Characterizing Post-Traumatic Growth and the Cognitive Engagement and Disengagement Strategies that Promote Growth in Caregivers of Children with Cancer

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Abstract

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Despite considerable distress and negative adjustment outcomes reported by caregivers of children with cancer (Pai et al., 2007; Patiño-Fernández et al., 2008; Sultan et al., 2016), many caregivers also report positive changes or personal growth (López et al., 2019). The term post-traumatic growth (PTG; Calhoun and Tedeschi, 1996) was coined to capture the experience of positive developments that directly result from the struggle with challenging circumstances. Multiple conceptual models (Joseph et al., 2012; Picoraro et al., 2014; Tedeschi & Calhoun, 2004) have been presented to help guide our understanding of how one moves from disruption to reintegration and growth, and models consistently identify cognitive processing as a key factor underlying the formation of PTG. However, research examining the association between cognitive engagement with the difficult aspects of cancer and PTG is mixed, with some research finding positive associations, some finding no associations, and some finding negative associations. Furthermore, the opposing cognitive strategy of disengagement is also conceptually and empirically linked to PTG, but again, the research is divided.

The current study sought to clarify contradictions in prior work linking cognitive engagement and disengagement strategies and PTG through improved study methodology. We

carried out a series of complementary aims that increased measurement precision (with regard to timing of cognitive engagement and disengagement strategies and the possibility of non-linear relationships with PTG) and depth of context (with regard to caregiver role, the concurrent use of engagement and disengagement strategies, and the relationship between PTG and traditional measures of adjustment). Findings from each aim are presented separately, then integrated in the discussion.

Primary caregivers (PCs) and secondary caregivers (SCs) of children aged 2-17 recently diagnosed with cancer (*N* = 143, diagnoses: 37% leukemia, 23% CNS malignancies, 11% lymphoma, 10% sarcomas, 9% Wilms tumor, 4% neuroblastoma, 5% other) completed measures of cognitive engagement and disengagement (Responses to Stress Questionnaire), depressive symptoms (Center for Epidemiological Studies – Depression 10), and post-traumatic stress symptoms (Impact of Events Scale – Revised) at 1-, 6-, and 12-months post-diagnosis. Reports of PTG (Post-Traumatic Growth Inventory) were collected at 12-months post-diagnosis. Results demonstrated that primary control engagement was the single cognitive strategy with the strongest evidence of association to PTG among both caregivers. Some evidence showed that secondary control engagement promoted growth, particularly among SCs. As an individual strategy, disengagement was only found to be a helpful for promoting PTG in SCs and only at moderate levels. Additionally, the ability to flexibly use all three volitional strategies (primary control, secondary control, and disengagement) was also seen to promote PTG in both caregivers. Higher levels of involuntary engagement and disengagement stress responses were also seen to promote PTG among SCs, but not PCs. Finally, despite links to traditionally "maladaptive" engagement and disengagement responses as well as conceptual links to

distress and disruption, PTG was largely orthogonal to trajectories adjustment, with the one exception being that SCs with greater post-traumatic stress symptoms also reported greater PTG.

Taken together, results emphasize taking a contextual and ideographic approach to understanding which cognitive engagement and disengagement strategies are helpful, when they are helpful, and for whom they are helpful in promoting PTG in the context of childhood cancer. A broader range of strategies than previously assumed advantageous may promote PTG, especially among SCs and when used in conjunction with conventionally adaptive strategies. Results are discussed with regard to challenges in measuring and defining PTG, given that some researchers have proposed that there may be two faces to PTG: one that is true and adaptive and one that is illusory and maladaptive (Maercker & Zoellner, 2004). Limitations and directions for future work are discussed alongside implications of findings.

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Introduction

In the U.S., an estimated 15,780 children are diagnosed with cancer each year (American Childhood Cancer Organization, 2021). Globally, this number extends to over 300,000 children. While treatments for pediatric cancers continue to improve, cancer remains the leading cause of death by disease in children. For the caregivers of these children in particular, a diagnosis of pediatric cancer constitutes a terrifying and destabilizing event that challenges one's very role as a caregiver. It follows that caregivers of children with cancer have been identified as having elevated symptoms of depression, anxiety, acute, and post-traumatic stress disorders (Katz et al., 2018; Pai et al., 2007; Patiño-Fernández et al., 2008; Sultan et al., 2016). And yet, in the face of immense hardship, caregivers of sick children also consistently report growth and positive changes resulting from the very same challenges that produce distress (López et al., 2019; Picoraro et al., 2014). In this study, post-traumatic growth (PTG) is presented as a construct that can be examined concurrently with traditional metrics of adjustment to more holistically characterize positive outcomes among caregivers of children with cancer. Cognitive engagement and disengagement processes underlying the formation of narratives of growth were investigated to help guide efforts to promote PTG among caregivers. While previous research has returned contradictory findings about the true nature of these relationships, this study presents a series of complementary aims that offer increased measurement precision and expanded scope of context. Ultimately, we endeavor to improve our understanding of the complex relation between cognitive engagement and disengagement and PTG.

An Introduction to PTG

The construct of PTG is defined as "the experience of positive change that occurs as a result of the struggle with highly challenging life crises" (Tedeschi & Calhoun, 2004, p. 1). It is a construct first named by Tedeschi and Calhoun in 1996 (Calhoun & Tedeschi, 1996) that aligns with the relatively more recent movement to focus on the positive dimensions of human character that promote adjustment, growth, and good health (Seligman, 2008). Of course, the idea that humans grow and learn from suffering is not even a remotely contemporary notion. Stories of the transformative power of trauma are riddled throughout centuries-old religious texts, central to Nietzsche's philosophical musings, and exemplified by such figures as Viktor Frankl. In his 1946 *Man's Search for Meaning*, Frankl chronicles his personal journey to make sense of his experiences as a prisoner in the Auschwitz Concentration Camp and to find reasons to continue living amidst unimaginable suffering. PTG is a positive aspect of adjustment that exists not just in spite of difficulty, but rather because of it.

Conceptually, it follows that PTG is included under the umbrella of positive adaptation, however PTG is conceptually distinct from definitions of adaptive behavior that characterize it as the absence of negative adjustment outcomes in the face of difficult circumstances. Historically, many theorists considered the mere absence of psychopathology among children treated for cancer evidence of positive adaptation (i.e., buffering models of resilience; Luthar, 1993), however, well-being does not necessarily imply positive growth. Comparatively, PTG is more in line with other models of positive adaptation that characterize it as the process of "bouncing back" or even "bouncing forward" (Walsh, 2002). Tedeschi and Calhoun's model of PTG posits that PTG is conceptually distinct from well-being and that in fact, some form of

trauma must initially create distress before positive growth can prevail. PTG is not the maintenance of baseline functioning, but rather a process borne out of reduced functioning that facilitates development beyond baseline functioning (Tedeschi & Calhoun, 2004). To further underscore this point, a large-scale study of adolescents and adults exposed to acts of terror actually found that PTG was positively related to distress (Levine et al., 2009). Those who experienced minimal to no distress following trauma also had the lowest demonstrated capacity for PTG.

PTG is often conflated with the more superficial ability to perceive any benefit or silver lining derived from difficulty, however this does not capture the full depth of processing required to make sense of trauma narratives (Sumalla et al., 2009; Thornton, 2002). Sumalla and colleagues (2009) contend that benefit-finding is a construct that is conceptually related to PTG, but distinct and not necessarily empirically related. In a study of women treated for breast cancer, the vast majority of patients reported finding benefits of their cancer, but benefit finding emerged as a construct that was distinct from PTG or long term positive psychological adjustment (Sears et al., 2003). Positive re-appraisal coping predicted both later PTG and positive psychological adjustment, whereas benefit finding was statistically unrelated. This suggests that benefit finding may bypass the more effortful cognitive processing necessary for PTG, and meaning making, and should not be considered evidence of PTG. Further, another study found that while highly correlated with one another, PTG and benefit finding had different disease-related determinants (Jansen et al., 2011). Higher objective cancer burden (e.g., higher stage of disease, higher intensity treatment) and perceived burden of cancer

diagnosis were related to higher PTG but not benefit finding, further underscoring that PTG develops as a consequence of engaging with greater adversity or threat.

Calhoun and Tedeschi (1998) discuss this adversity or threat as a "seismic event"—a traumatic event that serves to disrupt one's core beliefs and assumptions about the world. The resulting distress and drive for reintegration of fragmented narratives of self and world create fertile ground for the processes of building PTG (Neimeyer, 2004). PTG has been studied among a wide variety of types of "seismic events" including bereavement (Bellet et al., 2018; Eisma et al., 2019; Michael & Cooper, 2013), chronic illness (Jim & Jacobsen, 2008; Sawyer et al., 2010), sexual violence (Ulloa et al., 2016), natural disasters (Bernstein & Pfefferbaum, 2018), and accidents and acquired injury (Grace et al., 2015; Zoellner et al., 2008). Of the literature on PTG, a significant portion has been conducted with children and adults treated for cancer and their caregivers (see reviews: Casellas-Grau et al., 2017; Duran, 2013; Shand et al., 2015; Turner et al., 2017). Cancer poses considerable disruption for families ranging from increased caregiving demands and shuffled family roles to threat to a child's life. Together these challenges provoke reevaluation of one's priorities, values, sense of self, support, and security in the world. Qualitative research on PTG in cancer populations suggests that the threat of cancer can lead patients and caregivers to reevaluate values and life priorities, discover new found strengths and dimensions of self, increase closeness and depth of relationships, and increase gratitude and one's desire to pay forward acts of kindness (Duran, 2013).

The ubiquitous Post-Traumatic Growth Inventory used in the vast majority of PTG research (Casellas-Grau et al., 2017) measures PTG in domains of changed priorities, more intimate relationships with others; greater personal strength; recognition of new possibilities or

paths for one's life, and spiritual development. A recent scoping review of qualitative investigations of PTG in cancer found that 93% of studies identified qualitative themes of PTG mapping onto three or more of these five domains, with 57% identifying themes that mapped onto all five (Menger et al., 2021), suggesting that the cancer experience can produce a range of growth outcomes that are well captured by the PTGI.

PTG and Cognitive Engagement and Disengagement

Multiple conceptual models (Joseph et al., 2012; Tedeschi & Calhoun, 2004), including one specifically describing the phenomenon of PTG among pediatric patients and caregivers (Picoraro et al., 2014), have been presented to help guide our understanding of how one moves from disruption to reintegration and growth. These models consistently identify cognitive processing as a key factor underlying the formation of PTG. Cognitive processing of the event and aftermath enable one to examine and adjust these schemas to accommodate new narratives and experiences, this decreases dissonance and lessens distress to build PTG and promote overall well-being (Tedeschi & Calhoun, 2004). Through repeated cognitive engagement with difficult aspects of cancer and its treatment one may reconsolidate trauma narratives into narratives of growth (Greenberg, 1995; Joseph et al., 2012; Neimeyer, 2004; Zoellner & Maercker, 2006). Cognitive engagement strategies that help individuals appraise and make sense of difficulty, such as rumination, are theorized to promote PTG, and considerable empirical evidence supports this link in patients coping with cancer (Chan et al., 2011; Danhauer et al., 2013; Hong et al., 2019; Koutrouli et al., 2016; Lianchao & Tingting, 2020; Morris & Shakespeare-Finch, 2011; Mundey et al., 2019; Ramos et al., 2018; Salsman et al.,

2009; Soo & Sherman, 2015; Wilson et al., 2014; Yuen et al., 2014), including one paper of caregivers of children with cancer specifically (Kim, 2017).

Interestingly, even cognitive engagement strategies that are theorized to be maladaptive, such as intrusive rumination or brooding, and are associated with poor adjustment outcomes in cancer populations (Morris & Shakespeare-Finch, 2011; Soo & Sherman, 2015) have also been positively associated with PTG (Beckmann et al., 2021; Danhauer et al., 2013; Klosky et al., 2014; Liu et al., 2018; Morris & Shakespeare-Finch, 2011; Ogińska-Bulik, 2018; Wilson et al., 2014). However, other studies also find negative associations between cognitive engagement and PTG (Chan et al., 2011; Lianchao & Tingting, 2020; Wong et al., 2019) or that the majority of associations are null for certain domains of cognitive engagement (Carboon et al., 2005; M. J. Cordova et al., 2007; Hill & Watkins, 2017; Hong et al., 2019; Ogińska-Bulik, 2018; Ramos et al., 2018; Soo & Sherman, 2015). There may exist any number of factors ranging from measurement characteristics (e.g., measure used, timing of assessment) to participant demographic factors (e.g., gender, age, diagnosis type, culture) that explain the inconsistencies in these associations.

Further complicating our understanding of the cognitive mechanisms underlying PTG, the opposite cognitive style of cognitive disengagement (e.g., avoidance) has also been positively linked to PTG in conceptual models (Joseph et al., 2012) as well as empirical research (Beckmann et al., 2021; Gesselman et al., 2017; Klosky et al., 2014; Liu et al., 2018; Shand et al., 2015). It has been proposed that disengagement may be adaptive for developing PTG because one must separate from current identities, goals, and worldviews in order to create new identities, goals, and worldviews (Tedeschi & Calhoun, 2004). Thus cognitive engagement and

disengagement may work in concert to facilitate the rebuilding process of PTG. However, as with cognitive engagement strategies, existing research in patients and caregivers coping with cancer often mixed on whether cognitive disengagement strategies are positively, negatively, or not associated with PTG.

Little is known about conditions under which these two sets of cognitive approaches, engagement and disengagement, look beneficial for promoting PTG vs. the conditions under which they do not, and existing research in cancer populations has not adequately investigated how engagement and disengagement may function together to promote PTG. Furthermore, it remains counterintuitive that cognitive strategies that have demonstrated negative effects on adjustment would promote a positive outcome like PTG. The very role of PTG in the overall context of resilience and adjustment following a cancer diagnosis is complex given that PTG is characterized as an adaptive outcome that is borne directly from initial distress and disruption. This proposal endeavors to use more comprehensive and sensitive methods to address unanswered questions of how cognitive engagement and disengagement strategies function together to underlie PTG. Findings will be discussed with regard to the overall context of resilience for caregivers of a child with cancer.

Potential Explanations for Inconsistent Associations

There are multiple potential explanations for inconsistent and often counterintuitive associations between engagement and disengagement and PTG. I will now outline competing explanations to be tested in the current study. First, I will discuss how it is necessary to examine longitudinal trajectories of cognitive engagement and disengagement strategies to detect whether strategies promote PTG differentially at different stages in treatment. Second, I argue

that curvilinear rather than linear relationships between cognitive engagement and disengagement strategies and PTG may better capture the data. Third, I will investigate regulatory flexibility as a construct that may further explain the relationship between engagement/disengagement strategies and PTG. And finally, I will reconsider the role of PTG in the grander context of adjustment.

Trajectories.

Work evaluating the relationship between cognitive engagement and disengagement strategies has failed to sensitively examine longitudinal trajectories of cognitive processing to determine if there are differences with regard to what cognitive processing approaches matter at different points in treatment. One longitudinal paper (Salsman et al., 2009) assessed cognitive rehearsal, intrusive thinking, and PTG at 12- and 15- months post-diagnosis among adult survivors of colorectal cancer and found that cognitive rehearsal at both timepoints was related to later PTG, whereas only later intrusive thinking was associated with PTG. This suggests that different cognitive processing strategies might be helpful at different times for developing PTG. Perhaps intrusive thinking prompts further processing and engagement with cancer that produces PTG, but only further in time from diagnosis when intrusive thoughts are less likely to be associated with overwhelming distress (Katz et al., 2018).

Alternatively, it has been suggested that while initial processing of difficulty is likely to be involuntary and intrusive, this paves the way for later processing that is more likely to be volitional and constructive in promoting PTG (Sumalla et al., 2009). Supporting this idea, one study among adults with cancer found that the relationship between early intrusive rumination and PTG was mediated by later deliberate rumination (Ogińska-Bulik & Kobylarczyk, 2019).

Seventy-one adult participants with various forms of cancer were recruited from an oncology clinic in Poland at approximately six months post-diagnosis. Participants completed separate Event Related Rumination Inventories (Cann et al., 2011) reflecting rumination two weeks post-diagnosis and current rumination (six months post-diagnosis). Current deliberative rumination was found to fully mediate the relationship between initial intrusive rumination and appreciation of life.

Regarding disengagement, it has been suggested that while avoidance may have short-term benefits for minimizing distress, an abiding pattern of avoidance may be maladaptive in the long-term (Livneh, 2009; Wenninger et al., 2013). Unfortunately, very limited work has evaluated longitudinal trajectories of disengagement alongside PTG. One study among breast cancer survivors found that denial and disengagement during active treatment were unrelated to PTG two years later (Bussell & Naus, 2010), but no studies have compared disengagement at multiple timepoints as it relates to PTG from cancer.

Taken together, there is evidence that different cognitive processing strategies (as stratified by engagement/disengagement and involuntary/voluntary) may promote eventual PTG when implemented during different critical windows over the course of treatment. Failure to account for timing of measurement may explain inconsistencies in findings between existing studies. Future work should examine longitudinal trajectories of cognitive processing in relation to PTG to better elucidate what cognitive strategies are most beneficial at time of diagnosis as compared to later in treatment or survivorship.

Curvilinear Relationships.

Another dimension in which existing research falls short is in only testing for the presence of linear relationships between cognitive processing strategies and PTG. The presence of curvilinear relationships has only been proposed in one small scale (*N*=24) cross-sectional investigation of parents of children with cancer that was published after the initiation of this study (Beckmann et al., 2021), but otherwise remains unstudied in patients with cancer and caregivers. A larger body of evidence supports that the relationship between post-traumatic stress symptoms (PTSS) and PTG may be curvilinear rather than linear (Eisma et al., 2019; McCaslin et al., 2009; Shakespeare-Finch & Lurie-Beck, 2014). Interpreted in context, very low levels of distress may not produce enough disruption to prompt PTG and very high levels of distress may inhibit PTG. Thus, there may be a "sweet spot" of PTSS that enables maximum PTG without invoking maladjustment.

Logically, this pattern may extend to strategies for cognitive processing: Cognitive engagement is needed to do the work of consolidating narratives of growth, however constant involuntary and intrusive engagement may result in a level of distress and mental exhaustion that inhibits PTG. Similarly, some amount of disengagement may be necessary for self-preservation to downregulate distress, particularly in the context of cancer as a chronic rather than episodic traumatic stressor, but habitual disengagement may promote denial of difficulty rather than the acceptance and reintegration required for PTG. Beckmann et al. (2021) found direct support for curvilinear relationships between both involuntary engagement and disengagement with PTG in their preliminary sample of 24 parents surveyed 100 days after

their child's hematopoietic stem cell transplant, suggesting that involuntary engagement and disengagement may promote growth if used in moderation.

Initial evidence warrants larger, longitudinal investigations of curvilinear relationships between cognitive engagement/disengagement strategies and PTG in patients or caregivers coping with cancer. If the true nature of this relationship resembles the inverted-U shape described above (for an exemplar, see McCaslin et al., 2009), this may further explain why certain studies detect relationships between distress and/or negative dimensions of cognitive processing and PTG while others do not. Only one other study has tested for the presence of a curvilinear relationship between any type of cognitive engagement and PTG (Kleim & Ehlers, 2009). In a sample of 180 adult survivors of physical or sexual assault, Kleim and Ehlers (2009) administered questionnaires of PTG, rumination, PTSS, and depression six months following the assault. They tested for a quadratic effect of rumination predicting PTG and did not find evidence of a curvilinear effect. They did however find a significant curvilinear relationship between both PTSS and depressive symptoms and PTG. The consistent presence of curvilinear relationship between PTSS and PTG in samples of cancer patients and caregivers indicates that these relationships may exist for PTSS subscales of avoidance and intrusive thinking, two constructs that closely resemble the cognitive engagement/disengagement scales of disengagement and involuntary engagement. Future work should test whether curvilinear relationships better capture the association between these traditionally "maladaptive" cognitive processing strategies and PTG.

Regulatory Flexibility.

Examining curvilinear relationships will help ascertain whether there is a "just right" level of cognitive engagement and disengagement, but to further understand how cognitive engagement and disengagement work together in concert, we can look to the construct regulatory flexibility (Bonanno et al., 2011; Bonanno & Burton, 2013). Regulatory flexibility refers to one's ability to "flexibly deploy diverse types of coping behaviors in accord with the varying demands of different situations" seeing as the "effectiveness of individual coping behaviors is likely to vary across stressor situations" (Bonanno et al., 2011, p. 118). This may be particularly true in the case of pediatric cancer, as certain domains of difficulty (e.g., logistics of planning appointments) can be ameliorated through active engagement and problem solving, while other domains of difficulty (e.g., worries about how well treatment will work) are beyond one's scope of influence. Those with high regulatory flexibility have the context sensitivity to know when engagement begets helpful changes or insights and when it is likely to be an exercise in frustration, command a larger repertoire of strategies, and exercise the ability to monitor results and modify one's approach as needed (Bonanno & Burton, 2013). The regulatory flexibility composite differs from a simple average or sum score because it is created by combining variables and subtracting their polarity. The result is a score that cannot be elevated if a person is high on only one of the variables. In order to achieve a higher regulatory flexibility score, one must have relatively high scores for all variables in the composite.

Some research has examined regulatory flexibility as it relates to PTG in health populations. One study of individuals coping with spinal cord injuries found that engagement and disengagement coping efforts both predicted PTG but that a regulatory flexibility

composite score capturing one's ability to use both types of coping equally better predicted additional variance in PTG (Kunz et al., 2018). A sample of 122 adults admitted to a national spinal cord injury rehabilitation center completed the Brief COPE (Carver, 1997) at three months post-injury and completed the PTGI (Tedeschi & Calhoun, 1996) at rehabilitation discharge. A regulatory flexibility composite was created from the approach and avoidance factors of the Brief COPE. Kunz and colleagues concluded from these findings that flexibility in deploying different types of approach and avoidance coping responses may be more adaptive than the singular use of any one regulatory strategy.

In a longitudinal study of 198 survivors of breast cancer, Pat-Horenczyk et al. (2016) tested regulatory flexibility as a predictor of latent class membership characterized by various adaptive and maladaptive outcomes (i.e., PTG, depression, PTSS). They created a regulatory flexibility composite by combining the a) forward focus and b) trauma focus subscales of the Perceived Ability to Cope with Trauma (PACT) scale (Bonanno et al., 2011). Researchers determined that regulatory flexibility was associated with an increased likelihood of being in one of two high PTG classes and a decreased likelihood of being in the distressed latent class (Pat-Horenczyk et al., 2016). To replicate findings of previous research in other health populations with caregivers of children with cancer, regulatory flexibility (i.e., high use of both cognitive engagement and disengagement strategies) should be examined as it relates to PTG. This may clear up previous inconsistencies in research on cognitive engagement and disengagement strategies and further hold implications for how clinicians direct caregiver coping efforts to best promote PTG.

PTG in Context.

To more fully understand the construct of PTG, it is necessary to challenge assumptions about PTG measurement and its relationship to positive adjustment. PTG has obvious face validity as an adaptive outcome, however in noting the complex relationship between PTG and indicators of both positive and negative adjustment (Zoellner & Maercker, 2006), it has been suggested that there are multiple forms of PTG (Maercker & Zoellner, 2004; Sumalla et al., 2009). The Janus-Face Two Component Model of PTG presents two sides to this construct, one that is genuine and constructive (as presented by Tedeschi and Calhoun), and one that is illusory and maladaptive (Maercker & Zoellner, 2004). Rather than capturing the true presence of positive changes, illusory PTG captures positive illusions of change (i.e., positively distorted perceptions developed in response to the threat of trauma; Taylor, 1983) that function to repress difficulty when an individual in unable or unwilling to face their emotional pain. Illusory PTG then serves as a distraction from true distress, such as depressive and post-traumatic stress symptomology.

Some research in health populations supports the existence of illusory growth (Cheng et al., 2020; Pat-Horenczyk et al., 2015) while others do not find evidence for illusory growth (Kunz et al., 2018). However, each of the studies that have tested for the existence of multiple forms of PTG have used different methodologies to attempt the complicated task of operationalizing constructive vs. illusory growth, and much evidence that claims to demonstrate illusory growth is based on circular reasoning. Operating under the assumption that illusory PTG is bad for adjustment, authors conclude that if PTG is associated with constructs assumed to be negative, then PTG is illusory. One longitudinal study concluded that helpless-hopelessness coping was

associated with trajectories of illusory PTG, however they use this association as the basis of labeling the latent class in question as the "illusory trajectory" (Cheng et al., 2020). In contrast to the components of illusory growth and constructive growth, another empirical study suggests the presence of "struggling growth," a form of PTG characterized by high distress and high use of both adaptive and maladaptive coping styles (Pat-Horenczyk et al., 2016). This struggling growth group may capture the transitional phase between disruption and the emergence of constructive growth or, as Tedeschi and colleagues remind us (2007), we could alternatively cite this as evidence that true PTG can exist concurrently with distress.

Some of the previously used methods for parsing apart different components of PTG lack methodological precision; however, by better understanding how PTG relates to longitudinal changes in adjustment, we may parse apart different types of PTG. The relation of PTG to change in adjustment over time may help us capture the difference between constructive growth, that is thought to actively promote adjustment; illusory growth, that is thought to actively erode adjustment; or struggling growth, that may reflect growth as a positive construct that is orthogonal to adjustment Incorporating more traditional measures of adjustment alongside PTG may provide valuable context for interpreting findings of this complex and multifaceted construct.

Current Study

The current study takes a more nuanced look at PTG in the context of resilience for caregivers of children with cancer and how cognitive engagement and disengagement strategies promote PTG. Cognitive engagement and disengagement will be measured across five scales: primary engagement, secondary engagement, disengagement, involuntary

engagement, and involuntary disengagement. These scales can be organized into two categories; primary control engagement, secondary control engagement, and disengagement are all considered volitional coping responses, while involuntary engagement and involuntary disengagement are involuntary stress responses. With an emphasis on resolving previous discrepancies in the literature linking cognitive engagement and disengagement strategies to PTG in individuals coping with cancer, this current study proposes multiple sets of analyses that increase measurement precision (with regard to timing of cognitive engagement and disengagement strategies and the possibility of non-linear relationships with PTG) as well as provide depth of context (with regard to the relation of PTG to overall adjustment and the concurrent use of engagement and disengagement strategies).

Further, no work has examined these relationships separately for primary caregivers (PCs) and secondary caregivers (SCs). Considerable evidence describes that PCs and SCs take on distinct roles in cancer caregiving; PCs (most often mothers) are more likely to take on the brunt of managing the sick child's medical care, while SCs (most often fathers) are more likely to be tasked with ensuring financial security, parenting other siblings, and taking care of matters at home (McGrath, 2001; Nicholas et al., 2009, 2016). Most existing research focuses on the distinction between mothers and fathers rather than the distinction between PCs and SCs (Warmerdam et al., 2019); however, one study found that when fathers serve as PCs, their levels of distress and role strain are indistinguishable from that of mothers (Bonner et al., 2007), thus caregiver role may be a more meaningful distinction than caregiver gender. This divide in roles and responsibilities may have differential implications for caregiver distress and PTG. Given the potential differences in practical everyday engagement with a child's cancer

diagnosis, there may be differential implications in how cognitive engagement with cancer promotes eventual PTG among PCs and SCs. Therefore, this study examines all relationships separately for PCs and SCs to allow for the detection of distinct patterns based on caregiver role.

Through these improved methodological approaches, the current study improves upon the measurement precision and sensitivity that has limited previous research connecting cognitive engagement and disengagement strategies and PTG. Further, we offer more holistic consideration of these processes within the contexts of caregiver adjustment and caregiver role. Aims were designed to test conceptual models that provide competing explanations for what exactly PTG represents and how it develops. We hope that findings will advance our conceptual understanding of what PTG means to caregivers of children with cancer and inform best practice for promoting positive outcomes in the face of considerable challenge.

Aims

Aim 1, *Trajectories:* Aims 1-3 of the current study investigate the cognitive engagement strategies that underlie PTG. Specifically, Aim 1 will test how levels of cognitive engagement strategies over time predict caregivers' PTG at Time 12. The trajectories of scale scores for primary control engagement coping, secondary control engagement coping, disengagement coping, involuntary engagement, and involuntary disengagement will be examined as they relate to PTG at Time 12.

Hypothesis 1a: Higher volitional engagement coping scale scores (primary control and secondary control) and trajectories of increasing volitional engagement coping will predict higher PTG at Time 12. Higher cognitive engagement is consistently related to PTG in empirical

and conceptual models, so it is not expected that there will be differences in the relationship between volitional engagement and PTG at different points in treatment.

Hypothesis 1b: Disengagement and involuntary disengagement will not be related to PTG. Additionally, there will be no time by strategy interaction effect. Previous evidence is divided between characterizing disengagement as positively associated and unrelated to PTG. It is expected that no significant effects will be detected or that the size of associations will be very small because disengagement will only promote PTG when one also readily uses high engagement coping (tested as "regulatory flexibility" in Aim 3).

Hypothesis 1c: Higher involuntary engagement early in treatment and trajectories of decreasing involuntary engagement will be related to higher PTG. While high involuntary engagement directly following diagnosis may indicate a higher level of initial disruption that precedes more productive volitional cognitive processing, involuntary engagement that persists at high levels through Time 12 may indicate a global level of distress that is prohibitive of PTG.

Aim 2, Curvilinear Relationships: Analyses will assess for curvilinear relationships between theorized negative cognitive engagement strategies (i.e., disengagement, involuntary engagement, involuntary disengagement) and PTG, addressing the question of whether there is a "sweet spot" for promoting PTG. Extreme levels of disengagement and involuntary stress responses at either the low or the high end may be prohibitive of PTG, thus there may be a "sweet spot" in the middle that enables maximum PTG.

Hypothesis 2a: There will be curvilinear relationship between disengagement/involuntary engagement/involuntary disengagement and PTG resembling an inverted U-shape (i.e., very low/high disengagement/involuntary engagement/involuntary

disengagement are associated with lower PTG than individuals who report disengagement/involuntary engagement/involuntary disengagement).

Aim 3, *Flexibility:* The third aim of the current study is to describe how flexibility in the use of different volitional regulatory engagement and disengagement strategies predicts caregivers' PTG at Time 12. Regulatory flexibility composite scores will reflect higher scores for caregivers who use high levels of all three types of volitional coping or regulation strategies. The trajectory of flexibility scores in volitional engagement/disengagement (primary control engagement, secondary control engagement, and disengagement) will be examined as it predicts PTG at Time 12.

Hypothesis 3a: Higher flexibility in regulatory flexibility and increasing trajectories of regulatory flexibility will predict higher PTG at Time 12.

Aim 4, *PTG in Context:* The last aim the current study is to characterize the reports of PTG in our sample within the broader context of distress and resilience. This is a necessary final step before providing commentary on the meaning and implications of findings from Aims 1-3. Trajectories of more traditional indicators of adjustment (depressive and post-traumatic stress symptoms) over the first year of treatment will be examined as they relate to PTG at Time 12. This aim endeavors to address the Janus-Face Model of PTG. If PTG is related to trajectories of prolonged high and/or increasing distress, this could lend support to the presence of illusory growth. If PTG is related to trajectories of low and/or decreasing distress, this would lend support to the presence of constructive growth that parallels positive global adjustment. If PTG is unrelated to trajectories of distress and levels of distress at Time 12, this would lend support to the idea of PTG as an orthogonal construct to global adjustment.

Hypothesis 4a: Higher initial distress and trajectories of decreasing distress will be related to higher PTG, thus supporting the hypothesis that PTG captured in our sample is constructive growth that parallels other indicators of positive global adjustment.

Method

Overview

The current study is part of a larger longitudinal study of family adjustment to childhood cancer (*N* = 143 families). Primary and secondary caregivers of children newly diagnosed with cancer were invited to provide report on their use of various cognitive engagement strategies at 1-, 6-, and 12-months post-diagnosis (Time 1, 6, 12). Additionally, caregivers reported on their PTG at 12-months post-diagnosis (Time 12). Data were collected between the years of 2010 and 2014.

Participants

The present sample consists of 143 families with either PC or SC self-report at any of the three timepoints. Of these 143 families, 139 have PC report at Time 1, 89 have SC report, and 85 have both caregiver reports. Children were diagnosed with cancer between the ages of 2 and 17 (*M* = 6.35, *SD* = 3.67 years); they were half male (48% male) and mostly White (86% White). Cancer diagnoses included leukemia (37%), CNS malignancies (23%), lymphoma (11%), sarcomas (10%), Wilms tumor (9%), neuroblastoma (4%), and other (5%). Most families identified mothers as the PC (87%), with some identifying fathers (11%), or other adults (2%), like grandparents. PCs were on mean aged 36.32 years old (SD = 7.96), and most were white (90%), married (79%), and had completed some post-secondary education (70%). SCs (78% fathers, 8% mothers, 14% other adults) were on average 37.64 years old (*SD* = 8.41), and most

were white (88%) and had completed some post-secondary education (64%). Family incomes were widely distributed, with the median family income between $60,000 and $69,000. Families had anywhere from one to four children (including child with cancer), with an average of 2.35 (*SD* = 0.91) children per family. Approximately 1.7% of families reported an annual family income less than $10,000, 13.0% reported $10,000 – $19,000, 8.7% reported $20,000 – $29,000, 9.6% reported $30,000 – $39,000, 7.8% reported $40,000 –$49,000, 5.2% reported $50,000 – $59,000, 7.8% reported $60,000 – $69,000, 5.2% reported $70,000 – $79,000, 7.8% reported $80,000 – $89,000, 7.0% reported $90,000 – $99,000, 19.1% reported $100,00 – $149,000, 4.3% reported $150,000 – $199,000, and 2.6% reported earning greater than $200,000 per year.

Participation varied by timepoint. Of the 139 PCs and 89 SCs who participated at Time 1, 109 PCs (78.4%) and 70 SCs (78.6%) participated at Time 6, and 84 PCs (60.4%) and 51 SCs (57.3%) participated at Time 12. Caregivers who participated at Time 12 were compared to those who did not complete on a number of demographic and illness characteristics (child age, child gender, caregiver age, race/ethnicity, family income, Intensity of Treatment Ratings, caregiver relationship to child, caregiver relationship status) and it was found that PC completers were slightly more likely to have a child with sarcoma or Wilms tumor, X^2 (6, 143) = 12.84, p = .05, and to have completed more years of education, M = 14.80, SD = 2.50; M = 13.96, SD = 2.16), t (135) = 2.04, p = .04. SC completers were more likely to have a female child, X^2 (1, 143) = 11.27 p =.001.

Procedures

Families were contacted as part of a larger study conducted at two major children's hospitals in the U.S., one in the south and one in the Pacific Northwest. All procedures were approved by both hospitals' Institutional Review Boards. Families were considered eligible if they were English-speaking and the child had no history of developmental delay. Participants with NF1 or relapse/secondary malignancy diagnoses were excluded. Families self-identified the child's PC and SC. PCs and SCs were defined as the two adults most involved with the child's daily care, were required to be the same individuals who served as PC/SC for the child prior to diagnosis, and must have been caregivers for $\geq$2 years to ensure they had a consistent relationship of with the child and could serve as accurate reporters of the changes, or lack thereof, that their family was experiencing. Of the 502 families eligible for participation across both sites, 309 were approached, 176 provided informed consent, and 159 completed at least one study component. Primary reasons that eligible families were not approached included: (a) physician did not consent to approach because they child was too ill or overwhelmed or physician did not respond (40%); (b) families were recruited by a competing study (37%); and (c) there was difficulty completing the two-step approach process required by the IRB within the study window (14%). Of the families approached who did not enroll, common reasons for refusal were either excessive time required (29%) or no reason was given (71%).

Measures

Demographics. PCs completed a questionnaire that assesses background information about the child diagnosed with cancer (age, gender, race/ethnicity) and each caregiver (age, gender, race/ethnicity, level of education). Additionally, primary caregivers reported on family-

level information (marital status, family income). Demographic data was utilized to characterize the sample for the current study and perform attrition analyses. Additionally, certain demographic variables were tested as covariates in analyses.

Post-Traumatic Growth. The Post Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) was used to capture caregivers' ratings of their own PTG in response to their child's cancer and treatment. Primary and Secondary Caregivers completed this measure 12 months after their child's initial diagnosis. This 21-item self-report scale measures positive outcomes with regards to new possibilities (e.g., "New opportunities are available which wouldn't have been otherwise"), personal strength (e.g., "I discovered that I'm stronger than I thought I was"), relating to others (e.g., "I have a greater sense of closeness with others"), spiritual change (e.g., "I have a better understanding of spiritual matters"), and appreciation of life (e.g., "I changed my priorities about what is important in life"). Items are rated 0 ("I did not experience this change as a result of my child's cancer and treatment") to 5 ("I experienced this change to a very great degree as a result of my child's cancer and treatment"), thus the possible range for this measure is 0-105.The PTGI yields a Total PTG score, which is calculated as the sum of all items. This measure shows good internal consistency, with a Cronbach's alpha of .90. Test-retest reliability over a two month period had a correlation coefficient of .71 (Tedeschi & Calhoun, 1996).

Cognitive Engagement and Disengagement. The Response to Stress Questionnaire (RSQ; Connor-Smith et al., 2000) was used to measure caregivers' coping styles and involuntary stress responses with respect to their children's cancer diagnosis and treatment. Both caregivers completed the RSQ at Time 1, 6, & 12. The RSQ includes a list of 11 stressors that pertain to

having a child with cancer (e.g., “Not knowing if my child’s cancer will get better”, “Needing more help and support from family and friends”), which primary and secondary caregivers rated in terms of how stressful each item had been in the recent past, and 57 items that assess caregivers’ voluntary and involuntary responses to cancer-related stress. These 57 response to stress items comprise 19 subscales which are combined into 5 broadband factors. These factor scales include three volitional coping factors: Primary control Engagement, Secondary Control Engagement, and Disengagement as well as two broadband involuntary stress response factors: Involuntary Engagement and Involuntary Disengagement.

Primary control engagement is comprised of problem solving (“e.g., I try to think of different ways to change or fix the situation”), emotion regulation (e.g., “I do something to calm myself down when I’m dealing with the stress of having a child with cancer [take deep breaths, listen to music, pray, take a break, walk, meditate, none of these]”), and emotional expression (e.g., “I get sympathy, understanding, or support from someone [partner, children, parent, friend, nurse, physician, sibling, therapist, clergy member, none of these]]. Secondary control engagement is comprised of acceptance (e.g., “I realize that I just have to live with things the way they are”), cognitive reappraisal (e.g., “I tell myself things could be worse”), distraction (e.g., f“I imagine something really fun or exciting happening in my life”), and positive thinking (e.g., “I tell myself that I can get through this or that I will be okay”). Disengagement is comprised of denial (e.g., When I’m around other people, I act like my child’s cancer never happened”), avoidance (e.g., “I try to stay away from people and things that make me feel upset or remind me of the stressful parts of having a child with cancer”), and wishful thinking

(e.g., I deal with my child's cancer by wishing it would go away, that everything would work itself out").

Involuntary engagement is comprised of rumination (e.g., "When stressful parts about having a child with cancer come up, I can't stop thinking about how I am feeling), intrusive thinking (e.g., "When I am trying to sleep, I can't stop thinking about the stressful aspects of having a child with cancer or I have bad dreams about my child's cancer"), emotional arousal (e.g., "When something stressful happens related to my child having cancer, I get upset by things that don't usually bother me), physiologic arousal "When I am dealing with the stress of having a child with cancer, I feel it in my body [my heart races, I feel hot or sweaty, my breathing speeds up, my muscles get tight, none of these]), and impulsive action (e.g., "When I am dealing with the stress of having a child with cancer, sometimes I can't control what I do or say"). Involuntary disengagement is comprised of cognitive interference (e.g., "My mind goes blank when something stressful happens related to my child having cancer, I can't think at all"), involuntary avoidance (e.g., "I just have to get away when I am dealing with the stress of having a child with cancer, I can't stop myself"), inaction (e.g., "I just freeze when I am dealing with the stressful parts of having a child with cancer, I can't do anything", and emotional numbing (e.g., "When I think about stressful parts of having a child with cancer, I don't feel anything at all, it's like I have no feelings").

Items are rated on a scale of 1 ("Not at all") to 4 ("A lot"). The internal reliability for each of the scales was calculated in the current sample and judged to be adequate (Cronbach's alpha = .62-.80). Prorated scale scores for each of the 19 subscales were calculated to account for

missing data by multiplying the mean of valid items by the total possible items for each scale. Prorated factor scores are computed based on the number of valid scales.

Depressive Symptoms. The Center for Epidemiological Studies-Depression Scale (CES-D-10; Andresen et al., 2004) was used to assess caregiver depressive symptoms. This 10-item short form self-report measure demonstrated good predictive accuracy when compared to the original 20-item CES-D (Andresen et al., 2004; Radloff, 1977). Caregivers are asked to rate the frequency of each symptom within the past month, (e.g., "I felt that everything I did was an effort", "I had trouble keeping my mind on what I was doing"), from 0 (less than 1 day per week) to 3 (5-7 days per week). A total score is calculated as a sum of the 10 items. This measure shows a high internal consistency with a Cronbach's alpha of .85, and test-retest reliability ranges from .51 to .59 for a 2-8 week interval (Radloff, 1977).

Post-Traumatic Stress Symptoms. The Impact of Events Scale—Revised (IES-R; Weiss & Marmar, 1995) is a 22-item caregiver-report measure that assessed three domains of traumatic stress symptoms secondary to their child's cancer diagnosis and treatment. All items were rated on a 5-point scale ranging from 0 ("Not at all") to 4 ("Extremely"), with higher scores indicating a higher level of distress. The IES-R yields three subscales (Intrusion, e.g., "Pictures about my child's illness or treatment popped into my mind"; Avoidance, e.g., "I stayed away from reminders of my child's illness"; Hyperarousal, e.g., "I was jumpy and easily startled"), which map on to the three DSM-IV PTSD criteria. In addition to the three subscales, responses to each item were also summed to form an overall score of distress. The three subscales show a high degree of intercorrelation (r= .52 to .87). Each subscale also shows high levels of internal

consistency, with Cronbach's alpha levels of .79 to .94. Test-retest reliability over a 6-month interval ranged from .89 to .94.

Data Analytic Strategy

Descriptive characteristics, attrition analyses, and correlations were conducted in SPSS Version 27. Before addressing the primary aims of our study, we first modeled the trajectory and variability each cognitive engagement/disengagement scale, regulatory flexibility scores, depressive and post-traumatic stress symptoms. We estimated growth curve models with a Multilevel Modeling (MLM) approach using the Maximum Likelihood estimator in SPSS 27.0. Multilevel models are appropriate for examining non-independent data (e.g., repeated measures), and can be used to model both within-family trajectories of cognitive engagement over time as well as between-family differences in trajectories of cognitive engagement. Because MLM can sensitively accommodate missing data by estimating trajectories from variable numbers of observations per family, families were included in the models if they had any data on cognitive engagement or PTG.

For each variable, we estimated a series of four models that combine progressive combinations of fixed and random effects. Time was coded -2, -1, 0, corresponding the timepoints Time 1, 6, and 12, such that the intercept represents the variable at Time 12. As more effects are added in each subsequent model, improvement in model fit was measured via -2LL differences. Fixed effects are held constant for all families in the sample, while random effects examine whether there are between-family differences in the intercept and how each variable over time. If the addition of random effects significantly improved model fit, this

indicated that sufficient variance exists between families to use these trajectories as indicators of PTG at Time 12. The specific parameters of four progressive models are detailed below:

The first model is an unconditional linear growth model and estimates only a fixed effect for intercept, resulting in a grand mean for the sample. The second model estimates two fixed effects: an intercept parameter as well as a linear time parameter representing the variable's rate of linear change over time and the direction of such change (i.e., increase or decrease over the first year of treatment). The third model builds on the fixed effects but includes a random effect for intercept, representing between-family variability in the variable of interest at Time 12. Finally, the fourth model includes a random effect for time as well as intercept that variability in the variable of interest's linear rate of change.

Aim 1, *Trajectories*: After estimating growth models for primary and secondary caregiver cognitive engagement and disengagement strategies, each of these were entered into separate models with the corresponding caregiver's PTG total score. Due to the structure of the data and the modeling of time with the intercept at Time 12, PTG was entered as the predictor of the trajectory of cognitive engagement. This is technically the inverse of how the data will be interpreted (i.e., cognitive engagement/disengagement predicting PTG), however this is best practice for modeling the relationship between a longitudinal predictor and a cross-sectional outcome. Together this amounted to 5 models being tested for each caregiver; each of the 5 scale score factors (primary control engagement, secondary control engagement, disengagement, involuntary engagement, involuntary disengagement) was tested separately for primary and secondary caregivers respectively. Each model tested a single scale score factor

as the outcome and included the corresponding caregiver's PTG and PTG*time interaction terms as predictors.

Aim 2, *Curvilinear Relationships*: Analyses testing for the presence of curvilinear relationships between theorized negative cognitive strategies (disengagement, involuntary engagement, involuntary disengagement) and PTG used grand mean variables as predictors of PTG. These terms collapsed scores from each of the three timepoints into a single score for each caregiver representing their personal mean over the year. Multiple regression models tested disengagement/involuntary engagement/involuntary disengagement grand mean variables along with corresponding quadratic terms as predictors of PTG. Each of the negative cognitive strategies were tested in separate regression models, amounting to three models tested for each caregiver. Any significant quadratic effects were interpreted through graphing the data.

Aim 3, *Regulatory Flexibility*: This aim first required the computation of regulatory flexibility composite scores. Flexibility scores capture the degree to which one can utilize two disparate types of coping or regulation, with higher scores representing higher use of both types. In accordance with the procedures laid out by Bonanno et al. (2011), flexibility scores are computed by first summing the standardized scores for scale1 and scale2. Then the polarity of the two standardized scored (absolute average of scale1 minus absolute average of scale2) is subtracted from the standardized sum. Rather than simply using the sum of the two scales (wherein it would be possibly to achieve a fairly high value if only one type of coping is high) this procedure ensures that values on both scales are high (Bonanno et al., 2011). One flexibility score was computed for each caregiver at each timepoint capturing flexibility in volitional

coping (flexibility in primary control engagement/secondary control engagement/disengagement). This flexibility in volitional coping scale required summing all three scales (multiplied by a factor of two) and then subtracting of the absolute difference of each combination of variables (i.e., primary control engagement-secondary control engagement, primary control engagement-disengagement, secondary control engagement-disengagement). To illustrate this procedure, consider two participants: one with Z-scores of 1, 1, 1 and one with Z-scores of 2, 2, -1. Each would have identical sum scores of 3, but the first participant would have a regulatory flexibility score of 6 (2*3-0-0-0 = 6) while the second participant would have a regulatory flexibility score of 0 (2*3-0-3-3 = 0).

Following this procedure, linear growth models were estimated for the two flexibility scores for each caregiver in a manner identical to the procedures described above. Then each of these were entered into separate models with the corresponding caregiver's PTG total score. This process paralleled that of Aims 1 and 3, amounting to 2 models being tested for each caregiver. Flexibility in engagement/disengagement (volitional coping) was tested separately for primary and secondary caregivers. Again, due to our data structure, each model tested a single flexibility score factor as the outcome and include the corresponding caregiver's PTG and PTG*time interaction terms as predictors. Data is interpreted with flexibility as the predictor and PTG as the outcome.

Aim 4, *PTG in Context*: After estimating growth models for depressive and post-traumatic stress symptoms for primary and secondary caregivers, each of these variables was entered into separate models with the corresponding caregiver's PTG total score. Due to the structure of the data and the modeling of time with the intercept at Time 12, PTG was entered

as the predictor of the trajectory of adjustment. Together this amounts to two models being tested for each caregiver; each of the two adjustment variables will be tested separately for primary and secondary caregivers. Each model will test a factor as the outcome and include the corresponding caregiver's PTG and PTG*time interaction terms as predictors.

Covariates: All analyses were first run with the inclusion of the covariates of child age, diagnosis group, and intensity of treatment ratings (Kazak et al., 2012). These covariates did not produce significant effects in any of the models, nor did they create any substantial differences in the patterns of the results. Subsequently, the decision was made to remove covariates from the final models in the interest of model parsimony and preserving power for testing hypothesized effects.

Criterion of Significance: Overall between our four aims, 11 models were tested for each caregiver. While this sounds like a large number of models, this number encompasses three families of complementary hypotheses for how cognitive engagement strategies underlie the formation of PTG and a second set of analyses to interpret findings in the grander picture of resilience for caregivers. It is intended that findings from each aim may deepen the interpretation of the findings from the other three, balancing the potential for error from multiple comparisons. Research is limited in this area and increasingly, researchers have cautioned against defaulting to correcting for multiple comparisons (Rubin, 2021), particularly in pediatric populations where sample sizes and therefore power is often limited. Therefore, to preserve power for detecting effects in our current sample, the criterion for significance will be set at $p = .05$ for each analysis.

Results

At Time 12, PCs reported an average PTG score of 60.99 (*SD* = 23.06, Range = 18-103) and SCs reported an average score of 57.67 (*SD* = 28.34, Range = 0-105; see Table 1 for full list of descriptive characteristics of study variables). Tables 2 and 3 present comprehensive correlation matrices for all PC and all SC variables, respectively.

Growth Models

Before addressing the primary aims of this study, the average trajectory and variability of all longitudinal variables (cognitive engagement and disengagement strategies, adjustment, and regulatory flexibility) were modeled (Tables 4-7). Growth models for cognitive engagement and disengagement strategies are presented for PCs in Table 4 and SCs in Table 5 (final models bolded). For each variable, Model 3 was determined to be the best fit; this includes fixed effects of intercept and slope as well as a random effect of intercept. Including a random effect for slope, however, did not improve model fit. Interpreted in the context of PC primary control engagement, the final model suggests that the average value of primary control engagement at Time 12 was 21.37, that primary control engagement decreased 2.71 points on average between each timepoint, and while there was significant variability between families in primary control engagement at Time 12, there was not significant variability in the rate of change in primary control engagement over time.

Interestingly, PCs reported systematic decreases in all cognitive engagement and disengagement strategies over time (fixed effects of time), while SCs only reported decreases in primary control engagement and involuntary disengagement over time. For other variables, such as SC secondary control engagement, even though model three was the best fit for the

data, there was no fixed effect of time. This means that there was neither systematic change in secondary control engagement (linear increases or decreases) over time nor was there significant variability in the rate of change in SC secondary control engagement over time. Trends in SC secondary control engagement, disengagement, and involuntary disengagement were more stable over time, however there was still significant between-family variability in these variables at Time 12.

Growth models for PC and SC adjustment were also best captured by Model 3 (Table 6). All models showed that while there was significant variability in PC and SC depressive and post-traumatic stress symptoms between families at Time 12, depressive and post-traumatic stress symptoms decreased systematically over time. There was not significant between-family variability in the average rate of change in depressive or post-traumatic stress symptoms over time for either PCs or SCs.

Finally, growth models for PC and SC regulatory flexibility were also best captured by Model 3 (Table 7). There was significant variability between families in their level of regulatory flexibility at Time 12. Neither PCs nor SCs reported systematic changes in regulatory flexibility over time, and there was not significant between-family variability in the average rate of change in flexibility over time for either PCs or SCs.

Aim 1: Trajectories

Aim 1 examined associations between the trajectories of cognitive engagement and disengagement strategies and PTG at Time 12. Results are presented in Table 8. Five models (one for each of the cognitive engagement/disengagement strategies) were run for each caregiver, thus 10 total models were run for Aim 1.

Hypothesis 1a: Volitional Engagement Strategies. For PCs, primary control engagement was the only volitional engagement strategy that was associated with PTG. There was a significant main effect of PTG as well as a significant PTG*time interaction effect such that on average PCs who reported higher primary control engagement had higher PTG and additionally, trajectories of sustained higher primary control engagement were associated with higher PTG (Figure 2). Primary control engagement decreased on average over time, but PCs who decreased only marginally in primary control engagement reported higher PTG. PC secondary control engagement was not significantly related to PTG, however there was a positive association that approached significance (p = 0.092). For SCs, both primary control and secondary control engagement were both associated with PTG. Higher SC primary and secondary control engagement were both associated with higher PTG, however no time interaction effects were observed.

The hypothesis that higher volitional engagement coping scale scores (primary control and secondary control) and trajectories of increasing volitional engagement coping would predict higher PTG at Time 12 was partially supported. All significant associations were in the expected direction (i.e., volitional engagement promoting PTG), however secondary control was only marginally associated with PTG in PCs. Additionally, only one of four time interaction effects were detected. The interaction matched the hypothesized nature of the interaction in that higher sustained primary control engagement was associated with higher PTG.

Hypothesis 1b: Disengagement and involuntary disengagement. For PCs, neither disengagement nor involuntary disengagement were related to PTG, thus the hypothesized null associations were supported. No time interaction effects were detected. For SCs, there was no

main effect of disengagement, however there was a marginally significant time interaction effect (p = .068) such that SCs who had trajectories of increasing (rather than decreasing or stable) disengagement over time were more likely to report higher PTG (Figure 3). For SC involuntary disengagement, there was a significant main effect such that higher involuntary disengagement was associated with higher PTG. Additionally, the time interaction effect approached significance (p = .075). Mirroring the finding with SC disengagement, SCs who had trajectories of increasing (rather than decreasing or stable) involuntary disengagement were more likely to report higher PTG (Figure 4). It was hypothesized that disengagement/involuntary disengagement would be unrelated to PTG, thus the presence of significant and marginally significant effects for SCs determined that Hypothesis 1b was not supported for SCs.

Hypothesis 1c: Involuntary engagement. For PCs, involuntary engagement was not associated with PTG, and no time interaction was observed. For SCs, higher involuntary engagement was associated with higher PTG. No time interaction effect was observed. It was expected that higher initial involuntary engagement but trajectories of decreasing engagement would be associated with higher PTG, however contrary to expectations, overall higher involuntary engagement was associated with higher PTG in SCs at Time 12. Thus, Hypothesis 1c was not supported for either PCs or SCs.

Aim 2, Curvilinear Relationships

Aim 2 assessed for the presence of curvilinear relationships between theorized negative cognitive engagement strategies (i.e., disengagement, involuntary engagement, involuntary disengagement) and PTG, addressing the question of whether there is a "sweet spot" for

promoting PTG. As a reminder, analyses for this particular aim utilize data from every timepoint but are not longitudinal in nature. Analyses utilize individual caregivers' grand means for each theorized "maladaptive" engagement/disengagement variable, which is an average of their three reports of each variable across the first year of their child's cancer treatment. Results are presented in Table 9. Three models (one for each of the theorized "negative" cognitive engagement/disengagement strategies) were run for each caregiver, thus six total models were run for Aim 2.

Hypothesis 2a: It was hypothesized that the relationship between a person's own average disengagement/involuntary engagement/involuntary disengagement across the three timepoints and PTG at Time 12 would resemble an inverted U-shape (i.e., very low/high disengagement/involuntary engagement/involuntary disengagement are associated with lower PTG than individuals who report average levels of disengagement/involuntary engagement/involuntary disengagement). This relationship was detected for SC disengagement predicting SC PTG (Table 9). There was not a significant main effect of disengagement on PTG, however there was a significant quadratic effect such that PTG was highest in individuals who reported moderate levels of disengagement and lowest in those who reported extreme high or low disengagement (see Figure 5). The relationship between SC disengagement and PTG aligned with expectations, however no other significant quadratic effects were detected, thus the hypothesis was only partially supported. Specifically, PCs average levels of disengagement/involuntary engagement/involuntary disengagement across the three timepoints were not associated with PTG at Time 12. For SCs, there was a significant main effect of higher involuntary engagement associated with higher SC PTG, however involuntary

disengagement was not associated with PTG. The relationship between SC disengagement and PTG aligned with expectations, however no other significant quadratic effects were detected. Only one of 6 models aligned with expectations, thus the hypothesis was only partially supported.

Aim 3, Regulatory Flexibility:

Aim 3 of the current study examined trajectories of regulatory flexibility in relation to PTG at Time 12. Regulatory flexibility composite scores reflect higher scores for caregivers who use high levels of all three types of volitional engagement strategies (primary control engagement, secondary control engagement, and disengagement). Results are presented in Table 7. One model was run for each caregiver, thus 2 models were run for Aim 3.

Hypothesis 3a: Significant main effects showed that higher regulatory flexibility in both PCs and SCs over the course of the first year after diagnosis was associated with higher PTG at Time 12 (Table 10). Additionally, for SCs, a significant time interaction effect was detected such that trajectories of increasing flexibility predicted higher PTG (Figure 6). All associations and interaction effects were in the expected directions however Hypothesis 3a was only partially supported, as no significant time interaction effect was detected for PCs.

Aim 4, *PTG in Context:*

The last aim the current study was to characterize the reports of PTG in our sample within the broader context of caregiver distress and adjustment. Trajectories of depressive and post-traumatic stress symptoms over the first year of treatment were examined as they relate to PTG at Time 12. Results are presented in Table 11. Two models (1. depressive symptoms, 2.

post-traumatic stress symptoms) were run for each caregiver, thus four total models were run for Aim 4.

Hypothesis 4a: For PCs, both depressive and post-traumatic stress symptoms were unrelated to PC PTG. For SCs, depressive symptoms were not related to SC PTG, however higher post-traumatic stress symptoms were associated with higher PTG. No time interaction effects were detected in any of the models. Significant main effects of time suggest that depressive and post-traumatic stress symptoms decreased over time consistently for all PCs and SCs. The hypothesis was only partially supported, as only SC post-traumatic stress was related to higher PTG, however this relationship was in the expected direction in that higher symptoms were related to higher PTG. Symptoms decreased over time, but not differentially for those with higher PTG.

Discussion

After a child is diagnosed with cancer, there can be many negative outcomes for patients and families, and at the same time, they also consistently report domains of positive growth. Cognitive engagement with difficulty is consistently implicated in conceptual models of PTG following traumatic experiences, however the literature is both conceptually and empirically fraught. PTG has demonstrated associations with both salutary and iatrogenic cognitive processes (Maercker & Zoellner, 2004; Sumalla et al., 2009; Zoellner & Maercker, 2006); contradictory processes of engagement and disengagement have both been tied to PTG (Joseph et al., 2012); and individual cognitive engagement and disengagement strategies are frequently identified as being good, bad, and unrelated to PTG in separate investigations. No research has adequately disentangled these complex associations between cognitive

engagement and disengagement strategies and PTG to better explain the inconsistencies within the research base. A careful review of the literature and factors that stratify contradictory studies led to four distinct aims within the current study. These aims are not so much competing, but rather intended to be complementary in collectively shedding light upon the true nature of these relationships. Together, they examined the relationship between cognitive engagement and disengagement and PTG with respect to 1) longitudinal trajectories, 2) curvilinear relationships, and 3) a metric for examining concurrent use of engagement and disengagement called regulatory flexibility. We further situated these relationships within the broader context of caregiver adjustment by 4) examining relationships to measures of distress. We will now discuss findings collapsed across aims (and preliminary growth models) as they shed light on the relation between individual cognitive engagement and disengagement strategies and PTG before commenting on broader patterns and implications.

Primary Control Engagement

Of all cognitive engagement and disengagement strategies examined, primary control engagement was the only strategy that was positively associated with PTG in both PCs and SCs. Linear growth models demonstrated that both SCs and PCs reported lower use of primary control engagement at Time 12 relative to diagnosis. However, further underlining the salience of the relationship between primary control engagement and PTG, a time interaction effect among PCs showed that when PCs continued to use high primary control engagement, they reported higher PTG. Changes in SCs use of primary control engagement over time did not affect PTG. Taken together, these data suggest that primary control engagement may be the

single most important cognitive engagement strategy for promoting the development of PTG among caregivers of children with cancer, particularly PCs.

Primary control engagement describes active strategies taken to change the stressor or one's emotional response. These strategies include problem solving skills, emotion regulation skills, and seeking outlets for expressing emotions and receiving support (Connor-Smith et al., 2000). Findings contradict null associations between primary engagement and PTG seen in Beckmann et al. (2021), however these findings are to be interpreted with caution due to the small sample size (*N*=24). Findings are consistent with previous studies that find active, approach-oriented coping strategies broadly are predictive of PTG (Danhauer et al., 2013; Turner-Sack et al., 2012) as well as more specific findings that problem solving (Markman et al., 2020; Widows et al., 2005), emotion regulation (Darabos et al., 2021; Pat-Horenczyk et al., 2015), and emotional expression (Boyle et al., 2017; Cohen & Numa, 2011; Yeung et al., 2016) are also positively related to PTG.

Further, associations with PTG are unsurprising, as primary control engagement reflects not only the active engagement with difficult aspects of cancer and treatment needed to create narratives of growth, but also one's own sense of agency—the belief that one has the power to determine their experience and story, including why and how these circumstances came to be and what they will do about it now. Both problem-focused and emotion-focused strategies that utilize active engagement with the difficult aspects of cancer and treatment can jumpstart this necessary processing (Cordova, 2008; Stanton et al., 2006). For example, processing complex emotions around difficult care decisions, talking about these emotions with others, and using

these experiences to take action in making informed choices may be likely to promote PTG in the domains of discovering new personal strength as well as relating to others.

Secondary Control Engagement

Secondary control engagement was also associated with PTG; however, results were less robust than seen with primary control engagement. SCs who used higher secondary control engagement reported higher PTG, however this effect was only marginally significant among PCs. PCs reported using less secondary control engagement at one year than they did at diagnosis, however, changes in the levels of secondary control engagement used over time did not affect PTG at one year in either PCs or SCs.

In contrast to primary control coping strategies, which focuses on making active changes, secondary control engagement encompasses different techniques for adapting to the stressor. These include exercising acceptance, learning to reframe thoughts or think more positively, and engaging in time-limited distraction (Connor-Smith et al., 2000). Previous research among patients and caregivers coping with cancer has also emphasized the importance of secondary control strategies, particularly highlighting positive associations between cognitive reappraisal and positive thinking (Cao et al., 2018; Markman et al., 2020; Schroevers et al., 2011; Scrignaro et al., 2011; Strack et al., 2010) and PTG. With acceptance and distraction, some find positive relationships (Schroevers et al., 2011; Schulz & Mohamed, 2004; Scrignaro et al., 2011), however others find no associations (Schroevers et al., 2011; Scrignaro et al., 2011). Further, associations between secondary control engagement and PTG are unsurprising given that there may be a small amount of conflation in the measurement of these two constructs at the item-level. Certain items on the cognitive reappraisal subscale of the

Responses to Stress Questionnaire (e.g., "I think about things I am learning from having a child with cancer, or something good that will come from it"), directly pull for the same positive changes described in the Post-Traumatic Growth Inventory.

It has been suggested that secondary control engagement strategies may be particularly important in the context of coping with cancer (Compas et al., 2014, 2015) because of the uncontrollable nature of many of the stressful aspects of a child's cancer (Rodriguez et al., 2012). While certain aspects of cancer and treatment are within caregivers' control, realities of the actual course of the disease and how it responds to treatment exist fully beyond their scope of influence. Thus the wisdom and acceptance of knowing when one must change their response to the situation rather than push repeatedly to change the situation itself, may be critical for preserving the posture of hope, flexibility, and agency reflected in PTG. Conceivably, as one adjusts and adapts to new realities, this may open the door for new perspectives or priorities, creating PTG in the form of recognizing new possibilities or appreciation of life.

We were surprised to discover that the relationship between secondary control engagement and PTG was more salient among SCs than PCs, however it is possible that this reflects a difference in roles between PCs and SCs. As stated previously, caregivers often take complementary roles in caregiving with the influx of new tasks and responsibilities stemming from the cancer diagnosis (McGrath, 2001; Nicholas et al., 2009, 2016; Reay et al., 1998). With PCs typically delegating other responsibilities to primarily manage the sick child's care, it makes sense that they have more proactive roles with regard to cancer and treatment that are consistent with the active problem solving and emotional processing seen in primary control engagement. Conversely, for SCs who may be less on the frontlines of cancer care, secondary

control strategies of adapting to new realities may be more important. Thus, the content and context of the caregiver's role, be it at home or the hospital, may determine what engagement strategies are the most conducive to promoting PTG.

Disengagement

The relationship between disengagement and PTG was more complex than the relationship between volitional, constructive engagement and PTG. Overall, caregivers' use of disengagement did not predict their PTG at one year. PCs reported average decreases in disengagement over time, however SCs were fairly consistent in their use of disengagement across the year. We found that SCs who reported very low or very high disengagement had low PTG, and SCs who reported moderate levels of disengagement had the highest PTG. Additionally, for SCs, a time interaction effect approached significance such that SCs who reported increases in their disengagement over the year reported higher PTG. Taken together, there is no evidence that PC use of disengagement affected their PTG, but findings suggest that disengagement may be more impactful for PTG in SCs.

As a measure, the disengagement scale assesses caregiver use of strategies to deny or avoid thinking about the stressful aspects of their child's cancer as well as wishful thinking that these stressful aspects might just go away or work themselves out (Connor-Smith et al., 2000). Disengagement as measured by the RSQ is theorized to be a maladaptive cognitive strategy and has previously been linked to other negative outcomes in caregivers of children with cancer such as depressive symptoms (Compas et al., 2015). However, prior research is divided in identifying positive (Beckmann et al., 2021; Klosky et al., 2014; Liu et al., 2018; Widows et al., 2005; Wilson et al., 2014; Yonemoto et al., 2012) and null (Carboon et al., 2005; Chan et al.,

2011; M. J. Cordova et al., 2007; Ho et al., 2004) relationships between disengagement and PTG.

It was surprising that increases in disengagement for SCs was marginally associated with higher PTG (however overall levels were not related to PTG). We are cautious to over-interpret findings that did not fully reach the criterion of significance, however, this may suggest that disengagement at different times in treatment is differentially beneficial for promoting PTG. Perhaps SCs who disengage early in treatment may not interact with their child's cancer and treatment enough to grow from the experience, whereas SCs who are initially more engaged but balance out engagement with a healthy amount of disengagement further out in time from diagnosis are the ones best poised to grow from experiences. Gradually moving away from a state of hypervigilant engagement may even preserve their ability to stay present through the ongoing stress cancer places on the family. A review of denial in medical rehabilitation populations characterizes the construct as a multidimensional strategy that has both adaptive and maladaptive components and may interact with time (Kortte & Wegener, 2004). Authors explain that for certain illnesses, denial or disengagement early in diagnosis may be particularly maladaptive in that it may preclude necessary intervention and treatment, however it is possible that after treatment has started, disengagement strategies "aimed at positive reinterpretation and/or reconceptualization of the illness have been found to have adaptive effects" (Kortte & Wegener, 2004, p. 194). Avoiding realities of illness may preserve positive or hopeful illusions (Taylor, 1983) that, while inaccurate, have a positive impact of mental health over time by protecting individuals from becoming overwhelmed. Interestingly, research among survivors of childhood cancer suggests the inverse pattern, that disengagement might be

adaptive in the acute phases of treatment, but maladaptive in the long term (Wenninger et al., 2013). This difference may be a function of child vs. adult roles throughout treatment and the necessity of adults engaging to manage care.

While findings from the first two aims may initially appear discrepant, Aim 2's finding that there is a "sweet spot" of disengagement that is more likely to promote PTG in SCs is consistent with the idea that there may be benefit to disengagement under *some* but not under *all* circumstances. Disengagement is helpful for SCs at moderate, but not at particularly high levels. This is consistent with one previous study establishing a curvilinear relationship between disengagement and PTG (Beckmann et al., 2021). While too much disengagement may preclude cognitive processing necessary for PTG, some amount of disengagement may be a helpful short-term strategy to ward off emotional fatigue (Livneh, 2009; Wenninger et al., 2013).

It is also important to emphasize that relationships between disengagement and PTG were found for secondary, but not primary caregivers. As suggested with competing hypotheses about the utility of disengagement at various times in treatment for children and adults coping with disease, it is possible that this is a function of proximity to care and roles. Perhaps disengagement does not carry even conditional benefit for PCs, because there are more negative consequences any time the primary coordinator of cancer caregiving is not able to engage with distressing thoughts about their child's cancer. For example, disengagement from PCs may lead to poor communication with medical providers or encoding of information from care conferences. While no papers have previously compared the effects of disengagement on PTG by caregiver role, a few papers have compared these relationships in adult patients coping with cancer and their partners. In these papers disengagement was not

associated with PTG in patients, but was positively associated with PTG in partners, who like SCs may be more auxiliary to cancer management (Gesselman et al., 2017; Manne et al., 2004; Thornton & Perez, 2006). Overall, findings support the idea that disengagement may be beneficial for PTG, especially further in time from diagnosis among those less central to cancer care and treatment.

Regulatory Flexibility

Regulatory flexibility is a composite score that captures one's ability to use high levels of each of the three types of volitional regulation strategies discussed above: primary control engagement, secondary control engagement, and disengagement. While primary control engagement was the single strategy with the most compelling evidence for promoting PTG, results showed that regulatory flexibility looked just as promising. Higher regulatory flexibility predicted higher PTG at one year in both PCs and SCs. On average, PCs showed stable levels of regulatory flexibility over the year and changes in regulatory flexibility over time did not impact PTG. SCs similarly did not show average changes in regulatory flexibility over time, but for SCs who deployed increasing regulatory flexibility over the course of the first year post-diagnosis, this predicted higher PTG. Taken together, this provides compelling evidence that there is utility to the use of all three regulatory strategies when used in concert with one another, particularly among secondary caregivers.

This finding extends previous work touting the utility of regulatory flexibility among individuals sustaining spinal cord injuries (Kunz et al., 2018) or diagnosed with breast cancer (Pat-Horenczyk et al., 2016) to caregivers of children with cancer. Further, no other study has previously established feasibility of using three scales or the Responses to Stress Questionnaire

(Connor-Smith et al., 2000) to create a regulatory flexibility composite. Findings are consistent with prior work in caregivers of children with cancer that found that even cognitive strategies that were associated with negative outcomes in isolation could look good with concurrent use of other coping strategies. Compas and colleagues (2015) found that use of disengagement coping was significantly and positively associated with depressive symptoms in both mothers and fathers, however when primary and secondary control coping were also included in regression models, disengagement was associated with lower depressive symptoms in both mothers and fathers. This makes sense given that certain cancer-related stressors require active problem solving (e.g., talking to child/medical team/etc. about cancer), others require the individual to adapt to the situation (e.g., having less time or energy for other responsibilities), and others yet are fully uncontrollable (e.g., not knowing if child's cancer will get better) and may call for a certain amount of disengagement to regulate distress and pay attention to other, more positive aspects of the cancer experience to develop PTG. Broadly, this supports the notion that labels of "adaptive" or "maladaptive" may be overly reductionistic; engagement and disengagement strategies may be best evaluated with an eye to contextual factors like caregiver role, type of stressor, and concurrent use of other types of strategies used to determine if they are adaptive for promoting PTG.

Involuntary Engagement

In addition to testing volitional engagement and disengagement strategies, the current study also examined involuntary stress responses, and found some unexpected effects that differed between caregivers. Both caregivers reported less involuntary engagement with the stressful aspects of their child's cancer at one year relative to diagnosis. When SCs had more

involuntary engagement, they reported more PTG at one year, however involuntary engagement decreased consistently over time irrespective of PTG. Though there was not the expected time interaction effect, this did still fit the proposed pattern in that higher initial but decreasing involuntary engagement was related to PTG. PCs' involuntary engagement was not associated with PTG, and similarly, involuntary engagement decreased consistently among PCs irrespective of PTG. Further, contrary to expectations, no curvilinear relation between involuntary engagement and PTG was detected in either caregiver.

The involuntary engagement scale captures involuntary stress responses of ruminative and intrusive thinking, associated emotional and physical arousal from distressing thoughts, and impulsive action taken when distressed (e.g., "When I am dealing with the stress of having a child with cancer, sometimes I can't control what I do or say"; Connor-Smith et al., 2000). At the item level, involuntary engagement is directly reminiscent of intrusive thinking subscales of measures of post-traumatic stress symptoms in that it directly assesses intrusive thinking, uncontrollability of thoughts, and both emotional and physiological arousal. In our sample, an exploratory bivariate correlation analysis confirmed that involuntary engagement was indeed highly related to intrusive thinking subscale of the IES-R in PCs ($r(128) = .565$, $p < .001$) and SCs ($r(88) = .726$, $p < .001$). Therefore, it is unsurprising that we see similar patterns of associations between involuntary engagement and PTG and post-traumatic stress symptoms and PTG in the scope of the current study. While we did not hypothesize the null associations seen for PCs or the lack of curvilinear effects detected for both caregivers and they directly contradict the findings of Beckmann et al. (2021), these findings do align with some research that finds null associations between intrusive rumination/thinking and PTG among patients and caregivers

coping with cancer (Hill & Watkins, 2017; Hong et al., 2019; Ogińska-Bulik & Ciechomska, 2016; Soo & Sherman, 2015) as well as one paper finding that there was no curvilinear relationship between rumination and PTG (Kleim & Ehlers, 2009).

To our knowledge, only one previous paper has separately evaluated two caregivers' reports of the relation between a construct similar to involuntary engagement (in this case, intrusive rumination; Cann et al., 2011) and PTG (Ogińska-Bulik & Ciechomska, 2016). While they found that PTGI total scores were unrelated to both parents' intrusive rumination, intrusive rumination was positively related to one subscale of fathers' PTG, spiritual growth. It is not clear why we see involuntary engagement look better for PTG among SCs compared to PCs, but it may be because their daily realities are less consumed by cancer. For caregivers who are more consistently forced to engage with cancer and treatment, cognitive processing may be more automatic, therefore the intrusive process is less needed to jump-start the process of reconstructing assumptive world to accommodate new realities.

It is further unclear why curvilinear relationships among involuntary engagement and PTG were not found in our sample, but were for Beckmann et al.'s (2021) sample of 24 parents of children after hematopoietic stem cell transplant and are consistently found for PTSS (which contains intrusive thinking) and PTG. It is possible structure and timing of our analyses was not precise enough to capture curvilinear relationships. All studies that have previously establish curvilinear relationships (Beckmann et al., 2021; Eisma et al., 2019; McCaslin et al., 2009; Shakespeare-Finch & Lurie-Beck, 2014) have done so looking at cross-sectional reports of PTSS and PTG, whereas our analyses sought to capitalize our longitudinal data structure by looking at individuals' average levels of involuntary engagement collapsed across three timepoints in first

year after diagnosis. From our conceptual understanding of PTG, we posited that any prior disruption and processing would generate stable, sustained PTG, but it is possible that PTG is a more time-varying outcome dependent on situational factors. One study of Taiwanese women treated for cancer found that trajectories of PTG (assessed immediately after surgery and at 3-, 6-, and 12-months post-surgery) found that trajectories of PTG were variable, with trajectories either stable and high (27.4%), high and decreasing (39.4%), low and increasing (16.9%), or low and decreasing (16.9%; Wang et al., 2014). Another study similarly reproduced results of stable, increasing, and decreasing trajectories among adolescents and young adults treated for cancer (Husson et al., 2017). The finding that PTG can actually decrease over time might suggest that reporting of PTG can vary depending on how central cancer identity or coping with illness is to one's experience at that moment in time. Future work may endeavor to assess PTG longitudinally in tandem with cognitive engagement and test curvilinear relationships between theorized "maladaptive" cognitive engagement and disengagement strategies and PTG at different critical timepoints to better understand whether there are critical windows for how the timing of these strategies matter for PTG.

Involuntary Disengagement

The final cognitive strategy examined was involuntary disengagement. PCs reported less involuntary disengagement at one year relative to diagnosis, which was unrelated to their reports of PTG. Further, PCs who reported changes in reported involuntary disengagement over time were no more or less likely to report PTG. In contrast, involuntary engagement among SCs was seen to promote PTG. SCs did not report any average changes in their use of involuntary disengagement over the year, however there was a marginal effect such that SCs who used

increasing levels of involuntary disengagement over the year had higher PTG. Contrary to expectations, no curvilinear relationship between involuntary engagement and PTG was detected in either caregiver.

Involuntary disengagement is an involuntary stress response that captures automatic actions that downregulate distress through involuntary cognitive or behavioral avoidance (e.g., "My mind goes blank when something stressful happens related to my child having cancer, I can't think at all"), emotional numbing, or complete inaction (e.g, "I just freeze when I am dealing with the stressful parts of having a child with cancer, I can't do anything"; Connor-Smith et al., 2000). Of all the cognitive engagement and disengagement studies evaluated, involuntary disengagement is the least studied in the context of PTG. To our knowledge, only one other study has evaluated the relationship between involuntary disengagement and PTG (Beckmann et al., 2021), and did not find a relationship between this construct and PTG. Some limited work has investigated the subscale of emotional numbing, sometimes evaluated as a subcluster of post-traumatic stress symptoms (Hall et al., 2015; Wei et al., 2017), and in contrast to our findings, one study of women treated for breast cancer found a moderate negative relationship between emotional numbing and PTG (Navidian et al., 2017).

It was hypothesized that trajectories of caregiver involuntary disengagement would be unrelated to PTG in linear models because the true nature of relationship would be curvilinear and therefore washed out in the linear models. Results were not as hypothesized for either PCs or SCs, but for different reasons. Among PCs, the complete lack of associations between involuntary disengagement and PTG mirror our findings between disengagement and PTG, suggesting that all forms of disengagement fail to promote PTG in PCs—at least when evaluated

in isolation (see discussion of regulatory flexibility). Again, this may be a function of caregiver role. Responding to the stressful aspects of a child's cancer treatment primarily with disengagement, either voluntarily or not, may not be a viable or particularly useful strategy among those most central to cancer caregiving.

Among SCs, the finding that higher involuntary disengagement predicted PTG and that this relationship was linear, not curvilinear, was surprising. This suggests that involuntary disengagement promotes PTG, not just at moderate levels, but even at high levels. This idea is only further underscored by the fact that the time interaction effect from the trajectory model approached significance. Involuntary disengagement responses are suspiciously reminiscent of the inability to face difficulty Maerker and Zoellner (2004) describe might contribute to reports of illusory rather than genuine, constructive growth. If one cannot face the stressful aspects of their child's disease without avoiding, freezing, or numbing all emotion, this is exactly the type of repressive emotional style that may lead someone to create positive illusions of change that function to palliate distress. If higher and increasing involuntary disengagement promotes PTG, this may be a sign to reevaluate what PTG represents in SCs in our sample.

We have thus far focused on how differences in the caregiver role may produce differences in how cognitive engagement and disengagement function for PCs vs. SCs, but previous research on repressive coping styles also points to gender as a factor that may moderate these associations. Some prior research identifies gender differences in cognitive styles such that men may be more likely use repressive coping than women (Coifman et al., 2007; Ros et al., 2014; Weinberger & Davidson, 1994). In our sample, the vast majority of PCs (88.4%) identified as female while the vast majority of SCs identified as male (87.3%). Thus it is

possible that we see involuntary disengagement as adaptive for promoting PTG only in SCs because caregiver role is a rough proxy for gender. Involuntary disengagement was no higher for SCs than PCs at diagnosis, however SCs sustained higher levels of involuntary disengagement such that they had higher levels than PCs at one year (d = 0.33). To date, no work has commented on whether there are gender differences in how individuals report illusory vs. constructive growth patterns after trauma (largely because much of the research on illusory growth has been conducted in breast cancer survivors [Cheng et al., 2020; Pat-Horenczyk et al., 2015, 2016]), but it has been suggested (Cerdá, 2014) that gender differences in the relation between traumatic stress and PTG may indicate that gender could be an important factor in understanding distinct subgroups of PTG and positive adaptation. While examining caregiver role (i.e., primary or secondary) rather than caregiver gender may confer certain advantages (Bonner et al., 2007), future work should also examine caregiver gender as it relates to reporting of PTG and cognitive engagement and disengagement strategies.

Finally, whether or not associations between involuntary disengagement and PTG represent illusory PTG, there is the chance that this confers some very real, not-so-illusory benefits for caregivers. In a study of both bereaved and non-bereaved individuals, participants in both groups who exhibited more repressive coping behavior exhibited a number of psychological and physical health advantages over their non-repressing peers (Coifman et al., 2007). Not only did they report fewer symptoms of psychopathology after being administered full structured clinical interviews, which may be subject to the same repressive reporting bias, but they also experienced fewer health problems and somatic complaints and were rated as better adjusted by close friends. To better understand the potential adaptive value of

repressive coping or involuntary disengagement in the context of PTG, we may look to the role of cognitive bias in processes of perception, attention, processing and memory (Coifman et al., 2007). Hypervigilance to cues of threat may increase one's vulnerability to negative emotions (MacLeod et al., 2002) and thinking traps (Creswell & Myers, 2002), whereas involuntary disengagement shifts attention away from these cues and associated vulnerabilities. Instead, repressors may demonstrate a cognitive bias toward positive cues, which would produce exactly the same rumination of positives seen to promote PTG (Chan et al., 2011; Yuen et al., 2014). Indeed, one study among women with breast cancer found a direct association between positive attentional bias and PTG (Chan et al., 2011). Especially in the context of a chronic rather than episodic stressor such as cancer (Sumalla et al., 2009), automatic strategies for downregulating negative emotion and diverting attention may serve an adaptive function.

PTG in Context: Adjustment and the Janus-Face Model

To continue the discussion of illusory and constructive growth, we now will discuss results of growth models and Aims 1-3 in the context of results from Aim 4. Previous studies have attempted to parse apart illusory and constructive components of the Janus Face Model of PTG, however none have looked at how PTG might relate to trajectories of changing adjustment. By commenting on findings regarding PTG as it relates to adjustment, we can better comment on the implications of findings as situated within the broader picture of positive adaptation to childhood cancer. While it was hypothesized that higher initial distress and trajectories of decreasing distress would produce PTG, PC's distress symptoms were completely unrelated to reports of PTG. PC distress symptoms decreased over time, but this was not different for caregivers who had high vs. low PTG. SCs depressive symptoms and

changes in depressive symptoms were also unrelated to PTG, however, we did observe that SCs who reported higher post-traumatic stress symptoms reported higher PTG at one year. While it is possible elevated post-traumatic stress among high-PTG SCs indicates that PTG in SCs represents illusory growth (i.e., associated with poor adjustment), post-traumatic stress symptoms still decreased significantly among those who reported high PTG. Overall, mixed positive and null associations are consistent with previous research's divide between finding that PTG is related and unrelated to adjustment (see Zoellner and Maercker, 2006 for a review). Findings among SCs paired with involuntary disengagement findings raise some concern for the presence of illusory growth, but without time interaction effects proving that PTG was associated with changes in adjustment, evidence is not conclusive.

To provide greater context, exploratory post-hoc analyses showed that 38.5% of SCs in our sample had clinically significant post-traumatic stress symptoms at diagnosis and 21.6% of SCs (*n* = 11) had clinically significant at the end of one year (clinical cutoff = 33; Creamer et al., 2003). Of this subgroup of SCs with prolonged elevations in symptoms, 55% (*n* = 6) had high PTG (Z-score $\geq$ 0.5). This subgroup may either represent a profile of illusory growth, or a profile of concurrent markers of distress as well as positive adaptation/PTG termed "struggling growth" (Pat-Horenczyk et al., 2016). Pat-Horenczyk and colleagues (2016) followed women for two years after completing breast cancer treatment and found that the proportion of women with profiles of struggling growth decreased over time, with the largest proportion of them "resolving" their struggle to join the positive adaptation and PTG profile of constructive growth. Roughly a third of women demonstrated struggling growth at six months post-treatment, and most of the transitions from struggling growth to constructive growth occurred between 6- and

12-months after the conclusion of treatment. Given this timeline, it is reasonable to expect that a subgroup of our sample of caregivers may still display distress from the disruption of their child's disease as they start to experience the PTG that similarly stems from disruption at only one year post diagnosis. With most children still on active treatment at this time and many realities of daily life likely still in flux, caregivers may not have had enough time and space from continued "seismic event(s)" for adjustment to fully stabilize and for growth narratives to fully crystallize. Longer term follow-up of families would be help shed light on stability vs. change in the relation between adjustment and PTG and cross-lagged panel models may help elucidate whether distress drives increased PTG, PTG drives reductions in distress, or both. Previous cross-lagged models of PTSS and PTG among populations have been inconclusive, with some finding that distress drives greater PTG (Dekel et al., 2012), others finding that PTG drives reductions in distress (Chen et al., 2015), and others finding no predictive associations (Eisma et al., 2019). Future work should endeavor to evaluate these relationships among caregivers after children at multiple timepoints extending past active treatment for cancer.

The fact that PTG was not associated with the majority of caregiver adjustment domains tested may be interpreted in different ways. First, it may be taken as evidence that PTG is an orthogonal construct to global adjustment, underscoring Tedeschi and colleagues' assertion that true PTG and distress can exist concurrently (Tedeschi et al., 2007). It is alternatively possible that null findings are a function of distinct profiles of adjustment and PTG present among our sample. If half of high-PTG caregivers show positive adjustment consistent with constructive growth and half show poor adjustment consistent with illusory growth, this may wash out the presence of effects. Latent class analysis would be most useful for testing for

distinct profiles, but to provide preliminary commentary the viability of this explanation, post-hoc analyses were conducted to plot the concurrent associations between caregiver adjustment and PTG at Time 12 and examine whether a curvilinear U-shaped relationship may be obscuring true effects. No evidence of curvilinear effects was detected (see Supplementary Figures S1-S4), thus taken together, findings most aligned with the assertion that PTG is largely orthogonal to domains of adjustment. Trajectories of adjustment did not provide adequate evidence for the presence of illusory growth in our sample, though subgroup analyses may be warranted in future work.

Limitations

While the current study has many novel contributions, findings should be evaluated in light of study limitations. First, we had significant attrition and though maximum likelihood estimation helps account for missing data, some systematic missingness occurred (see methods section for a detailed description of participation rates and differences between completers and non-completers). Additionally, there was low demographic variability in the current sample. We recruited from two large children's hospitals in different geographic regions in the US, however, participants were mostly White and of high socioeconomic status (SES). Thus findings may not capture the experiences of racially diverse or lower SES individuals, who may be even more likely to experience greater stress associated with caring for a child with cancer (Bemis et al., 2015).

In addition to limitations of the study sample, there were also limitations of our study design that should be improved upon in future research. First, we were limited by the single timepoint report of PTG. Looking at longitudinal changes in cognitive engagement and

disengagement and PTG concurrently may shed further light on the nature of these relationships. For example, one paper actually found that PTG predicted positive emotion regulation, not the other way around (Hamama-Raz et al., 2019). Additionally, longer term follow-up may be necessary to characterize PTG in caregivers beyond one year post-diagnosis. Research on trajectories of PTG demonstrate changes that reports of PTG can shift even well after the conclusion of active treatment (Husson et al., 2017; Pat-Horenczyk et al., 2016; Wang et al., 2014). Further, in discussing potential explanations for our patterns of findings, we presented several theories related to caregiver role and the centrality of the caregiver to daily tasks of medical caregiving and decision making. In reality, caregiver involvement in these matters is not binary, but rather exists on a continuum. It would be interesting to directly assess caregiver roles and responsibilities to empirically test whether cognitive engagement and disengagement strategies matter differently for caregivers who are more and less central to cancer treatment. Similarly, we did not empirically test for differences in gender because study aims prioritized examining caregiver role over gender, but this may be an interesting moderator to examine in future work.

Finally, results were based on average trends for caregivers separated out by primary or secondary role. Increasing speculation about the idiographic or contextually-dependent benefit of various engagement and disengagement strategies as well as the potential for distinct profiles of PTG that differ in both form and function suggest that future work may benefit from analytical strategies that allow for detection of distinct phenotypic subgroups (e.g., latent class/profile analysis, latent transition analysis) that were beyond the constraints of this study's sample size.

Conclusions and Implications

The current study expands on existing knowledge of how cognitive engagement strategies promote PTG in caregivers of children with cancer. To our knowledge, this is the first study that has explored longitudinal trajectories of cognitive engagement, non-linear relationships, and regulatory flexibility in the context of this population, and the first paper to combine these three different complementary strategies for testing the relation between cognitive engagement and disengagement strategies and PTG in any traumatic stress context. Results demonstrated that primary control engagement was the single cognitive strategy with the strongest connection to PTG for both caregivers. However, the ability to flexibly use all three volitional strategies concurrently (primary control, secondary control, and disengagement) showed equally promising associations. As an individual strategy, disengagement was only found to be helpful for promoting PTG at moderate levels and only among SCs. Higher levels of secondary control engagement and involuntary engagement/disengagement stress responses were also seen to promote PTG among SCs, but not PCs. Additionally, despite links to traditionally "maladaptive" engagement and disengagement responses as well as conceptual links to distress and disruption, PTG was largely orthogonal to trajectories adjustment, with the one exception being that SCs with greater post-traumatic stress also reported greater PTG.

One of the biggest patterns observed in findings was the distinction by caregiver role. Of the five distinct strategies, only higher primary control engagement significantly predicted PC PTG, while all five had either positive linear or curvilinear relationships with SC PTG. While a proactive engagement approach may be most important for the caregivers on the front lines of

treatment, a wider range of strategies may be considered adaptive for promoting PTG from the stressful aspects of cancer among caregivers with less day-to-day agency and active involvement in treatment. Alternatively, it is possible that this distinction exists because caregiver role was a rough proxy for gender in our sample. This would dictate that proactive engagement is most important for promoting PTG in female caregivers, but male caregivers may benefit from a variety of other engagement and disengagement strategies, regardless of whether they are theorized as being adaptive. Future research may test this empirically by assessing specific caregiver roles and testing competing models of caregiver centrality to treatment and caregiver gender.

Broadly, findings caution against unqualified, black and white judgments regarding which cognitive engagement and disengagement strategies are adaptive vs. maladaptive. As care teams support caregivers to promote PTG and positive adaptation, they should use their clinical judgment to evaluate engagement and disengagement coping behaviors in the functional context of the problem (e.g., is active engagement needed, or might disengagement be protective in the context of this ongoing, uncontrollable stressor?), the caregiver's role functioning (e.g., are engagement/disengagement responses interfering with caregiver roles like medical caregiving, communication, etc.?), and the caregiver's broader repertoire of coping responses (e.g., are disengagement strategies balanced by use of a range of engagement strategies?). It is encouraging that research shows clinicians consistently converge in judging positive adaptation among caregivers of children who have had cancer, even though objective assessment measures of adjustment may sometimes miss the mark (Rosenberg et al., 2014), as it suggests that clinicians may be able to provide accurate assessment of the adaptive value of

different engagement and disengagement strategies in context and tailor recommendations at the individual level.

Capitalizing on our data structure and complementary aims, we had hoped to discuss findings in the context of the debate between constructive and illusory components of growth. However, with no conclusive findings about how PTG relates to *changes* in growth, we can neither make conclusive statements that PTG is operating in a constructive way nor and illusory way in our sample. Curiously, the most compelling evidence for the presence of illusory growth was the finding that higher involuntary disengagement (and even to some extent trajectories of increasing involuntary disengagement) was associated with higher PTG among SCs. Involuntary disengagement strategies parallel coping efforts employing self-deceptive positive illusions of change, and thus may indicate the presence of illusory growth among SCs. However, even if initially based on illusory processes, there is evidence that this type of growth may confer very real psychological benefits for caregivers (Coifman et al., 2007) or later transition to a more typically presenting profile of high PTG and positive adaptation (Pat-Horenczyk et al., 2016). While this study marks an important first step towards addressing questions about how caregivers develop growth and what it represents, in order to make definitive statements about the nature of PTG and the adaptive value of PTG in this population, additional research is needed that measures PTG, cognitive-engagement/disengagement, and adjustment at multiple time-points beyond diagnosis into more stable phases of survivorship. Cross-lagged autoregressive panel models are needed to further mine these associations.

There is still debate about what PTG represents and how we can measure its adaptive value, however research is clear that narratives of growth are part of the experience for

caregivers of children with cancer. Consistently, an overwhelming proportion of caregivers report at least one positive change resulting from their child's disease, with a significant percentage reporting four or more domains of change (Barakat et al., 2006). Aligning with our findings touting the usefulness of primary and secondary control engagement, a recent meta-analytic review of interventions aimed at promoting growth classified the two most common elements of interventions as expressive self-disclosure and cognitive-behavioral therapy (CBT) strategies like cognitive restructuring and exposure (Roepke, 2015). To promote growth, clinicians may utilize cognitive-behavioral and acceptance-based therapy strategies that help individuals confront fears, express negative emotions, restructure negative thoughts, attend to positives, clarify values, and make plans to better carry out values. Further, while not adaptive on face value or directly prescribed in any interventions for promoting growth, disengagement strategies are not a monolith; they may be helpful for some caregivers, and clinicians should use their judgment to advise caregivers on a case-by-case basis. PTG is a complex outcome that may be both conceptually and empirically distinct from other measures of positive adaptation. Therapists have long identified that focusing on eliminating emotional pain as the goal of treatment is both maddening and ineffective; alternatively, helping foster PTG among individuals coping with cancer may empower them to lead lives that are emotionally richer and more meaningful in the midst of the most trying circumstances.

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Figure 1. Cognitive Engagement and Disengagement Strategies

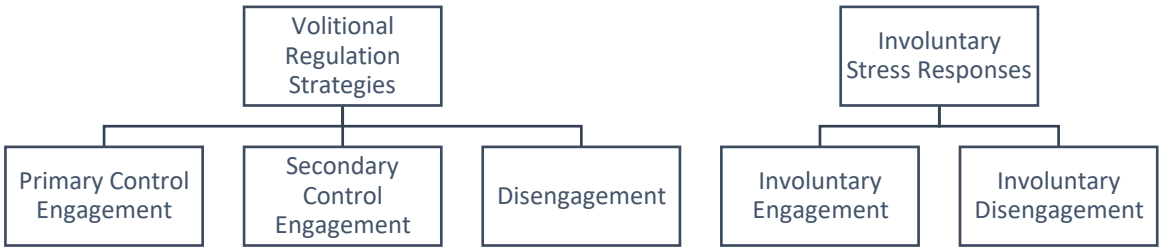
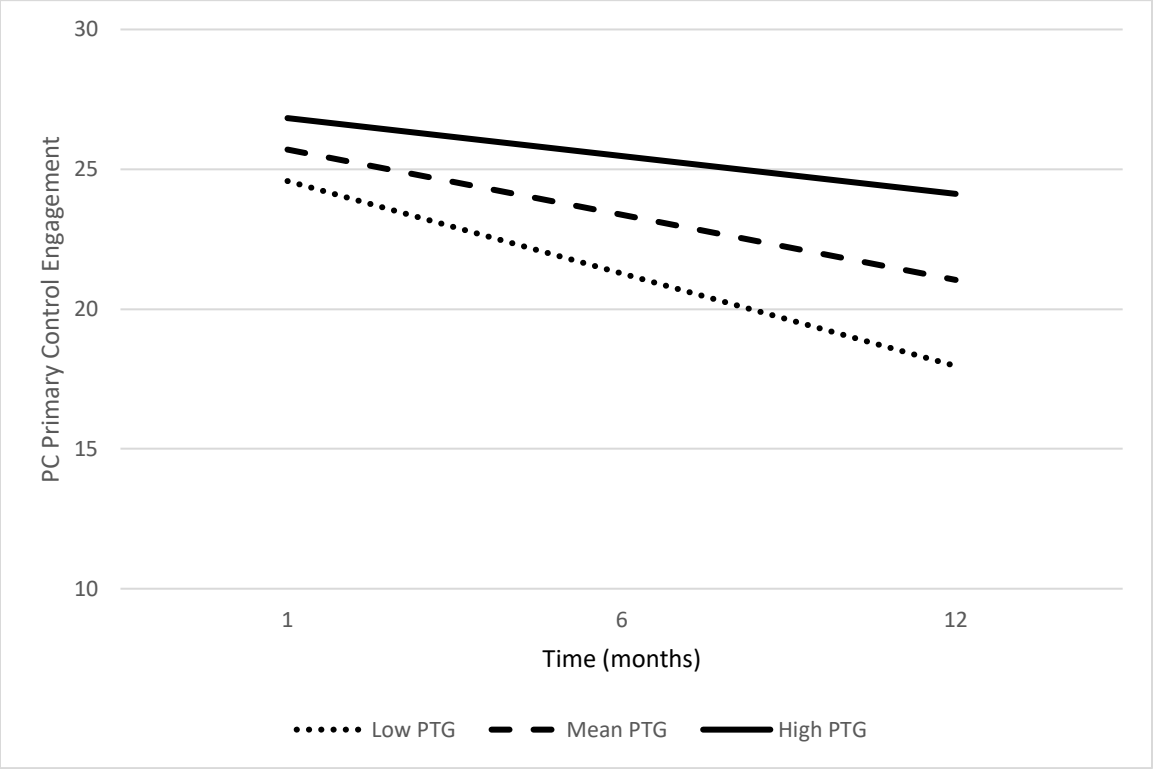
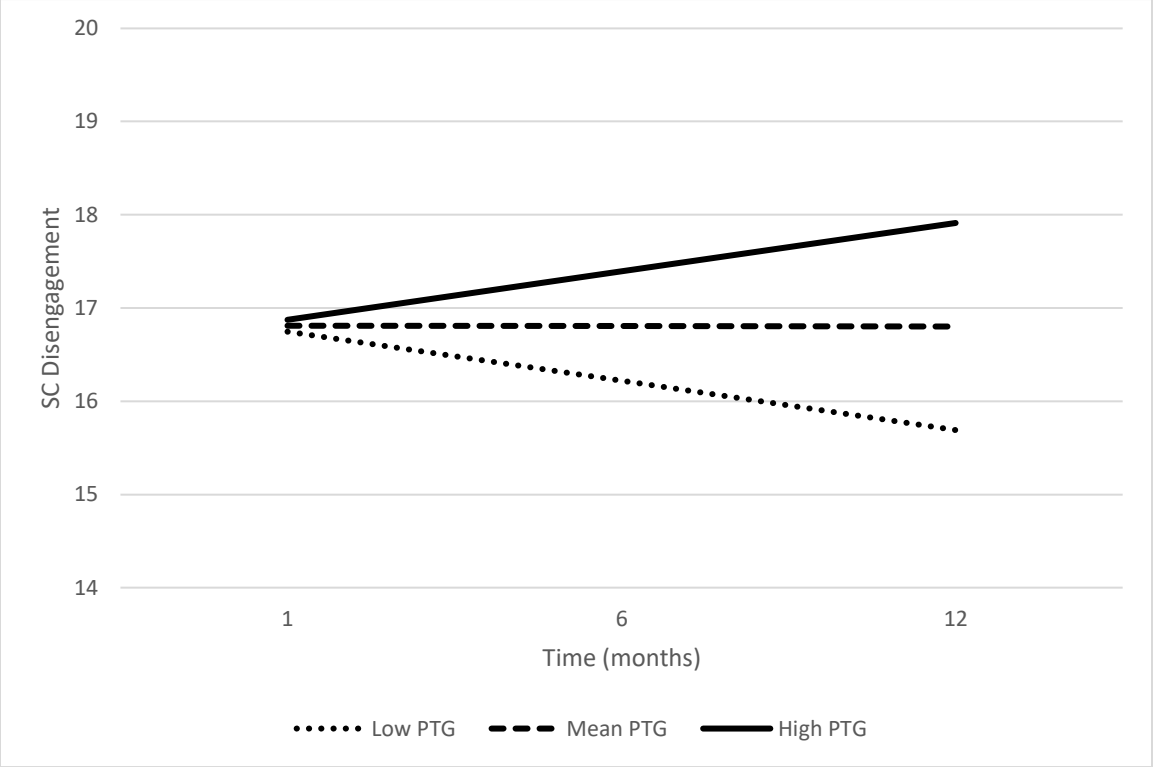


Figure 2. Trajectory of Primary Caregiver Primary Control Engagement by PTG



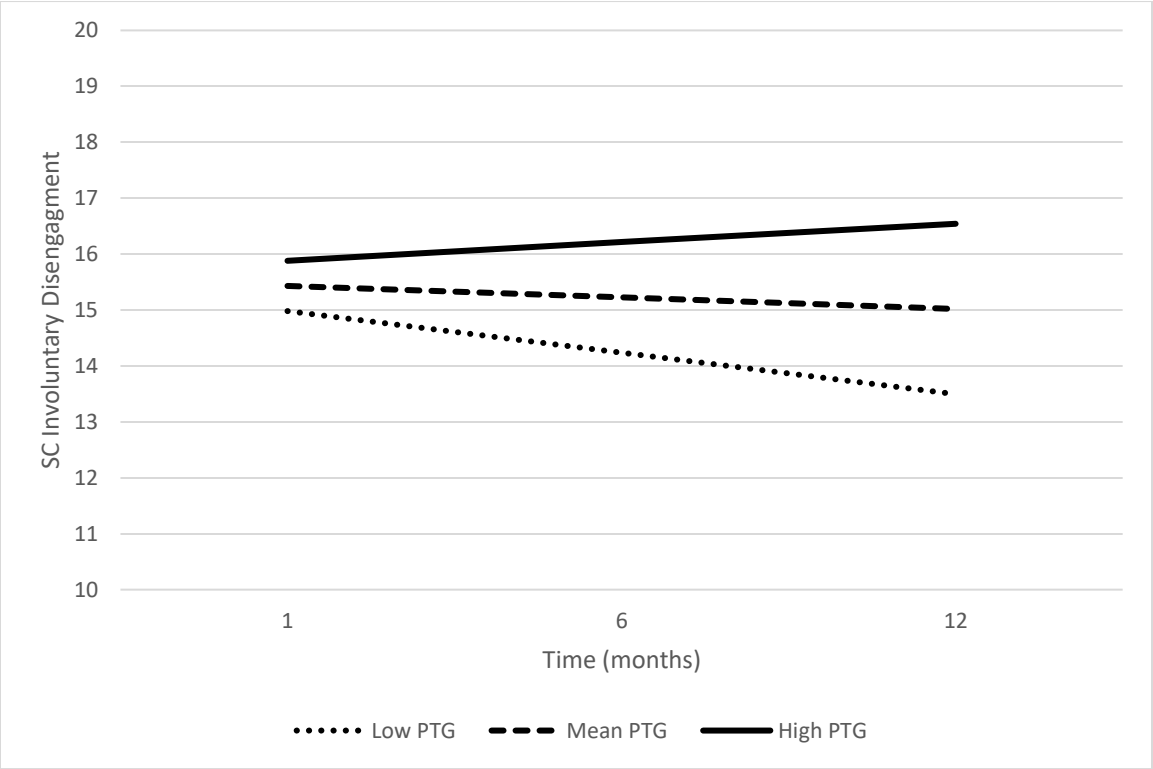
*Significant interaction effect, $p < .05$

Figure 3. Trajectory of Secondary Caregiver Disengagement by PTG



†Marginally significant interaction effect, $p = .068$

Figure 4. Trajectory of Secondary Caregiver Involuntary Disengagement by PTG



†Marginally significant interaction effect, $p = .075$

Figure 5. Secondary Caregiver Disengagement and PTG

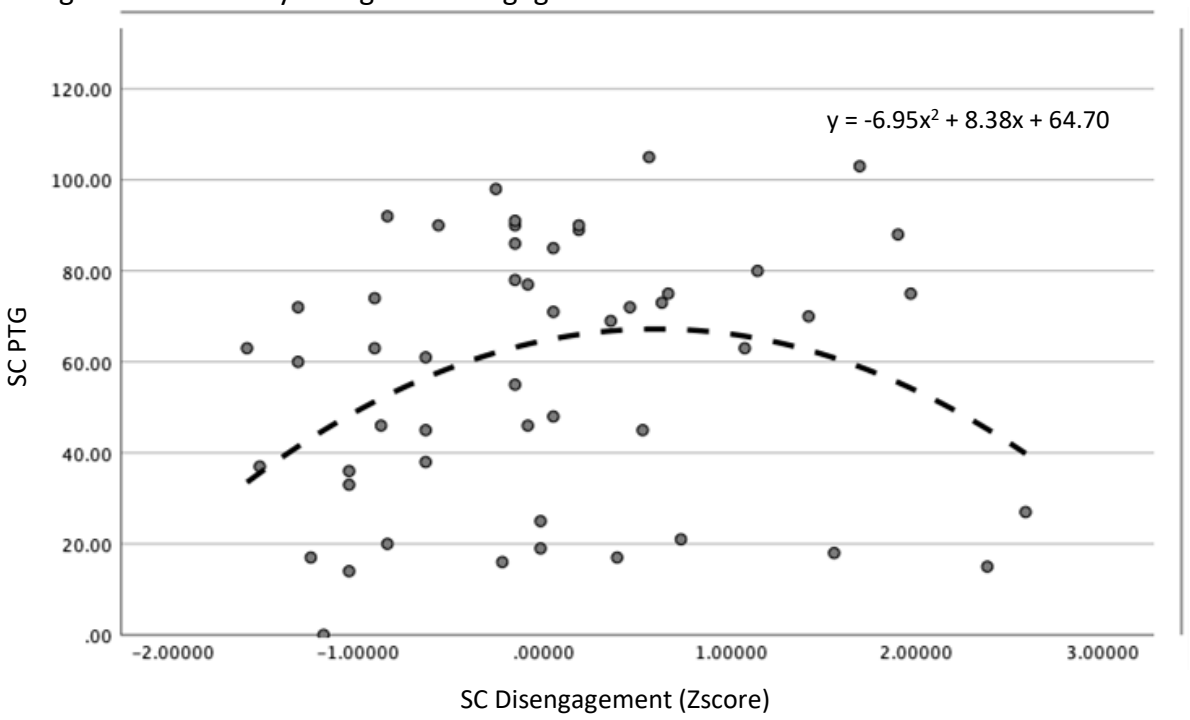
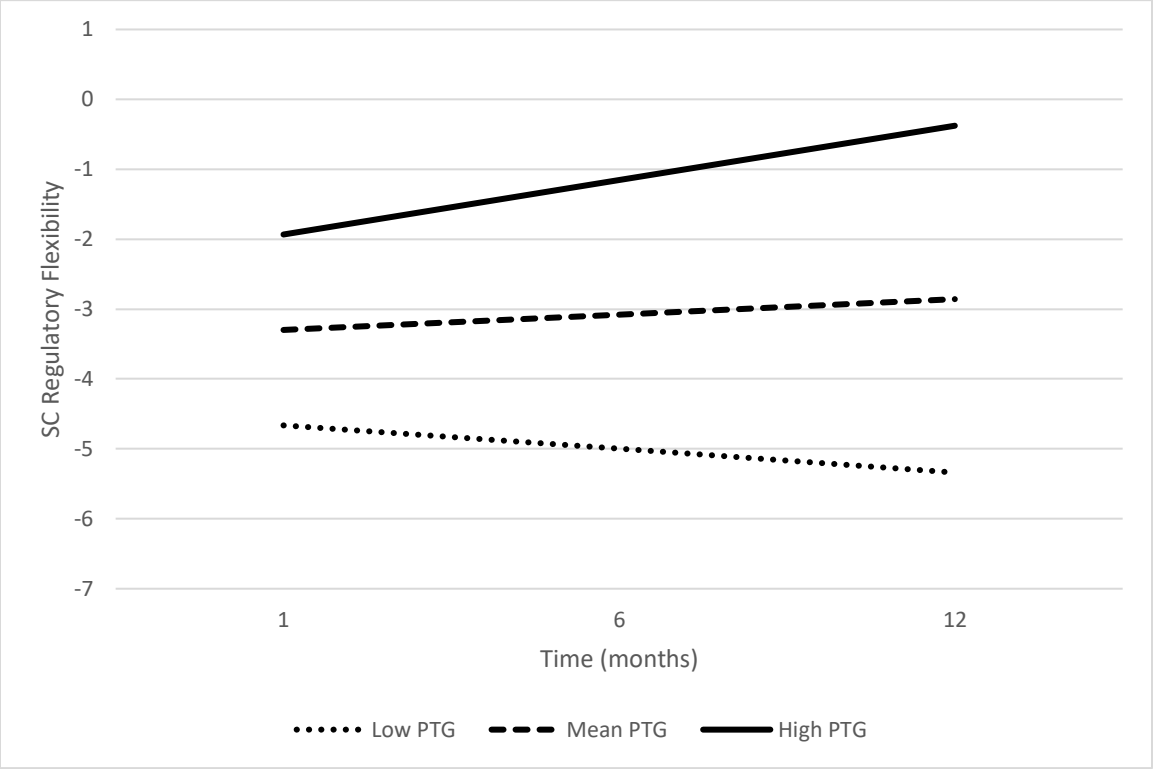
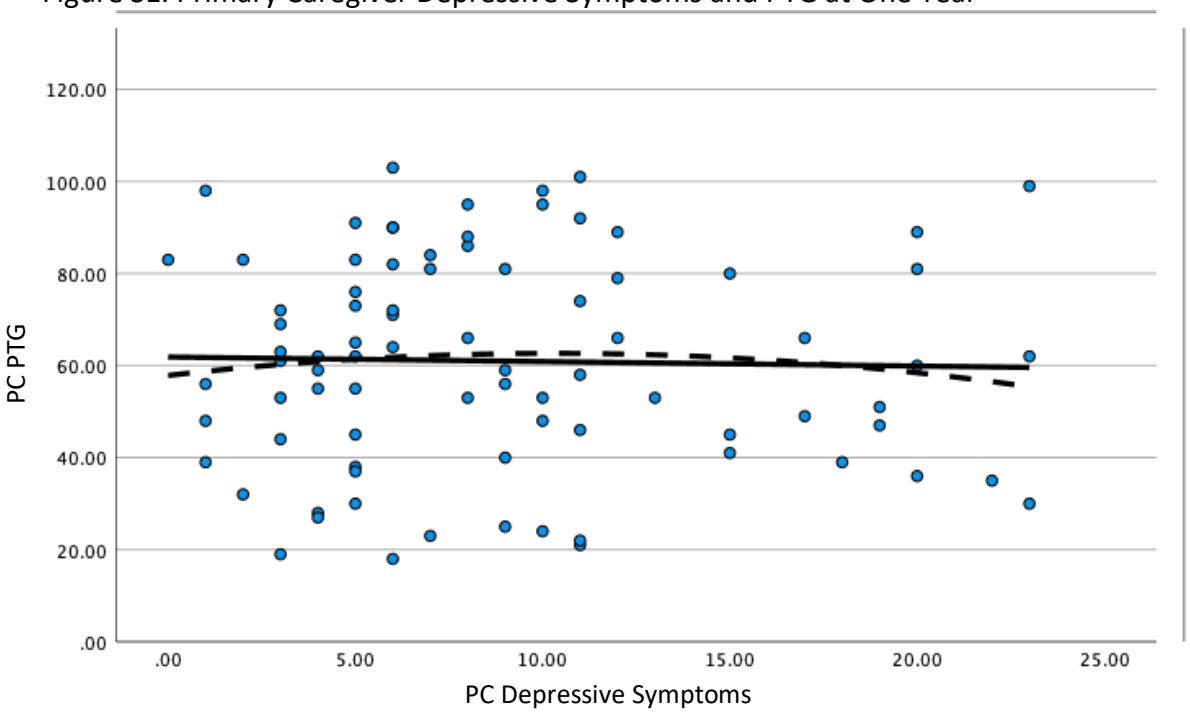


Figure 6. Trajectory of Secondary Caregiver Regulatory Flexibility by PTG



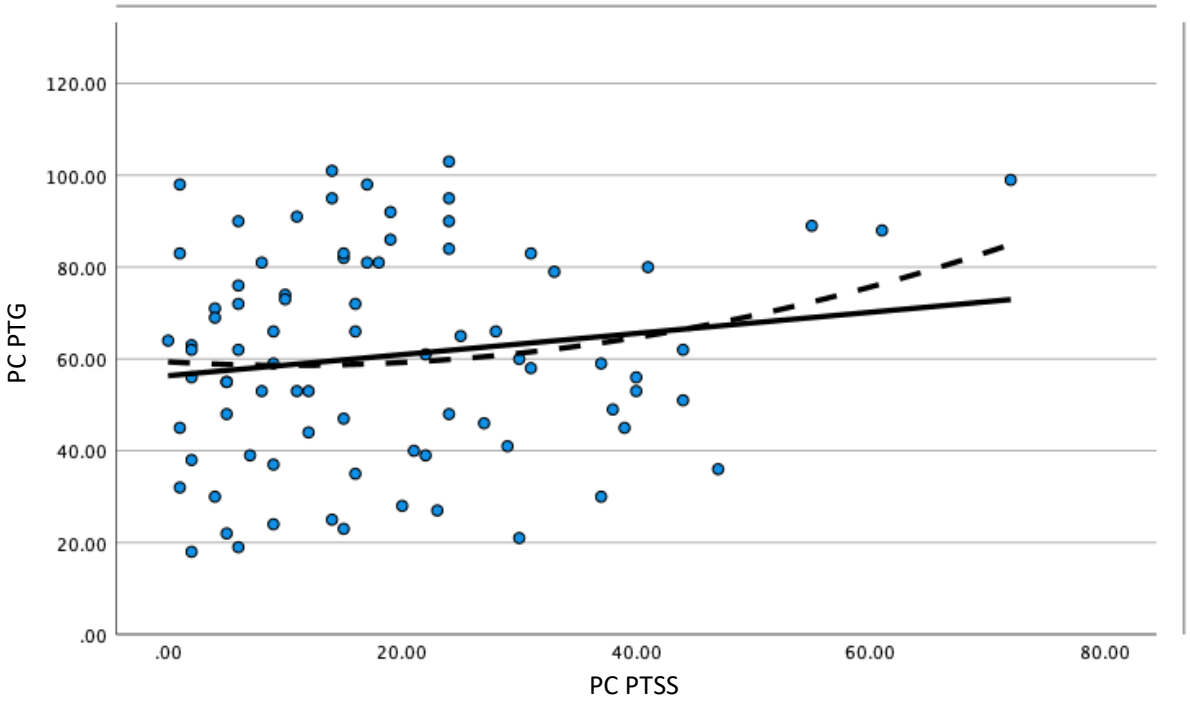
*Significant interaction effect, $p < .05$

Figure S1. Primary Caregiver Depressive Symptoms and PTG at One Year



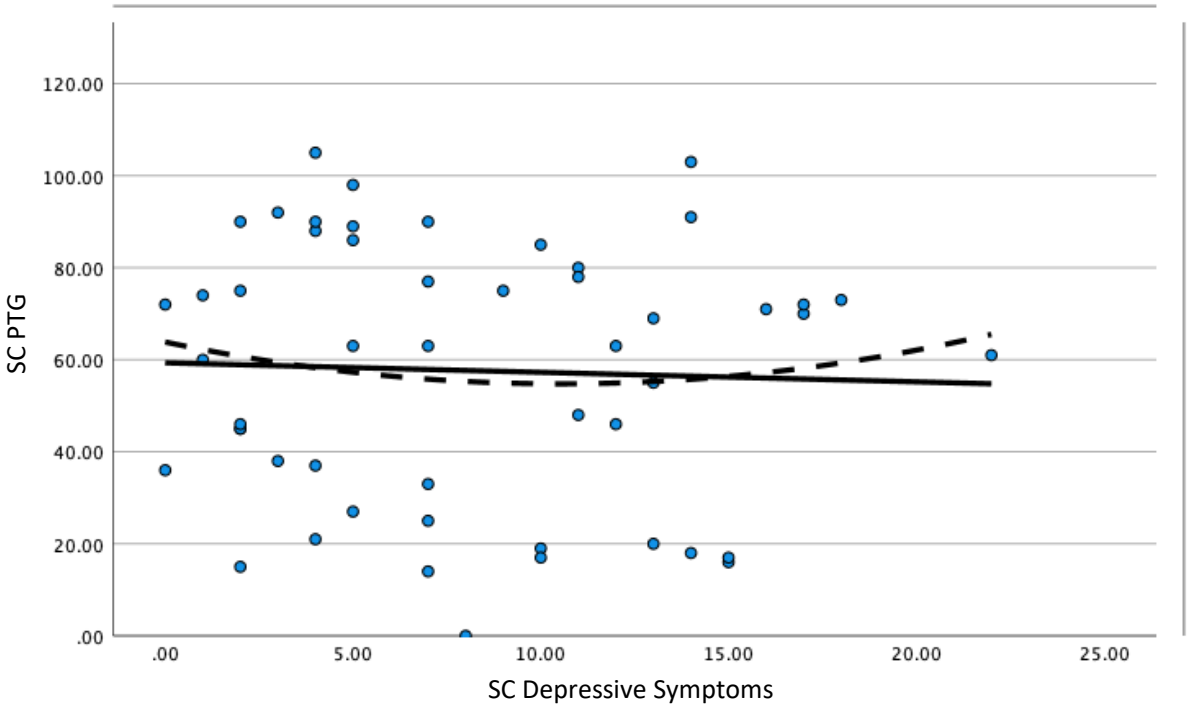
Note: Linear and curvilinear trend lines shown. No significant relationship detected.

Figure S2. Primary Caregiver Post-Traumatic Stress Symptoms and PTG at One Year



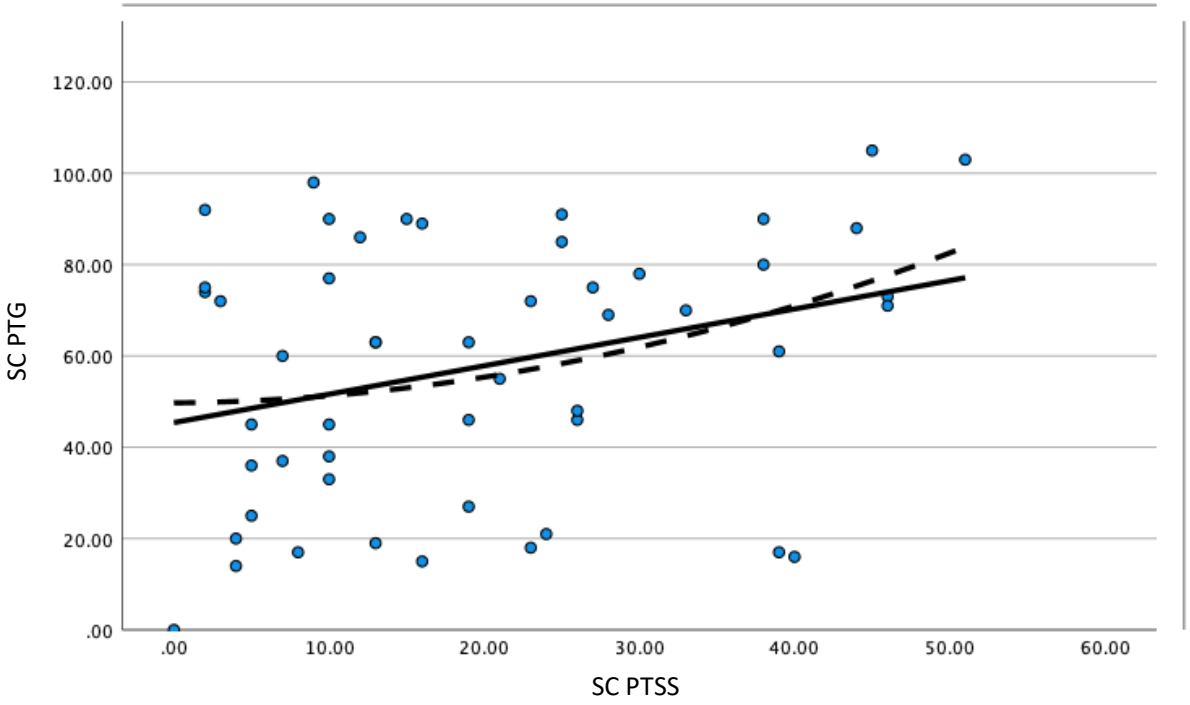
Note: Linear and curvilinear trend lines shown. No significant relationship detected.

Figure S3. Secondary Caregiver Depressive Symptoms and PTG at One Year



Note: Linear and curvilinear trend lines shown. No significant relationship detected.

Figure S4. Secondary Caregiver Post-Traumatic Stress Symptoms and PTG at One Year



Note: Linear and curvilinear trend lines shown. No significant curvilinear relationship detected.

Table 1. Descriptive Characteristics

	Primary Caregivers			Secondary Caregivers		
	Time 1 Mean (SD)	Time 6 Mean (SD)	Time 12 Mean (SD)	Time 1 Mean (SD)	Time 6 Mean (SD)	Time 12 Mean (SD)
PTG	N/A	N/A	60.99 (23.06)	N/A	N/A	57.67 (28.34)
Primary Control Engagement	27.18 (7.37)	23.20 (6.54)	21.46 (6.97)	24.94 (6.34)	22.97 (7.22)	22.21 (5.31)
Secondary Control Engagement	23.96 (4.55)	23.02 (5.53)	21.97 (4.33)	23.62 (4.09)	22.83 (4.44)	22.47 (3.68)
Disengagement	17.00 (5.21)	15.98 (5.32)	14.56 (4.98)	16.79 (5.14)	16.77 (5.37)	16.78 (5.74)
Involuntary Engagement	20.71 (5.37)	18.79 (6.33)	16.61 (5.73)	19.34 (5.79)	18.71 (6.69)	18.02 (6.01)
Involuntary Disengagement	16.19 (4.60)	15.23 (4.83)	13.67 (3.92)	15.50 (4.76)	15.29 (5.21)	15.05 (4.71)
Regulatory Flexibility	-3.11 (3.30)	-2.65 (3.83)	-2.83 (3.78)	-2.90 (4.28)	-2.79 (4.14)	-2.87 (4.30)
Depressive Symptoms	13.84 (5.76)	10.78 (6.64)	8.82 (5.98)	11.60 (6.11)	9.72 (6.11)	8.07 (5.47)
PTSS	30.87 (16.38)	22.02 (15.04)	18.47 (15.13)	28.13 (15.58)	21.21 (15.47)	19.71 (14.17)

Note: Post traumatic growth (PTG), post-traumatic stress symptoms (PTSS).

Table 2. Correlations between Variables for Primary Caregivers

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1 T1 PCE	1																					
2 T1 SCE	.23**	1																				
3 T1 D	-.04	.02	1																			
4 T1 IE	.09	-.12	.66**	1																		
5 T1 ID	-.04	-.07	.75**	.67**	1																	
6 T1 Dep	-.11	-.22*	.45**	.63**	.53**	1																
7 T1 PTSS	.00	-.04	.56**	.74**	.56**	.65**	1															
8 T6 PCE	.41**	.15	.20*	.22*	.09	-.04	.16	1														
9 T6 SCE	.23*	.56**	.01	-.06	-.04	-.19	.10	.46**	1													
10 T6 D	.048	.06	.71**	.58**	.59**	.51**	.54**	.30**	.12	1												
11 T6 IE	.11	.01	.47**	.62**	.49**	.39**	.61**	.38**	.29**	.71**	1											
12 T6 ID	.07	.04	.47**	.53**	.59	.46**	.51**	.14	.13	.73**	.82**	1										
13 T16 Dep	-.07	-.03	.39**	.41**	.42	.46**	.42**	.10	-.08	.59**	.63**	.73**	1									
14 T6 PTSS	.07	.07	.53**	.59**	.54**	.52**	.69**	.17	.07	.72**	.76**	.77**	.74**	1								
15 T12 PCE	.40**	.18	.04	.20	.00	.05	.34**	.30**	.17	.06	.15	.10	-.05	.16	1							
16 T12 SCE	.15	.52**	.06	-.01	.03	-.11	.21	.17	.46**	.12	.09	.09	.00	.14	.35**	1						
17 T12 D	.03	.05	.62**	.46**	.49**	.46**	.53**	.15	.06	.78**	.62**	.62**	.57**	.69**	.14	.15	1					
18 T12 IE	.08	.01	.37**	.56**	.37**	.48**	.59**	.17	.00	.61**	.71**	.65**	.56**	.70**	.32**	.19	.73**	1				
19 T12 ID	.04	.06	.46**	.51**	.56**	.48**	.53**	.12	.05	.63**	.65**	.78**	.57**	.70**	.17	.15	.81**	.78**	1			
20 T12 Dep	-.03	.04	.26*	.21	.30**	.47**	.29*	-.11	-.09	.45**	.40**	.57**	.79**	.64**	-.01	.04	.58**	.56**	.59**	1		
21 T12 PTSS	.07	.10	.31**	.41**	.36**	.48**	.57**	.07	.06	.54	.53**	.55**	.54**	.73**	.26*	.20	.72**	.79**	.74**	.66**	1	
22 T12 PTG	.25*	.17	.08	.13	.02	.18	.33	.24	.20	.08	.16	.15	-.08	.14	.48**	.19	.04	.13	.11	-.03	.15	1

Note: *$p < .05$, **$p < .01$. Primary control engagement (PCE), secondary control engagement (SCE), disengagement (D), involuntary engagement (IE), involuntary disengagement (ID), depressive symptoms (Dep), posttraumatic stress symptoms (PTSS), post traumatic growth (PTG).

Table 3. Correlations between Variables for Secondary Caregivers

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1 T1 PCE	1																					
2 T1 SCE	.51**	1																				
3 T1 D	.16	.17	1																			
4 T1 IE	.36**	.19	.65**	1																		
5 T1 ID	.22*	.22*	.77**	.66**	1																	
6 T1 Dep	.24*	-.06	.21	.50**	.66**	1																
7 T1 PTSS	.29**	.18	.57**	.79**	.50**	.50**	1															
8 T6 PCE	.54**	.28*	.06	.18	.79**	.12	.23	1														
9 T6 SCE	.44**	.63**	.17	.09	.18	-.01	.15	.45**	1													
10 T6 D	.17	.27*	.76**	.56**	.09	.14	.62**	.12	.31*	1												
11 T6 IE	.30	.24	.43**	.73**	.56**	.34**	.72**	.31*	.15	.65**	1											
12 T6 ID	.19	.27*	.58**	.58**	.73**	.18	.65**	.22	.24	.80**	.82**	1										
13 T16 Dep	.21	.11	.12	.38**	.58**	.38**	.44**	.15	-.08	.35**	.62**	.51**	1									
14 T6 PTSS	.38**	.30	.34**	.64**	.38	.33**	.70**	.24*	.16	.61**	.81**	.66**	.72**	1								
15 T12 PCE	.50**	.22	-.10	.21	.64**	.35*	.23	.61**	.39**	.22	.45**	.35*	.28	.46**	1							
16 T12 SCE	.44**	.49**	.03	.04	.21	.11	.12	.41**	.56**	.26	.14	.19	.05	.31*	.36*	1						
17 T12 D	.12	.15	.67**	.45**	.04	.21	.47**	.07	.14	.83**	.56**	.68**	.27	.50**	.23	.22	1					
18 T12 IE	.23	.11	.48**	.83**	.45**	.46**	.68**	.20	-.03	.42	.83**	.63**	.54**	.75**	.34*	.00	.56**	1				
19 T12 ID	.20	.18	.49**	.53**	.83**	.34	.52**	.23	.20	.60**	.71**	.77**	.46**	.65**	.35*	.10	.74**	.78**	1			
20 T12 Dep	.05	-.11	.16	.45**	.53**	.50**	.42**	.13	-.10	.22	.58**	.40**	.46**	.51**	.33*	-.25	.28*	.62**	.57**	1		
21 T12 PTSS	.13	.00	.37*	.64**	.45**	.49**	.58**	.27	.11	.53**	.75**	.61**	.44**	.69**	.38**	.03	.51**	.77**	.65**	.62**	1	
22 T12 PTG	.38**	.27	-.04	.27	.64**	.21	.23	.48**	.29*	.15	.40**	.31**	.17	.37*	.49**	.46**	.17	.34*	.28*	-.04	.31*	1

Note: *$p < .05$, **$p < .01$. Primary control engagement (PCE), secondary control engagement (SCE), disengagement (D), involuntary engagement (IE), involuntary disengagement (ID), depressive symptoms (Dep), posttraumatic stress symptoms (PTSS), post traumatic growth (PTG).

Table 4. Linear Growth Models: Primary Caregiver Engagement/Disengagement Strategies

		Fixed Effects		Random Effects	
Model	AIC	Intercept *b* (SE)	Slope *b* (SE)	Intercept σ^2 (SE)	Slope σ^2 (SE)
Primary Control Engagement					
1	2232.35	24.40 (0.41)***			
2	2198.90	20.99 (0.67***	-2.94 (0.48)***		
3	**2160.77**	**21.37 (0.69)*** **	**-2.71 (0.39)*** **	**21.17 (4.79)*** **	
Secondary Control Engagement					
1	1969.47	23.14 (0.27)***			
2	1962.63	21.99 (0.47)***	-.99 (0.33)**		
3	**1900.25**	**21.87 (0.46)*** **	**-1.04 (0.25)*** **	**11.23 (2.02)*** **	
Disengagement					
1	2017.29	16.04 (0.29)***			
2	2007.99	14.64 (0.50)***	-1.20 (0.36)***		
3	**1871.58**	**14.74 (0.48)*** **	**-1.13 (0.21)*** **	**18.84 (2.74)*** **	
Involuntary Engagement					
1	2103.26	19.03 (0.33)***			
2	2079.83	16.67 (0.56)***	-2.04 (0.40)***		
3	**1977.67**	**16.73 (0.54)*** **	**-1.97 (0.26)*** **	**20.33 (3.17)*** **	
Involuntary Disengagement					
1	1930.59	15.22 (0.25)***			
2	1916.90	13.79 (0.44)***	-1.23 (0.31)***		
3	**1815.72**	**13.82 (0.43)*** **	**-1.21 (0.20)*** **	**13.21 (2.07)*** **	

Note: *p < .05, **p < .01., ***p < .001. AIC = Akaike Information Criteria.

Table 5. Linear Growth Models: Secondary Caregiver Engagement/Disengagement Strategies

		Fixed Effects		Random Effects	
	AIC	Intercept *b* (SE)	Slope *b* (SE)	Intercept σ^2 (SE)	Slope σ^2 (SE)
Primary Control Engagement					
1	1378.01	23.63 (0.45)***			
2	1373.44	21.94 (0.79)***	-1.43 (0.55)**		
3	**1333.84**	**22.16 (0.77)*** **	**-1.39 (0.40)*** **	**23.16 (5.04)*** **	
Secondary Control Engagement					
1	1194.04	23.08 (0.28)***			
2	1193.21	22.28 (0.51)***	-.59 (0.35)		
3	**1146.89**	**22.78 (0.48)*** **	**-.41 (0.26)**	**8.67 (1.79)*** **	
Disengagement					
1	1302.39	16.78 (0.37)***			
2	1304.39	16.78 (0.66)***	-0.00 (0.46)		
3	**1203.61**	**16.79 (0.59)*** **	**0.01 (0.26)**	**19.91 (3.38)*** **	
Involuntary Engagement					
1	1361.06	18.81 (0.42)***			
2	1361.51	18.03 (0.75)***	-0.66 (0.53)		
3	**1249.84**	**18.02 (0.67)*** **	**-0.69 (0.28)***	**26.38 (4.40)*** **	
Involuntary Disengagement					
1	1264.71	15.32 (0.34)***			
2	1266.42	15.06 (0.60)***	-.22 (0.42)		
3	**1199.50**	**15.16 (0.57)*** **	**-.15 (0.27)**	**14.94 (2.77)*** **	

Note: *p < .05, **p < .01., ***p < .001. AIC = Akaike Information Criteria.

Table 6. Linear Growth Models: Primary and Secondary Caregiver Adjustment

		Fixed Effects		Random Effects	
Model	AIC	Intercept *b* (SE)	Slope *b* (SE)	Intercept σ^2 (SE)	Slope σ^2 (SE)
Primary Caregiver Depressive Symptoms					
1	2129.65	11.52 (0.36)***			
2	2096.98	8.59 (0.59)***	-2.55 (0.42) ***		
3	**2021.74**	**8.76 (0.58) *** **	**-2.43 (0.29) *** **	**20.70 (3.51)*** **	
Primary Caregiver Post-Traumatic Stress Symptoms					
1	2737.57	24.77 (0.91)***			
2	2706.10	17.35 (1.52)***	-6.42 (1.08)***		
3	**2591.83**	**18.41 (1.48)*** **	**-5.94 (0.69)*** **	**160.89 (24.69)*** **	
Secondary Caregiver Depressive Symptoms					
1	1332.50	10.11 (0.42)***			
2	1323.03	8.03 (0.73)***	-1.77 (0.52)***		
3	**1299.18**	**8.06 (0.73)*** **	**-1.69 (0.42)*** **	**14.08 (3.64)*** **	
Secondary Caregiver Post-Traumatic Stress Symptoms					
1	1753.17	23.84 (1.07)***			
2	1743.77	18.52 (1.88)***	-4.47 (1.31)***		
3	**1679.73**	**18.12 (1.76)*** **	**-4.56 (0.86)*** **	**141.05 (26.73)*** **	

Note: *p<.05, **p<.01., ***p<.001. AIC = Akaike Information Criteria.

Table 7. Linear Growth Models: Primary and Secondary Caregiver Regulatory Flexibility

		Fixed Effects		Random Effects	
	AIC	Intercept *b* (SE)	Slope *b* (SE)	Intercept σ^2 (SE)	Slope σ^2 (SE)
Primary Caregiver Regulatory Flexibility					
1	1758.62	-2.88 (0.20)***			
2	1760.23	-2.70 (0.35)***	0.15 (0.25)		
3	**1669.54**	**-2.70 (0.34)*** **	**0.17 (0.17)**	**7.39 (1.20)*** **	
Secondary Caregiver Regulatory Flexibility					
1	1197.96	-2.85 (0.29)***			
2	1199.96	-2.83 (0.52)***	0.02 (0.36)		
3	**1146.87**	**-2.53 (0.25)*** **	**0.16 (0.25)**	**9.74 (1.94)*** **	

Note: *p < .05, **p < .01., ***p < .001. AIC = Akaike Information Criteria.

Table 8. Trajectories of Cognitive Engagement/Disengagement Predicting PTG at One Year

	Primary Caregivers	Secondary Caregivers
Primary Control Engagement		
Intercept *b* (SE)	21.04 (0.61)***	21.73 (0.76)***
Time *b* (SE)	-2.33 (0.40)***	-1.45 (0.44)
PTG *b* (SE)	3.08 (0.61)***	2.75 (0.76)***
PTG*Time *b* (SE)	0.98 (0.40)*	-0.02 (0.44)
Secondary Control Engagement		
Intercept *b* (SE)	21.94 (0.52)***	22.39 (0.53)***
Time *b* (SE)	-1.11 (0.28)	-0.17 (0.27)
PTG *b* (SE)	0.88 (0.52)†	1.65 (0.54)**
PTG*Time *b* (SE)	-0.01 (0.28)	0.27 (0.28)
Disengagement		
Intercept *b* (SE)	14.54 (0.53)***	16.80 (0.75)***
Time *b* (SE)	-1.13 (0.22)	0.00 (0.28)
PTG *b* (SE)	0.20 (0.53)	1.11 (0.75)
PTG*Time *b* (SE)	-.11 (0.22)	0.52 (0.28)†
Involuntary Engagement		
Intercept *b* (SE)	16.60 (0.60)***	17.92 (0.83)***
Time *b* (SE)	-2.04 (0.28)**	-0.82 (0.30)
PTG *b* (SE)	0.85 (0.60)	2.27 (0.83)**
PTG*Time *b* (SE)	0.04 (0.28)	0.08 (0.30)
Involuntary Disengagement		
Intercept *b* (SE)	13.67 (0.46)***	15.02 (0.63)***
Time *b* (SE)	-1.32 (0.21)**	-0.21 (0.30)*
PTG *b* (SE)	0.54 (0.46)	1.52 (0.63)*
PTG*Time *b* (SE)	0.15 (0.21)	0.54 (0.30)†

Note: *$p < .05$, **$p < .01$., ***$p < .001$.

Table 9. Regression Coefficients for Engagement/Disengagement Predicting PTG at One Year: Main and Quadratic Effects

	Primary Caregivers	Secondary Caregivers
Disengagement		
Constant *b* (SE)	62.23 (3.51)***	64.70 (4.99)***
Disengagement *b* (SE)	2.47 (3.13)	8.38 (4.36)
Disengagement^2 *b* (SE)	-1.16 (2.69)	-6.95 (3.11)*
Involuntary Engagement		
Constant *b* (SE)	63.32 (3.38)***	58.89 (5.26)***
Inv. Engagement *b* (SE)	4.29 (2.68)	10.27 (3.79)**
Inv. Engagement^2 *b* (SE)	-1.96 (2.4)	-0.74 (3.24)
Involuntary Disengagement		
Constant *b* (SE)	62.31 (3.41)***	54.62 (5.39)***
Inv. Disengagement *b* (SE)	3.31 (3.05)	6.06 (4.56)
Inv. Disengagement^2 *b* (SE)	-1.29 (2.76)	3.70 (4.23)

Note: *$p < .05$, **$p < .01$., ***$p < .001$.

Table 10. Trajectories of Regulatory Flexibility Predicting PTG at One Year

	Primary Caregivers	Secondary Caregivers
Regulatory Flexibility		
Intercept *b* (SE)	-2.79(0.37)***	-2.86 (0.53)***
Time *b* (SE)	0.17 (0.17)	0.22 (0.28)
PTG *b* (SE)	1.23 (0.37)***	2.48 (0.53)***
PTG*Time *b* (SE)	0.16 (0.17)	0.55 (0.28)*

Note: *$p < .05$, **$p < .01$., ***$p < .001$.

Table 11. Trajectories of Caregiver Adjustment predicting PTG at One Year

	Primary Caregivers	Secondary Caregivers
Depressive Symptoms		
Intercept *b* (SE)	8.73 (0.63)***	8.01 (0.81)***
Time *b* (SE)	-2.28 (0.29)***	-1.73 (0.45)***
PTG *b* (SE)	-0.37 (0.63)	-0.14 (0.82)
PTG*Time *b* (SE)	-0.47 (0.30)	-0.80 (0.45)
Post-Traumatic Stress Symptoms		
Intercept *b* (SE)	17.59 (1.61)***	18.49 (1.99)***
Time *b* (SE)	-5.72 (0.74)***	-4.57 (0.89)***
PTG *b* (SE)	1.81 (1.61)	4.78 (2.00)*
PTG*Time *b* (SE)	-1.29 (0.74)	0.26 (0.90)

Note: *$p < .05$, **$p < .01$., ***$p < .001$.