: singular matrix

4. Similarity of Knee-Ankle Coordination

Model: ccc ~BTB+(1|subject_id)(R-squared: 0.2838)
Explanatory variable : coefficient/P-value
BTB :0.0040172/0.69922

Model: ccc ~Tibia+(1|subject_id)(R-squared: 0.28384)
Explanatory variable : coefficient/P-value
Tibia :0.0068243/0.50685

Model: ccc ~Femur+(1|subject_id)(R-squared: 0.28392)
Explanatory variable : coefficient/P-value
Femur :0.0078623/0.44188

Model: ccc ~LLL+(1|subject_id)(R-squared: 0.28397)
Explanatory variable : coefficient/P-value
LLL :0.0092001/0.3697

Model: ccc ~cruralIndex+(1|subject_id)(R-squared: 0.28376)
Explanatory variable : coefficient/P-value
cruralIndex :-0.002588/0.80029

Model: ccc ~BL+(1|subject_id)(R-squared: 0.28374)
Explanatory variable : coefficient/P-value
BL :-0.003212/0.75757

Model: ccc ~speed_diff+(1|subject_id)(R-squared: 0.27972)
  Explanatory variable : coefficient/P-value
   speed_diff :-0.043968/4.1564e-10

Model: ccc ~BTB+Tibia+(1|subject_id)(R-squared: 0.28275)
  Explanatory variable : coefficient/P-value
   BTB :0.003426/0.74212
   Tibia :0.0065205/0.52739

Model: ccc ~BTB+Femur+(1|subject_id)(R-squared: 0.28286)
  Explanatory variable : coefficient/P-value
   BTB :0.0046622/0.65359
   Femur :0.0082188/0.42237

Model: ccc ~BTB+LLL+(1|subject_id)(R-squared: 0.28289)
  Explanatory variable : coefficient/P-value
   BTB :0.0040912/0.69249
   LLL :0.0092337/0.36759

Model: ccc ~BTB+cruralIndex+(1|subject_id)(R-squared: 0.28268)
  Explanatory variable : coefficient/P-value
   BTB :0.0044066/0.67388
   cruralIndex :-0.0031201/0.76192

Model: ccc ~BTB+BL+(1|subject_id)(R-squared: 0.28292)
  Explanatory variable : coefficient/P-value
   BTB :0.015318/0.33653
   BL :-0.014874/0.35108

Model: ccc ~BTB+speed_diff+(1|subject_id)(R-squared: 0.27855)
  Explanatory variable : coefficient/P-value
   speed_diff :-0.043938/4.8955e-10
   BTB :0.00038164/0.96267

Model: ccc ~Tibia+Femur+(1|subject_id)(R-squared: 0.28281)
  Explanatory variable : coefficient/P-value
   Tibia :0.0049396/0.64506
   Femur :0.0064273/0.54696

Model: ccc ~Tibia+LLL+(1|subject_id)(R-squared: 0.28281)
  Explanatory variable : coefficient/P-value
   Tibia :0.00018123/0.9904
   LLL :0.0090675/0.54696

Model: ccc ~Tibia+cruralIndex+(1|subject_id)(R-squared: 0.28286)

Explanatory variable : coefficient/P-value
Tibia :0.01169/0.33835
cruralIndex :-0.0088914/0.46312

Model: ccc ~Tibia+BL+(1|subject_id)(R-squared: 0.28268)
Explanatory variable : coefficient/P-value
Tibia :0.006675/0.55644
BL :-0.00035612/0.97521

Model: ccc ~Tibia+speed_diff+(1|subject_id)(R-squared: 0.2781)
Explanatory variable : coefficient/P-value
speed_diff :-0.044807/4.9913e-10
Tibia :-0.0039001/0.63496

Model: ccc ~Femur+LLL+(1|subject_id)(R-squared: 0.28281)
Explanatory variable : coefficient/P-value
Femur :-0.0002448/0.9904
LLL :0.0094128/0.64506

Model: ccc ~Femur+cruralIndex+(1|subject_id)(R-squared: 0.28279)
Explanatory variable : coefficient/P-value
Femur :0.01047/0.43008
cruralIndex :0.0040782/0.75795

Model: ccc ~Femur+BL+(1|subject_id)(R-squared: 0.2828)
Explanatory variable : coefficient/P-value
Femur :0.0093382/0.46555
BL :0.0024906/0.84792

Model: ccc ~Femur+speed_diff+(1|subject_id)(R-squared: 0.27876)
Explanatory variable : coefficient/P-value
speed_diff :-0.043705/6.1438e-10
Femur :0.0032515/0.68355

Model: ccc ~LLL+cruralIndex+(1|subject_id)(R-squared: 0.28282)
Explanatory variable : coefficient/P-value
LLL :0.0090178/0.38614
cruralIndex :-0.0010696/0.91753

Model: ccc ~LLL+BL+(1|subject_id)(R-squared: 0.28288)
Explanatory variable : coefficient/P-value
LLL :0.012365/0.35958
BL :0.0049165/0.71839

Model: ccc ~LLL+speed_diff+(1|subject_id)(R-squared: 0.27857)
Explanatory variable : coefficient/P-value

speed_diff :-0.043896/8.6007e-10
LLL :0.00042357/0.95856

Model: ccc ~cruralIndex+BL+(1|subject_id)(R-squared: 0.28261)
Explanatory variable : coefficient/P-value
cruralIndex :-0.0020936/0.8403
BL :-0.0028342/0.78862

Model: ccc ~cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27847)
Explanatory variable : coefficient/P-value
speed_diff :-0.04442/2.7709e-10
cruralIndex :-0.0056499/0.47541

Model: ccc ~BL+speed_diff+(1|subject_id)(R-squared: 0.27852)
Explanatory variable : coefficient/P-value
speed_diff :-0.043995/4.4453e-10
BL :0.00043095/0.9578

Model: ccc ~BTB+Tibia+Femur+(1|subject_id)(R-squared: 0.28174)
Explanatory variable : coefficient/P-value
BTB :0.0041557/0.69083
Tibia :0.0044346/0.68106
Femur :0.0068919/0.52055

Model: ccc ~BTB+Tibia+LLL+(1|subject_id)(R-squared: 0.28174)
Explanatory variable : coefficient/P-value
BTB :0.0041557/0.69083
Tibia :-0.00066762/0.96496
LLL :0.0097228/0.52055

Model: ccc ~BTB+Tibia+cruralIndex+(1|subject_id)(R-squared: 0.28178)
Explanatory variable : coefficient/P-value
BTB :0.0041321/0.69158
Tibia :0.011558/0.34365
cruralIndex :-0.0093191/0.44333

Model: ccc ~BTB+Tibia+BL+(1|subject_id)(R-squared: 0.28177)
Explanatory variable : coefficient/P-value
BTB :0.017139/0.44254
Tibia :-0.0018467/0.90719
BL :-0.017051/0.48748

Model: ccc ~BTB+Tibia+speed_diff+(1|subject_id)(R-squared: 0.27695)
Explanatory variable : coefficient/P-value
speed_diff :-0.044766/5.6166e-10
BTB :0.00066752/0.93468

Tibia :-0.003951/0.63162

Model: ccc ~BTB+Femur+LLL+(1|subject_id)(R-squared: 0.28174)
Explanatory variable : coefficient/P-value
BTB :0.0041557/0.69083
Femur :0.00090179/0.96496
LLL :0.0084506/0.68106

Model: ccc ~BTB+Femur+cruralIndex+(1|subject_id)(R-squared: 0.28172)
Explanatory variable : coefficient/P-value
BTB :0.004396/0.67344
Femur :0.010464/0.4299
cruralIndex :0.0035437/0.78961

Model: ccc ~BTB+Femur+BL+(1|subject_id)(R-squared: 0.28176)
Explanatory variable : coefficient/P-value
BTB :0.014638/0.53177
Femur :0.0007437/0.96836
BL :-0.013902/0.63444

Model: ccc ~BTB+Femur+speed_diff+(1|subject_id)(R-squared: 0.27762)
Explanatory variable : coefficient/P-value
speed_diff :-0.043648/7.6057e-10
BTB :0.00068126/0.93368
Femur :0.0033111/0.67932

Model: ccc ~BTB+LLL+cruralIndex+(1|subject_id)(R-squared: 0.28175)
Explanatory variable : coefficient/P-value
BTB :0.0042885/0.68077
LLL :0.0089631/0.38866
cruralIndex :-0.0015969/0.87797

Model: ccc ~BTB+LLL+BL+(1|subject_id)(R-squared: 0.28179)
Explanatory variable : coefficient/P-value
BTB :0.034326/0.72653
LLL :-0.016305/0.84438
BL :-0.040066/0.75671

Model: ccc ~BTB+LLL+speed_diff+(1|subject_id)(R-squared: 0.27741)
Explanatory variable : coefficient/P-value
speed_diff :-0.043864/1.0193e-09
BTB :0.00039299/0.96158
LLL :0.00043383/0.95758

Model: ccc ~BTB+cruralIndex+BL+(1|subject_id)(R-squared: 0.28178)
Explanatory variable : coefficient/P-value

BTB :0.015262/0.33829
cruralIndex :-0.0019036/0.85385
BL :-0.014488/0.36773

Model: ccc ~BTB+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27735)
Explanatory variable : coefficient/P-value
speed_diff :-0.044346/3.3212e-10
BTB :0.0010903/0.89396
cruralIndex :-0.0057794/0.46881

Model: ccc ~BTB+BL+speed_diff+(1|subject_id)(R-squared: 0.27734)
Explanatory variable : coefficient/P-value
speed_diff :-0.04398/1.0471e-09
BTB :0.0001206/0.99246
BL :0.00033816/0.97885

Model: ccc ~Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.27734)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.28191)
Explanatory variable : coefficient/P-value
Tibia :0.087361/0.25748
Femur :-0.083124/0.32048
cruralIndex :-0.10262/0.2807

Model: ccc ~Tibia+Femur+BL+(1|subject_id)(R-squared: 0.28172)
Explanatory variable : coefficient/P-value
Tibia :0.0062687/0.5801
Femur :0.0089752/0.48275
BL :0.0049513/0.7179

Model: ccc ~Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.27712)
Explanatory variable : coefficient/P-value
speed_diff :-0.044716/5.2765e-10
Tibia :-0.0052226/0.54049
Femur :0.0046206/0.57536

Model: ccc ~Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.28191)
Explanatory variable : coefficient/P-value
Tibia :0.1489/0.28291
LLL :-0.11727/0.32048
cruralIndex :-0.10262/0.2807

Model: ccc ~Tibia+LLL+BL+(1|subject_id)(R-squared: 0.28172)
Explanatory variable : coefficient/P-value
Tibia :-0.00037586/0.98018

LLL :0.012662/0.48275
BL :0.0049513/0.7179

Model: ccc ~Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.27712)
Explanatory variable : coefficient/P-value
speed_diff :-0.044716/5.2765e-10
Tibia :-0.0086433/0.46313
LLL :0.0065185/0.57536

Model: ccc ~Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.28178)
Explanatory variable : coefficient/P-value
Tibia :0.01593/0.31026
cruralIndex :-0.01219/0.39536
BL :0.0058045/0.66771

Model: ccc ~Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27718)
Explanatory variable : coefficient/P-value
speed_diff :-0.044601/6.1752e-10
Tibia :-0.0010404/0.91505
cruralIndex :-0.0051087/0.58683

Model: ccc ~Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.27689)
Explanatory variable : coefficient/P-value
speed_diff :-0.044847/4.8665e-10
Tibia :-0.0044966/0.61855
BL :-0.0014101/0.87434

Model: ccc ~Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.28191)
Explanatory variable : coefficient/P-value
Femur :-0.20113/0.28291
LLL :0.16648/0.25748
cruralIndex :-0.10262/0.2807

Model: ccc ~Femur+LLL+BL+(1|subject_id)(R-squared: 0.28172)
Explanatory variable : coefficient/P-value
Femur :0.0005077/0.98018
LLL :0.011946/0.5801
BL :0.0049513/0.7179

Model: ccc ~Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.27712)
Explanatory variable : coefficient/P-value
speed_diff :-0.044716/5.2765e-10
Femur :0.011675/0.46313
LLL :-0.0099522/0.54049

Model: ccc ~Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.28168)

Explanatory variable : coefficient/P-value
Femur :0.013973/0.42049
cruralIndex :0.0055554/0.69237
BL :0.0043183/0.75389

Model: ccc ~Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27722)
Explanatory variable : coefficient/P-value
speed_diff :-0.04453/4.8969e-10
Femur :-0.0008263/0.93722
cruralIndex :-0.0061891/0.55408

Model: ccc ~Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.27764)
Explanatory variable : coefficient/P-value
speed_diff :-0.043761/5.7626e-10
Femur :0.0054984/0.58186
BL :0.0038136/0.70837

Model: ccc ~LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.28173)
Explanatory variable : coefficient/P-value
LLL :0.012231/0.36598
cruralIndex :-0.0014158/0.89135
BL :0.0050847/0.71029

Model: ccc ~LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.2772)
Explanatory variable : coefficient/P-value
speed_diff :-0.04456/5.4258e-10
LLL :-0.00075538/0.92718
cruralIndex :-0.0057931/0.47254

Model: ccc ~LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.27744)
Explanatory variable : coefficient/P-value
speed_diff :-0.043836/9.9428e-10
LLL :0.0012272/0.90915
BL :0.0012298/0.9089

Model: ccc ~cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27723)
Explanatory variable : coefficient/P-value
speed_diff :-0.044545/2.8177e-10
cruralIndex :-0.0059497/0.46042
BL :0.0016034/0.84601

Model: ccc ~BTB+Tibia+Femur+LLL+(1|subject_id)(R-squared: 0.27723)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+(1|subject_id)(R-squared: 0.28079)
Explanatory variable : coefficient/P-value

BTB :0.0024874/0.81271
Tibia :0.084249/0.28156
Femur :-0.079793/0.34685
cruralIndex :-0.099123/0.30305

Model: ccc ~BTB+Tibia+Femur+BL+(1|subject_id)(R-squared: 0.28065)
Explanatory variable : coefficient/P-value
BTB :0.04092/0.69882
Tibia :-0.01304/0.79885
Femur :-0.013933/0.81805
BL :-0.048454/0.72684

Model: ccc ~BTB+Tibia+Femur+speed_diff+(1|subject_id)(R-squared: 0.276)
Explanatory variable : coefficient/P-value
speed_diff :-0.044641/6.1833e-10
BTB :0.0012005/0.88341
Tibia :-0.0053542/0.53275
Femur :0.0047603/0.56651

Model: ccc ~BTB+Tibia+LLL+cruralIndex+(1|subject_id)(R-squared: 0.28079)
Explanatory variable : coefficient/P-value
BTB :0.0024874/0.81271
Tibia :0.14332/0.30807
LLL :-0.11257/0.34685
cruralIndex :-0.099123/0.30305

Model: ccc ~BTB+Tibia+LLL+BL+(1|subject_id)(R-squared: 0.28065)
Explanatory variable : coefficient/P-value
BTB :0.04092/0.69882
Tibia :-0.0027252/0.86715
LLL :-0.019656/0.81805
BL :-0.048454/0.72684

Model: ccc ~BTB+Tibia+LLL+speed_diff+(1|subject_id)(R-squared: 0.276)
Explanatory variable : coefficient/P-value
speed_diff :-0.044641/6.1833e-10
BTB :0.0012005/0.88341
Tibia :-0.0088783/0.45535
LLL :0.0067157/0.56651

Model: ccc ~BTB+Tibia+cruralIndex+BL+(1|subject_id)(R-squared: 0.28057)
Explanatory variable : coefficient/P-value
BTB :-0.040782/0.72781
Tibia :0.055756/0.62932
cruralIndex :-0.037941/0.6147
BL :0.058543/0.70038

Model: ccc ~BTB+Tibia+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27605)
Explanatory variable : coefficient/P-value
speed_diff :-0.044529/7.2412e-10
BTB :0.0010996/0.893
Tibia :-0.0010556/0.91384
cruralIndex :-0.0052313/0.57972

Model: ccc ~BTB+Tibia+BL+speed_diff+(1|subject_id)(R-squared: 0.27601)
Explanatory variable : coefficient/P-value
speed_diff :-0.044573/6.9396e-10
BTB :0.0082647/0.63522
Tibia :-0.008512/0.49173
BL :-0.0094133/0.6218

Model: ccc ~BTB+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.28079)
Explanatory variable : coefficient/P-value
BTB :0.0024874/0.81271
Femur :-0.19359/0.30807
LLL :0.16054/0.28156
cruralIndex :-0.099123/0.30305

Model: ccc ~BTB+Femur+LLL+BL+(1|subject_id)(R-squared: 0.28065)
Explanatory variable : coefficient/P-value
BTB :0.04092/0.69882
Femur :0.003681/0.86715
LLL :-0.024849/0.79885
BL :-0.048454/0.72684

Model: ccc ~BTB+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.276)
Explanatory variable : coefficient/P-value
speed_diff :-0.044641/6.1833e-10
BTB :0.0012005/0.88341
Femur :0.011992/0.45535
LLL :-0.010203/0.53275

Model: ccc ~BTB+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.28075)
Explanatory variable : coefficient/P-value
BTB :0.058957/0.42717
Femur :-0.048614/0.54676
cruralIndex :-0.027972/0.52937
BL :-0.072738/0.45795

Model: ccc ~BTB+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27609)
Explanatory variable : coefficient/P-value
speed_diff :-0.044455/5.8642e-10

BTB :0.0010817/0.89476
Femur :-0.00080843/0.9386
cruralIndex :-0.0063059/0.54819

Model: ccc ~BTB+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.27585)
Explanatory variable : coefficient/P-value
speed_diff :-0.044883/5.7601e-10
BTB :-0.011133/0.55221
Femur :0.011884/0.41744
BL :0.016311/0.48481

Model: ccc ~BTB+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.28067)
Explanatory variable : coefficient/P-value
BTB :0.043124/0.67736
LLL :-0.023924/0.78557
cruralIndex :-0.0028825/0.79218
BL :-0.051252/0.70646

Model: ccc ~BTB+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27607)
Explanatory variable : coefficient/P-value
speed_diff :-0.044487/6.441e-10
BTB :0.0010881/0.89412
LLL :-0.00075313/0.92741
cruralIndex :-0.0059219/0.46609

Model: ccc ~BTB+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.27574)
Explanatory variable : coefficient/P-value
speed_diff :-0.044705/6.9744e-10
BTB :-0.049179/0.52561
LLL :0.042019/0.51946
BL :0.065627/0.5202

Model: ccc ~BTB+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27601)
Explanatory variable : coefficient/P-value
speed_diff :-0.044585/6.5854e-10
BTB :-0.00031224/0.9804
cruralIndex :-0.0059579/0.4601
BL :0.0018453/0.88572

Model: ccc ~Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.27601)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.27601)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.27601)

Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.28079)
Explanatory variable : coefficient/P-value
Tibia :0.086236/0.26433
Femur :-0.079147/0.3526
cruralIndex :-0.10008/0.29539
BL :0.0034161/0.80285

Model: ccc ~Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27582)
Explanatory variable : coefficient/P-value
speed_diff :-0.044895/1.2024e-09
Tibia :-0.011413/0.8541
Femur :0.011284/0.86574
cruralIndex :0.0076509/0.91984

Model: ccc ~Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.276)
Explanatory variable : coefficient/P-value
speed_diff :-0.04464/6.0011e-10
Tibia :-0.0046739/0.60466
Femur :0.0056524/0.56969
BL :0.0019956/0.85253

Model: ccc ~Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.28079)
Explanatory variable : coefficient/P-value
Tibia :0.14483/0.29943
LLL :-0.11166/0.3526
cruralIndex :-0.10008/0.29539
BL :0.0034161/0.80285

Model: ccc ~Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27582)
Explanatory variable : coefficient/P-value
speed_diff :-0.044895/1.2024e-09
Tibia :-0.019767/0.85883
LLL :0.015919/0.86574
cruralIndex :0.0076509/0.91984

Model: ccc ~Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.276)
Explanatory variable : coefficient/P-value
speed_diff :-0.04464/6.0011e-10
Tibia :-0.0088585/0.45434
LLL :0.0079742/0.56969
BL :0.0019956/0.85253

Model: ccc ~Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27606)
Explanatory variable : coefficient/P-value

speed_diff :-0.044511/7.4068e-10
Tibia :0.00025334/0.98389
cruralIndex :-0.0061067/0.58575
BL :0.001738/0.87001

Model: ccc ~Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.28079)
Explanatory variable : coefficient/P-value
Femur :-0.19563/0.29943
LLL :0.16433/0.26433
cruralIndex :-0.10008/0.29539
BL :0.0034161/0.80285

Model: ccc ~Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27582)
Explanatory variable : coefficient/P-value
speed_diff :-0.044895/1.2024e-09
Femur :0.0267/0.85883
LLL :-0.021748/0.8541
cruralIndex :0.0076509/0.91984

Model: ccc ~Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.276)
Explanatory variable : coefficient/P-value
speed_diff :-0.04464/6.0011e-10
Femur :0.011966/0.45434
LLL :-0.0089066/0.60466
BL :0.0019956/0.85253

Model: ccc ~Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27609)
Explanatory variable : coefficient/P-value
speed_diff :-0.044467/5.4041e-10
Femur :0.00082494/0.95198
cruralIndex :-0.0054893/0.62114
BL :0.0020202/0.85136

Model: ccc ~LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27608)
Explanatory variable : coefficient/P-value
speed_diff :-0.044482/6.232e-10
LLL :0.00045729/0.96605
cruralIndex :-0.0059175/0.46489
BL :0.0018947/0.85986

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+(1|subject_id)(R-squared: 0.27608)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+(1|subject_id)(R-squared: 0.27608)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+speed_diff+(1|subject_id)(R-squared: 0.27608)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+(1|subject_id)(R-squared: 0.2796)
Explanatory variable : coefficient/P-value
BTB :-0.016155/0.89289
Tibia :0.099538/0.42742
Femur :-0.076362/0.38334
cruralIndex :-0.10719/0.32648
BL :0.024392/0.87605

Model: ccc ~BTB+Tibia+Femur+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27468)
Explanatory variable : coefficient/P-value
speed_diff :-0.044852/1.2767e-09
BTB :0.0013431/0.87091
Tibia :-0.012997/0.83614
Femur :0.012988/0.84759
cruralIndex :0.0094275/0.90233

Model: ccc ~BTB+Tibia+Femur+BL+speed_diff+(1|subject_id)(R-squared: 0.27452)
Explanatory variable : coefficient/P-value
speed_diff :-0.045055/5.395e-10
BTB :-0.032539/0.69471
Tibia :0.010565/0.79119
Femur :0.023815/0.61505
BL :0.04445/0.68266

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.2796)
Explanatory variable : coefficient/P-value
BTB :-0.016155/0.89289
Tibia :0.15607/0.33721
LLL :-0.10773/0.38334
cruralIndex :-0.10719/0.32648
BL :0.024392/0.87605

Model: ccc ~BTB+Tibia+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27468)
Explanatory variable : coefficient/P-value
speed_diff :-0.044852/1.2767e-09
BTB :0.0013431/0.87091
Tibia :-0.022613/0.84074
LLL :0.018323/0.84759
cruralIndex :0.0094275/0.90233

Model: ccc ~BTB+Tibia+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.27452)
Explanatory variable : coefficient/P-value
speed_diff :-0.045055/5.395e-10

BTB :-0.032539/0.69471
Tibia :-0.007066/0.57693
LLL :0.033598/0.61505
BL :0.04445/0.68266

Model: ccc ~BTB+Tibia+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27483)
Explanatory variable : coefficient/P-value
speed_diff :-0.044467/7.6201e-10
BTB :-0.029184/0.74957
Tibia :0.028766/0.74988
cruralIndex :-0.024534/0.67662
BL :0.039499/0.73949

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.2796)
Explanatory variable : coefficient/P-value
BTB :-0.016155/0.89289
Femur :-0.21081/0.33721
LLL :0.18968/0.42742
cruralIndex :-0.10719/0.32648
BL :0.024392/0.87605

Model: ccc ~BTB+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27468)
Explanatory variable : coefficient/P-value
speed_diff :-0.044852/1.2767e-09
BTB :0.0013431/0.87091
Femur :0.030544/0.84074
LLL :-0.024768/0.83614
cruralIndex :0.0094275/0.90233

Model: ccc ~BTB+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.27452)
Explanatory variable : coefficient/P-value
speed_diff :-0.045055/5.395e-10
BTB :-0.032539/0.69471
Femur :0.0095445/0.57693
LLL :0.020133/0.79119
BL :0.04445/0.68266

Model: ccc ~BTB+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.2745)
Explanatory variable : coefficient/P-value
speed_diff :-0.045131/6.7831e-10
BTB :-0.023078/0.69588
Femur :0.025069/0.69343
cruralIndex :0.0074389/0.83137
BL :0.03215/0.67964

Model: ccc ~BTB+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27456)

Explanatory variable : coefficient/P-value
speed_diff :-0.044978/5.5174e-10
BTB :-0.034925/0.66789
LLL :0.029573/0.66716
cruralIndex :-0.0047777/0.57401
BL :0.0475/0.65667

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.27456)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27456)
Error: singular matrix

Model: ccc ~Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.27456)
Error: singular matrix

Model: ccc ~Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27469)
Explanatory variable : coefficient/P-value
speed_diff :-0.044847/1.2763e-09
Tibia :-0.012008/0.84677
Femur :0.013647/0.84053
cruralIndex :0.009107/0.90511
BL :0.002118/0.84422

Model: ccc ~Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27469)
Explanatory variable : coefficient/P-value
speed_diff :-0.044847/1.2763e-09
Tibia :-0.022112/0.84319
LLL :0.019253/0.84053
cruralIndex :0.009107/0.90511
BL :0.002118/0.84422

Model: ccc ~Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27469)
Explanatory variable : coefficient/P-value
speed_diff :-0.044847/1.2763e-09
Femur :0.029868/0.84319
LLL :-0.022883/0.84677
cruralIndex :0.009107/0.90511
BL :0.002118/0.84422

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+(1|subject_id)(R-squared: 0.27469)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+speed_diff+(1|subject_id)(R-squared: 0.27469)
Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+BL+speed_diff+(1|subject_id)(R-squared: 0.27469)
  Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27337)
  Explanatory variable : coefficient/P-value
   speed_diff :-0.044953/1.1337e-09
   BTB :-0.035722/0.70389
   Tibia :0.017085/0.8626
   Femur :0.02011/0.77308
   cruralIndex :-0.0062443/0.9424
   BL :0.048519/0.69222

Model: ccc ~BTB+Tibia+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27337)
  Explanatory variable : coefficient/P-value
   speed_diff :-0.044953/1.1337e-09
   BTB :-0.035722/0.70389
   Tibia :0.0021967/0.98639
   LLL :0.028371/0.77308
   cruralIndex :-0.0062443/0.9424
   BL :0.048519/0.69222

Model: ccc ~BTB+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27337)
  Explanatory variable : coefficient/P-value
   speed_diff :-0.044953/1.1337e-09
   BTB :-0.035722/0.70389
   Femur :-0.0029671/0.98639
   LLL :0.032557/0.8626
   cruralIndex :-0.0062443/0.9424
   BL :0.048519/0.69222

Model: ccc ~Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27337)
  Error: singular matrix

Model: ccc ~BTB+Tibia+Femur+LLL+cruralIndex+BL+speed_diff+(1|subject_id)(R-squared: 0.27337)
  Error: singular matrix

VITA

Binnan Yu earned a doctoral degree in rehabilitation science from the University of Washington in 2021. Binnan's research interests focus on biomechanics and motor control supporting clinical practice in physical rehabilitation. Binnan is particularly interested in understanding the mechanism of human locomotion. Binnan has extensive clinical experience in sport medicine. He hopes to pursue his research and practice interests within a future academic position. Binnan also hold a master of science degree in athletic training from the Minnesota State University at Mankato and a bachelor of education degree in social sports from Shanghai University of Sports.