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The Posttraumatic Growth Process in Young Adult Survivors of Adolescent Cancer: The Relevance of Peer Relationships and Self-esteem

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THE POSTTRAUMATIC GROWTH PROCESS IN YOUNG ADULT SURVIVORS OF ADOLESCENT CANCER: THE RELEVANCE OF PEER RELATIONSHIPS AND SELF-ESTEEM

by

JENSI GISE

Under the Direction of Lindsey Cohen, PhD

ABSTRACT

Many youth with cancer experience positive outcomes, such as posttraumatic growth (PTG). This study aimed to understand the process that theoretically precedes PTG, often described as a shattering and rebuilding of world-views, for young adult survivors (YAS) of childhood cancer. Peer relationships (PR) and self-esteem (SE) were evaluated as two world-views that might be vulnerable to change during a youth's cancer experience. In this study, YAS retrospectively reported their PR and SE before and during their cancer, and currently as survivors, in addition to current PTG. Six patterns of change in PR and SE across the cancer experience were identified. Individuals who endorsed a pattern that mirrored the process that theoretically precedes PTG in their SE, reported higher PTG than individuals who did not endorsed that pattern. Findings provide insight into how YAS remember their cancer experience and its impact on current circumstances and positive adaptation.

INDEX WORDS: Childhood cancer, Posttraumatic growth, Peer relationships, Self-esteem, Patterns, Young adults, Survivorship

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JENSI GISE

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May 2020

DEDICATION

This work is dedicated to the survivors of pediatric cancer, especially to those whom I have personally had the privilege to know and learn from.

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS ..... **V**

LIST OF TABLES ..... **IX**

LIST OF FIGURES ..... **X**

1 INTRODUCTION **1**

1.1 Pediatric Cancer Prevalence **1**

1.2 Pediatric Cancer Experience **1**

1.3 Pediatric Cancer as Trauma **9**

1.4 Posttraumatic Growth **10**

1.4.1 Posttraumatic Growth Outcome ***11***

1.4.2 Posttraumatic Growth Outcome in Various Populations ***11***

1.4.3 Posttraumatic Growth Outcome in Adolescents ***12***

1.4.4 Posttraumatic Growth Outcome in Adolescents with Cancer ***13***

1.4.5 Posttraumatic Growth Process ***14***

1.5 Peer Relationships **16**

1.6 Self-Esteem **18**

1.7 Current Study **20**

1.7.1 Aim 1 and Hypotheses ***21***

1.7.2 Aim 2 and Hypotheses ***22***

2 METHODS **23**

2.1 Participant Sample and Recruitment 23

2.2 Procedure 24

2.3 Measures 25

2.3.1 Pediatric Peer Relationships 25

2.3.2 Self-Esteem 26

2.3.3 Posttraumatic Growth 27

2.4 Data Analyses 28

2.4.1 Preliminary Analyses 28

2.4.2 Primary Analyses 28

3 RESULTS 31

3.1 Preliminary and Descriptive Analyses 31

***3.2* Primary Analyses 34**

3.2.1 Primary Aim 1 34

3.2.2 Primary Aim 2 52

4 DISCUSSION 54

4.1 Purpose and Overview 54

4.2 Preliminary Analyses 55

4.3 Patterns of Change in Peer Relationships and Self-Esteem 57

4.3.1 No-Change Pattern 59

4.3.2 Recovery Pattern 60

4.3.3 Partial Recovery Pattern 61

4.3.4 Decreasing Pattern 63

4.3.5 Increasing Pattern 64

4.3.6 Pre-PTG Pattern 66

4.3.7 Peer Relationship Patterns 67

4.3.8 Self-Esteem Patterns 68

4.4 Primary Aim 2 70

4.5 Limitations and Future Directions 73

4.6 Summary and Conclusions 75

REFERENCE 77

APPENDICES 100

Appendix A 100

Appendix B 102

Appendix C 104

LIST OF TABLES

Table 1 Participant Demographic Information (N = 90) 23

Table 2 Descriptives of Study Variables 32

Table 3 Intercorrelations Among Study Variables 33

Table 4 Group Descriptives for Patterns in Peer Relationships 41

Table 5 Group Descriptives for Patterns in Self-Esteem 50

LIST OF FIGURES

Figure 1. Theorized Posttraumatic Growth Process Pattern (Pre-PTG) 22

Figure 2. No-Change pattern for peer relationships. 35

Figure 3. Recovery pattern for peer relationships. 36

Figure 4. Partial Recovery pattern for peer relationships. 37

Figure 5. Decreasing pattern for peer relationships. 38

Figure 6. Increasing pattern for peer relationships. 39

Figure 7. Pre-PTG pattern for peer relationships. 40

Figure 8. Plots of pattern averages for peer relationships. 42

Figure 9. No-Change pattern for self-esteem. 44

Figure 10. Recovery pattern for self-esteem. 45

Figure 11. Partial Recovery pattern for self-esteem. 46

Figure 12. Decreasing pattern for self-esteem. 47

Figure 13. Increasing pattern for self-esteem. 48

Figure 14. Pre-PTG pattern for self-esteem. 49

Figure 15. Plots of pattern averages for self-esteem. 51

1 INTRODUCTION

1.1 Pediatric Cancer Prevalence

The incidence of pediatric cancer has been increasing at about 0.6% annually in the last several decades, with an estimated 15,590 children and adolescents in the United States being diagnosed with cancer in 2018 (National Cancer Institute, 2018). Although the prevalence of cancer has increased, death rates in both children and adolescents have decreased by more than half, resulting in an overall five-year or greater survival rate of about 83% for youth who were diagnosed with cancer from 2005 to 2011 (Siegel, Miller, & Jemal, 2016). Data from 2014 shows that there were approximately 429,000 survivors of pediatric cancer in the United States (National Cancer Institute, 2018). The growing prevalence of cancer, paired with increased survival rates, underscores the importance of better understanding the pediatric cancer experience and outcomes for young adult survivors of pediatric cancer.

1.2 Pediatric Cancer Experience

The pediatric cancer experience can be described in three broad phases, including diagnosis, treatment, and survivorship. One commonality across phases is that there are stressors and challenges for the young patient. During the diagnosis phase, which can vary in length, youth and their families must cope with the initial shock of learning that the child has a life-threatening disease and deal with questions and thoughts about mortality (Brown, 2014; Stegenga & Ward-Smith, 2009). Childhood cancers might be quite different from adult cancers; thus, it is important to find an oncologist who specializes in treating pediatric cancer (Pizzo, Poplack, Adamson, Blaney & Helman, 2016), which may involve stressful and pressured periods of searching for the right provider for a child. Diagnostic processes vary depending on a child's symptoms, age, health condition, and the suspected type of cancer; however, typically a series of

tests, exams, and procedures will be required. Diagnostic tests and procedures might include blood tests; biopsies; ultrasound; or other imaging techniques such as computed tomography (CT), positron emission tomography (PET), or magnetic resonance imaging (MRI) (Allen-Rhoades & Steuber, 2016, as cited in Pizzo, Poplack, Adamson, Blaney, & Helman, 2016; Heerema-McKenney, Cleary, & Arber, 2016, as cited in Pizzo, Poplack, Adamson, Blaney, & Helman, 2106; Jadvar, Connolly, Fahey, & Shulkin, 2007). These procedures can be time-consuming, uncomfortable, and painful (Ljungman, Gordh, Sorensen, & Kreuger, 2000). Often, a combination of methods and repeated tests are necessary to determine a cancer diagnosis (Brown, 2006) and these procedures are associated with fear, anxiety (Anderzen-Carlsson, Sorlie, & Kihlgren, 2012; Blount, Sturges, & Powers, 1990), distress (Jibb et al., 2015; Varni & Katz, 1997), withdrawal, and muscle tension for children and adolescents (Katz, Kellerman, & Siegle, 1980).

Upon diagnosis with cancer, youth often report feeling sad, afraid, concerned, discouraged, or angry in response to the invasive diagnostic procedures and other stressors (Caprini & Motta, 2017), including the myriad of changes to daily life (Caprini & Motta, 2017) and the loss of normalcy their diagnosis brings (Stegenga & Ward-Smith, 2009). A cancer diagnosis can be isolating for young people, and involves a sense of alienation from friends due to missing school and other activities (Hedstrom, Skolin, & von Essen, 2004), along with simultaneous increased dependence on parents (Williams, McCarthy, Eyles, & Drew, 2013). Adolescents worry about fear of dying, imminent medical treatments, and how their physical appearance will be altered (e.g., hair loss from treatment, amputation of a limb) (Hedstrom, Skolin, & von Essen, 2004). Some children and adolescents report symptoms of posttraumatic stress (Phipps, Long, Hudson, & Rai, 2005) following a diagnosis of cancer; however, many do

not experience symptoms of posttraumatic stress related to their diagnosis (Phipps et al., 2014). Youth also report that knowing their diagnosis is better than having a sense of uncertainty about their health (Hedstrom, Skolin, & von Essen, 2004). Taken together, this suggests that youth may experience a range of emotions during the diagnosis phase of pediatric cancer and individual's experiences may vary.

Treatment of pediatric cancer is based on the type and stage of the cancer; however, the treatment phase typically involves additional painful and invasive procedures, such as intravenous injection, lumbar puncture, and bone marrow aspiration (Kuppenheimer & Brown, 2002). Common treatments for pediatric cancer include surgery, chemotherapy, and radiation therapy (National Cancer Institute, 2018), all of which have immediate side effects and require adherence to a strict medical regimen. Treatment by surgery involves the removal of a cancerous or non-cancerous tumor or body part where the tumor is located, and may involve procedural sedation and risk of infection for the young patient (Loeffen et al, 2015). Chemotherapy is a drug therapy that destroys cancer cells and may be administered in invasive ways such as intravenous tubes placed into the spine, muscle, or skin via a needle. Other times chemotherapy may be administered by pill, but in either scenario, a chemotherapy regimen typically consists of a number of treatments over an extended period of time and immediate side effects including nausea, vomiting, mouth sores, fatigue, loss of hair, decreased appetite, loss of weight, and risk of infection (Brown, 2014; Hedstrom, Skolin, & von Essen, 2004). Radiation therapy destroys cancer cells via high doses of radiation. Children are required to lie still and alone while the radiation is administered via an external laser in specialty clinics with intimidating large equipment. Radiation therapy is administered on a schedule, sometimes multiple times a day, for a set period of time. Immediate side effects of radiation therapy in children and adolescents

typically include stomach discomfort, skin reactions, and lethargy (Brown, 2006). Children may undergo a combination of multiple treatments within a short and intense time-period or an extended period of treatment for years (Brookstein, Cohen, & Walco, 2002). Across the treatment phase, it is common for the adolescent to have unplanned and extended hospitalizations due to unexpected procedures, treatment of acquired infections, pain management, or dehydration (Warner, Kirchhoff, Nam, & Fluchel, 2015).

In summary, pediatric cancer treatment often involves painful and invasive procedures that might be repeated and are associated with an array of negative physical side-effects (Zebrack, Kent, Keegan, Kato, & Smith, 2014a). It is not uncommon for youth with cancer to experience anxiety and discomfort before, during, and after cancer treatments (Flowers & Birnie, 2015; Kellerman, Zeltzer, Ellenberg, & Dash, 1983). Cancer treatment in youth has been associated with anticipatory anxiety about upcoming medical procedures, distress and pain during the procedure, and anxiety around side-effects of treatment (Blount, Sturges, & Powers, 1990; Brookstein, Cohen, & Walco, 2002; Kuppenheimer & Brown, 2002; Cline et al., 2006; Jay, Ozolins, Elliot, & Caldwell, 1983; Katz, Kellerman, & Siegel, 1980; Kellerman et al., 1983).

Frequent visits to a clinic, planned or unplanned hospitalizations, and compromised immune health during the treatment phase may impact the normalcy of adolescent life. Treatment demands force youth to miss school and social situations, which contribute to poor academic performance, stress, and feelings of alienation from friends and peers (Brown, 2014; Elizelaine de Chico, Castanheira, & Garcia 2010; Loeffen et al., 2015; Rodriguez et al., 2012). In addition to feeling isolated and bored (Brookstein, Cohen, & Walco, 2002), youth with cancer must manage limitations (physical and cognitive) from treatment and cope with feeling different from peers (Woodgate, 2006; Zebrack et al., 2014a). Changes in social relationships and social

activity are common (Kent et al, 2012; Pendley, Dahlquist, & Dreyer, 1997; Zebrack et al., 2014a), which are understandable given that treatment often requires an abrupt transition from having a busy adolescent schedule (e.g., social activities, schoolwork) to lying in a hospital bed for extended periods of time.

Some adolescents report feeling a loss of control related to their treatment process and unpredictable health, which contributes to anger, frustration, a sense of inadequacy, and distress that can persist even after treatment ends (Wicks & Mitchell, 2010). Youth may also struggle to form a new identity as a cancer patient and potentially cope with the death of friends who died from cancer (Bessell, 2001; Jones, Parker-Raley, & Barczyk, 2011; Woodgate, 2006; Zebrack et al., 2014a).

Adolescents with cancer may experience negative changes in their body image, which can contribute to feeling self-conscious, anxious (Williamson, Harcourt, Halliwell, Frith, & Wallace, 2010), and different from peers (Larouche & Chin-Peuckert, 2006). Some adolescents express reduced self-confidence and poorer self-esteem in response to concerns about the loss of their hair and other changes in appearance which make it obvious they are on treatment (Wallace, Harcourt, Rumsey, & Foot, 2007).

It should be noted that research on adolescent distress throughout cancer treatment is mixed, with some data indicating that adolescents have elevated distress during the first year of their cancer experience (e.g., Zebrack et al., 2014b), some suggesting that procedural and treatment related anxiety decreases over the first year since initial diagnosis (e.g., Dupuis et al., 2016), and some showing that children's level of distress does not differ or decrease across the treatment phase (e.g., Jay et al, 1983). Depression, often attributed to symptoms of treatment (Zebrack et al., 2014a), has also been documented in youth with cancer. Although many

researchers have found negative psychological responses to cancer treatment in youth, others have found that pediatric cancer patients report behavioral and emotional problems, depression, and anxiety similar to the general population (Patenaude & Kupst, 2005) and many youth do not indicate decline in functioning during their cancer experience (Phipps et al., 2014). Taken as a whole, the treatment trajectory and psychosocial responses are highly variable in youth with cancer.

At the end of successful treatment, youth enter the "survivorship" phase. Survivorship refers to the period of time when a person has been treated for cancer and is successfully off of treatment (Zebrack & Chesler, 2001). Survivorship refers to life and health from the end of cancer treatment through the end of life and emphasizes the importance of long-term and late treatment-related effects that persist into adulthood (Meadows & D'Angio, 1974; National Cancer Institute, 2018). There are data to suggest that there can be physical and psychological health problems that may develop months or years after treatment (National Cancer Institute, 2018; Weiner & Simone 2003). Some common late and long-term effects of pediatric cancer include higher rates of abnormal pulmonary function, hearing loss, reproductive and endocrine dysfunction, cardiac conditions, long-term toxicity, and neurocognitive impairment (Butler & Haser, 2006; Galligan, 2017; Hudson, Ness, & Gurney, 2013; Landier et al., 2004; Schwartz, 1995; Weiner & Simone, 2003); all of which require adjustment and management during the survivorship phase. Other common issues, such as fatigue and aches and pains, also persist and are related to quality of life for pediatric cancer survivors (Zebrack & Chesler, 2002). Many survivors follow a medical care-plan that involves testing to check for cancer recurrence, medical management of long-term effects with other medical specialists, psychosocial support, and financial support (Landier et al., 2004; National Cancer Institute, 2018; Weiner & Simone 2003).

Furthermore, pediatric cancer survivors might have to manage ongoing long-term cognitive, behavioral, and emotional outcomes related to neurotoxicity or neurodevelopmental issues associated with cancer or earlier treatment (e.g., Marusak et al., 2018).

During the immediate survivorship phase, youth and their families are often faced with rebuilding their lives due to changed perspectives as a result of cancer (Barrera, Shaw, Speechley, Maunsell, & Pogany, 2005; Brown, 2014) and managing uncertainty around the success of their treatment (Decker, Haase, & Bell, 2007). Whereas severe psychiatric disorders for pediatric cancer survivors are not found to be greater than the rates in the general population (Fritz, Williams, & Amylon, 1988), some survivors do struggle with adjustment and the difficulties that accompany survivorship, such as future health concerns (Zeltzer, 1993), altered life perspectives, changed perceptions of self, lasting effects on relationships (Brown, Pearce, Bailey, & Skinner, 2016), and difficulty with school re-entry and socialization (Barrera et al., 2005; Libman, 2017). Transition to survivorship may be confusing for adolescents as they shift from their identity as a cancer patient to a new identity as a survivor (Jones, et al., 2011) and some report low self-esteem (von Essen, Enskar, Kreuger, Larsson, & Sjoden, 2000), low self-worth, negative body image, and social anxiety upon entering survivorship (Pendley, et al., 1997). Young adult survivors of pediatric cancer sometimes describe feeling unprepared to manage the late-effects of their treatment, which are health effects that occur during survivorship as a result of cancer treatment, and confused about being neither healthy nor sick as they re-enter daily life after cancer (Hauke, Larsen, & Holsen, 2013). Upon completion of treatment, some children report higher depression and elevated anxiety (Hobbie et al., 2000; von Essen et al., 2000) in addition to distress (Zebrack, et al., 2014b) related to intrusive memories of cancer treatment (Greenberg et al., 1997). Some researchers have found that approximately one fifth of

pediatric cancer survivors meet criteria for posttraumatic-stress disorder at some point after successfully completing treatment (Hobbie et al., 2000).

In contrast, adolescents also report positive outcomes after having completed cancer treatment, such as increased motivation, focus, and confidence (Wicks & Mitchell, 2010). For the majority of survivors, severe psychosocial problems are rare (Fritz, Williams, & Amylon, 1988; Phipps et al., 2014; Yallop, McDowell, Koziol-McLain, & Reed, 2013) with some survivors being higher in positive affect and lower in negative affect than healthy peers (Gray et al., 1992). Survivors describe being better able to engage in perspective taking for everyday life stressors because of their cancer experience (Wallace et al., 2007) and demonstrate higher global-self-worth compared to healthy controls after treatment has ended, suggesting they may have matured or grown because of their cancer experience (e.g., Bessell, 2001). Some adolescents reflect positively on their self-image during survivorship after having been concerned and anxious about their appearance during treatment (Wallace et al., 2007). Survivors generally report being happy, feeling good about themselves, and being hopeful about their futures (e.g., Zebrack & Chesler, 2001). Whereas, survivors participate in fewer social activities (Pendley et al, 1997) and feel as if they matured faster than peers because of their cancer (Wicks & Mitchell, 2010), they do not differ significantly from healthy peers on measures of social anxiety or loneliness (Pendley et al, 1997). Many report social adjustment post treatment to be positive (Bessell, 2001) and result in stronger personal relationships with friends and family (Wicks & Mitchell, 2010; Zebrack & Chesler, 2002).

Whereas many survivors of pediatric cancer do not experience negative psychological outcomes (Howard Sharp, Rowe, Russell, Long & Phipps, 2014), there is a critical subset of individuals who do report high levels of anxiety, distress, negative health beliefs, and

posttraumatic stress symptoms (Bitsko et al., 2016; Hobbie et al., 2000). In summary, the impact of cancer on youth is multifaceted, variable, and can impact various aspects of an adolescent's life, including social roles and engagement, academic achievement, identity formation, and mental and emotional health throughout the course of treatment and survivorship (Foster & Stern, 2014; Kim, White, & Patterson, 2016); however, many children with a history of cancer demonstrate resilience (Howard Sharp, Rowe, Russell, Long, & Phipps, 2014).

1.3 Pediatric Cancer as Trauma

Pediatric cancer is an unpredictable and life-threatening illness. Older children and adolescents can recognize the serious and potentially fatal nature of cancer, which for some can be traumatic (Stuber, Kazak, Meeske, & Barakat, 1998) and challenge their beliefs about their safety (Kazak et al, 2006). Some children who have undergone cancer treatment display symptoms similar to children exposed to other traumatic events (e.g., violence and abuse), such as the re-experiencing of treatment-related distress (Greenberg et al., 1997; Stuber, Nader, Yasuda, Pynoos, & Cohen, 1991) and posttraumatic-stress symptoms (Erickson & Steiner, 2001; Stuber et al., 1991). For youth who face a potentially life-threatening illness such as pediatric cancer, evidence shows that they appraise and interpret their experience of the event as traumatic based on their subjective experience, rather than objective indices (e.g., disease severity, treatment intensity) (Stuber et al., 1997; Stuber et al., 1998); thus, some youth may view their cancer as traumatic, whereas others may not, independent of their objective cancer trajectory.

Researchers have conceptualized pediatric cancer and treatments as traumatic or potentially traumatic experiences (Kazak et al., 2001; Rourke, Hobbie, Schwartz, & Kazak, 2007; Stuber et al., 1998), suggesting that, for some children, it may lead to pediatric medical traumatic stress (Kazak et al., 2006). Pediatric medical traumatic stress (National Child

Traumatic Stress Network, 2018) refers to children's physiological and psychological responses to frightening medical procedures, treatments, serious illness, and pain and has been reported in a variety of childhood illnesses including pediatric cancer (Kazak et al., 2006). Other researchers have suggested applying an early adversity framework to understanding pediatric cancer and the negative neurodevelopmental effects it may leave on survivors (Marusak et al., 2018). Still, others have found that youth may not conceptualize their cancer as traumatic, but rather as a significant and manageable event (Howard Sharp, Rowe, Russell, Long, & Phipps). Although pediatric cancer has been established in the literature as being potentially traumatic for some youth, there may be positive outcomes at later stages. In fact, when reporting about their cancer, youth tend to report more positive outcomes and less negative outcomes than healthy peers, and indicate that although cancer is challenging and significant, they may actually thrive in the face of such adversity (Phipps et al., 2014).

1.4 Posttraumatic Growth

Tedeschi and Calhoun's Posttraumatic Growth (PTG) theory (1996) suggests that people can experience "positive psychological change as the result of struggle with highly challenging life circumstances or traumatic events" (Tedeschi & Calhoun, 2004, p. 1). PTG is described as both an outcome and a process. The outcome of PTG, commonly measured by the Posttraumatic Growth Inventory (PTGI) (Tedeschi & Calhoun, 1996), has been studied extensively across a variety of populations, and is described as perceived positive growth in the aftermath of trauma or difficult life experiences. Separately, the process of PTG, describes an individual's trajectory beginning from the onset of adversity and is theorized to be the pathway by which one arrives at the outcome of PTG; however, the empirical basis for the process of PTG is lacking.

1.4.1 Posttraumatic Growth Outcome

The PTG outcome has been conceptualized as a potential consequence of adversity, difficult experiences, or trauma and has been found to reflect positive changes in cognition in five broad domains: Appreciation of Life, New Possibilities, Spirituality, Relating to Others, and Personal Strength (Tedeschi & Calhoun, 2004). Appreciation of Life reflects appreciation for one's existence, positive perspectives on life, goals of living each day to the fullest, or heightened sense of priorities (Tedeschi & Calhoun, 1996; Tedeschi & Calhoun, 2004). New Possibilities is described as recognition of one's ability to take new or different paths in life (Tedeschi and Calhoun, 2004). The Spirituality domain reflects one's religious views or engagement with existential questions (Tedeschi and Calhoun, 2004); however, some have noted that it is difficult to distinguish the degree to which baseline spirituality impacts PTG in this domain (Picoraro, Womer, Kazak, & Feudtner, 2014). Relating to Others refers to meaningful personal relationships with parents, siblings, or peers, in addition to compassion for others who have experienced similar adversity (Tedeschi & Calhoun, 2004). Personal Strength involves one's ability to cope and a sense of strength to survive adversities (Tedeschi & Calhoun, 2004). Altogether, positive changes in these domains reflect the PTG outcome; although, the amount of change in each domain may differ depending on the adverse event. PTG is often discussed with resilience outcomes; however, whereas resilience is indicated by minimal negative outcomes following adversity, PTG refers to growth beyond baseline and the experience of positive outcomes as the result of significant adversity.

1.4.2 Posttraumatic Growth Outcome in Various Populations

The PTG outcome has been studied extensively in a variety of populations and occurs in response to a number of traumatic experiences or stressful events, including war (Evans et al.,

2018; Ullman, 2014; Ulloa, Guzman, Salazar, & Cala, 2016), childhood abuse (Kaye-Tzadok & Davidson-Arad, 2016; Mohr & Rosen, 2017), natural disaster (Meyerson, Grant, Carter, & Kilmer, 2011; Taku, Cann, Tedeschi, & Calhoun, 2015; Zhou, Wu, Fu, & An, 2015), adult life-threatening illnesses including cancer (Danhauer et al., 2015; Wilson, Morris, & Chambers, 2014), and childhood cancer (Barakat, Alderfer, & Kazak, 2006; Koutna, Jelinek, Blatny, & Kepak, 2017; Meyerson et al., 2011; Picoraro et al., 2014; Yi, Zebrack, Kim, & Cousino, 2015). PTG has also been studied in individuals who are exposed to a variety of other difficult life events such as the loss of a loved one (Frazier et al., 2009; Sandberg & Grant, 2017), illness and injury (Danhauer et al., 2015; Frazier et al., 2009; Wilson et al., 2014), assault, accidents, and vicarious experiences of adversity among college student populations (Frazier et al., 2009; Smith & Cook, 2004). Thus, PTG is a possible outcome of a range of events, from traumatic experiences to less severe adverse experiences. Across populations and events, perceiving PTG as an outcome of one's adversity does not appear to relate to how much time has passed since the adverse event (Prati & Peitrantoni, 2009; Tedeschi & Calhoun, 2004), suggesting that the PTG outcome may be appropriately captured at various points after the trauma.

1.4.3 Posttraumatic Growth Outcome in Adolescents

The PTG outcome has been found to occur for youth in response to traumatic and stressful events. Child survivors of hurricanes (Cryder, Kilmer, Tedeschi, & Calhoun, 2006; Kilmer & Gil-Rivas, 2010) and other natural disasters (Hafstad, Gil-Rivas, Kilmer, & Raeder, 2010), urban youth who experienced the death of a loved one, pregnancy during adolescence, relationship problems, or the vicarious experience of a close loved-one's problems (Ickovics et al., 2006), and siblings of youth with cancer (Turner-Sack, Menna, Setchell, Maan, & Cataudella, 2016) have all reported PTG as an outcome of their respective adversity. In fact,

sufficient study of the PTG outcome in youth has warranted a systematic review (Meyerson et al., 2011). In this paper, the authors found that the relation between severity of trauma and PTG outcome is inconsistent, suggesting that PTG can occur as an outcome across varying degrees of stress, adversity, or trauma. Among adolescents, female youth tend to report higher PTG than males do; however, this finding is not consistent (Cryder et al., 2006; Laufer & Solomon, 2006; Laufer, Hamama-Raz, Levine, & Solomon, 2009). Very few studies have examined differences in PTG across race and ethnicity, and those that do have varying results (Milam, Ritt-Olsen, Tan, Unger, & Nezami, 2005; Wolchik, Coxe, Tein, Sandler, & Ayers, 2009). The relation of age to the outcome of PTG is mixed (Barakat et al., 2006; Laufer & Solomon, 2006; Meyerson et al., 2011; Milam, Ritt-Olson, & Unger, 2004); however, adolescents compared to children, may be more likely to experience growth after trauma because older youths have established world-views and schemas that are more developed and therefore more vulnerable to trauma than are the developing world-views of younger children (Janoff-Bulman, 1992; Meyerson et al., 2011). Posttraumatic stress symptoms also tend to correlate positively with the outcome of PTG in youth (Laufer & Solomon, 2006), highlighting that posttraumatic stress and PTG are not phenomena that exists on opposite ends of a spectrum but instead can co-exist.

1.4.4 Posttraumatic Growth Outcome in Adolescents with Cancer

Pediatric cancer survivors report experiencing positive outcomes as a result of their cancer experience (Castellano-Tejedor et al., 2015), including benefit finding (Currier et al., 2009; Koutna et al., 2017; Phipps, Long, & Ogden, 2007), meaning making (Parry & Chesler, 2005), and PTG (Barakat et al., 2006; Picoraro, et al., 2014; Zebrack, et al., 2012). For youth with cancer, age at data collection is not related to the PTG outcome; however, age at the time of diagnosis is, such that youth diagnosed at older ages are more likely to experience PTG than

individuals who were young children at the time of diagnosis (Barakat et al., 2006; Yi et al., 2015). Subjective ratings of treatment severity and life-threat are associated with PTG for adolescents with cancer, whereas, objective disease severity is not (Barakat et al., 2006). For youth with cancer, the PTG outcome is related to posttraumatic-stress symptoms (Barakat et al., 2006; Klosky et al., 2014), and benefit and burden are often reported simultaneously (Currier, Hermes, & Phipps, 2009), providing further evidence of the co-occurrence of stress and growth. Notably, the literature suggests that many youth report posttraumatic growth related to their cancer even when they may not have perceived their cancer as traumatic or to have caused decline in their functioning (Phipps et al., 2014).

1.4.5 Posttraumatic Growth Process

The PTG process is described in theory as the pathway by which one arrives at the PTG outcome and can be generally described as changes to an individual's world-view. According to Janoff-Bullman (1992), when trauma or difficult life circumstances occur, they disrupt and disconfirm the schemas that comprise an individual's world-view (i.e., specific assumptions and schemas about one's self, one's world, and how one relates to one's world). These schemas are developed via life experience and influence the expectations one has for his or her life (Jannoff-Bullman, 1992; Tedeschi & Calhoun, 2004). Tedeschi and Calhoun (2004) theorize a specific pattern that causes or precedes PTG (i.e., Pre-PTG). This Pre-PTG process involves an initial disruption or depreciation in world-view following adversity, and subsequently, a rebuilding. Unfortunately, there are scarce data showing patterns of change in one's world-view schemas before, during, and after adversity; however, there are studies of general changes to core beliefs related to the PTG outcome (Cann et al., 2010). Specifically, some evidence suggests that PTG outcome is more likely to occur when individuals reexamine their core beliefs following stressful

events (Taku et al., 2015) and for adolescents in particular, a challenge to one's core beliefs is predictive of the PTG outcome (Zhou et al., 2015). These findings support the Pre-PTG theory; however, they do not evaluate specific schemas that may be uniquely challenged by different experiences and traumas. Furthermore, these cross-sectional findings fail to shed light on how schemas change over the course of different time points around stressful events.

Several authors have suggested youth who experience adversity can be classified into a trajectories-of-change of either growth, recovery or stress resistant, or depreciation across their adverse experience from pre to during to post adversity (Kroneberg et al., 2010; Masten & Obradovic, 2008; Tillery, Sharp, Okado, Long, & Phipps, 2016). Individual responses to trauma or adversity are complex and it should be noted that there are many other patterns that could emerge in response to adversity. Some authors propose up to six or more unique trajectories (Masten & Obradovic, 2008), whereas others have found that the post-adversity patterns of youth are best described by three unique trajectories (Kroneberg et al., 2010; Tillery et al., 2016).

Different responses to trauma and stress result in part from the nature of the adversity and which specific schemas are threatened (Janoff-Bullman, 1992). Although data suggest that schemas related to the broad outcome-domains of PTG (i.e., Appreciation of Life, New Possibilities, Spirituality, Relating to Others, and Personal Strength) might change, there is a gap in the PTG literature regarding what unique schemas change for specific populations and specific adversities. It is likely that certain schemas are challenged and changed for youth with cancer that may differ from the schemas that are challenged in other populations and for other stressors (e.g., adults who experience domestic violence may experience disruptions to interpersonal relationship schemas, whereas, young child survivors of natural disaster may experience challenges to schemas related to environmental safety and life-predictability). The PTG process

in adolescents with cancer is likely related to changes in specific schemas that are unique to the impacts of life-threatening illness and treatment on aspects of life that are important during adolescence.

In summary, the PTG outcome is common in youth experiencing stressors and has been studied in adolescents who survived cancer; however, we know little about the PTG process, namely the specific worldview schemas and beliefs that might change for youth during the pediatric cancer experience. That said, developmental research paired with literature on adolescents with cancer would suggest that two primary schemas to consider are perspectives on peer relationships and self-esteem.

1.5 Peer Relationships

Peer relationships during adolescence influence individual growth, new experiences, and identity development (Laursen & Collins, 2011; Marion, Laursen, Zettergren, & Bergman, 2013). Data indicate that individuals spend increasing time with peers during adolescence and develop a need for interpersonal intimacy and closeness with peers because certain social skills are predominately acquired through interactions with friends (Laursen & Collins, 2011). Sullivan (1953) argued that friendships prepare adolescents for important future life events such as having intimate relationships in adulthood. Peer relationships during adolescence are also critical for individuation (Laursen & Collins, 2011). For example, adolescents' identity develops via peer interactions when they might be exposed to values that differ from those of their family (Cicchetti & Cohen, 2006). Some evidence suggests that peer relationships, specifically the risks of peer rejection and benefits of peer friendships during adolescence, are related to life satisfaction in adulthood (Marion, et al., 2013), setting peer relationships apart as a particularly important and influential factor in adolescence.

Peer relationships and changes to peer relationships may be particularly salient for adolescents with cancer. Some youth with cancer have difficulty maintaining friendships and are often isolated from peers due to compromised immune systems and demands of treatment, which result in absences from school and limited social interactions (Brown, 2014; Loeffen et al., 2015; Rodriguez et al., 2012; Yi, Kim, & Sang, 2016). Overprotective parenting styles during pediatric cancer may contribute to social withdrawal and dependence (Yi et al., 2016) and some youth describe that their new identity as cancer patient can lead to feeling different from peers without cancer (Jones et al., 2011). Pediatric cancer may interfere with the developmental importance of peer relationships and social activity during these pivotal years (Elizelaine de Chico et al., 2010) and result in changes to how youth perceive interpersonal relationships (Stuber, et al., 1998). For example, some youth with pediatric cancer report that different life experiences contribute to them feeling more mature than their peers and thus difficulty forming social and emotional bonds (Li, Lopez, Chung, Ho, & Chiu, 2013; Yi et al., 2016). Some recall feeling unaccepted, overlooked, invisible, picked on (Bessel, 2001), rejected, and bullied (Yi et al., 2016) during cancer treatment. Research suggests that youth with cancer may struggle with social competence (Katz, Leary, Breiger, & Friedman, 2011), social isolation (Noll et al., 1993), social anxiety, and peer acceptance (Bessell, 2001), and may be perceived by their peers as being more socially isolated than healthy youth (Noll, Bukowski, Davies, Koontz, & Kullkarni, 1993). It should be noted, however, that there are some data suggesting that youth with cancer do not differ from their healthy peers in terms of peer relationships and social interactions (Bessell, 2001).

Some survivors of pediatric cancer report worrying about their social lives (Yi et al., 2016) and experience difficulty with friendships (Mackie, Kiomdryn, & McNally, 2000). Many survivors, however, report positive social adjustment after treatment and clarity in identifying

close and dependable friendships (Bessell, 2001). Surviving pediatric cancer may result in stronger relationships with friends and family, and highlight the value of relationships with other adolescents who survived cancer as well (Wicks & Mitchell, 2010), contributing to a sense of social well-being among many survivors (Zebrack & Chesler, 2002). Brown (2014) describes that adolescents may experience a change in their friendships as a result of their cancer, noting that some friendships grow stronger, whereas others stay the same or fade away, suggesting that changes to peer relationships, while variable, may be an important part of the cancer experience (Kent et al., 2012; Pendley et al., 1997; Wicks & Mitchell, 2010; Zebrack & Chesler, 2002; Zebrack et al., 2014a, 2014b).

In summary, peer relationships are critical for adolescent development. There is variability in the subjective quality of peer relationships, which might be impacted by cancer. It is possible that some youth with cancer experience deterioration in their views on their peer relationships during their cancer journey, but perspectives on these relationships improve in the survivorship phase. Changes in how peer relationships are viewed for youth across their cancer experience may be critical to understanding the PTG process; however, no studies to date have examined the pattern of change in peer relationships over the course of cancer or how changes in perspectives might relate to the PTG outcome.

1.6 Self-Esteem

Self-esteem is central to adolescent development (Brinthaupt & Lipka, 2002; Chubb & Fertman, 1997). Self-esteem describes an individual's global attitude toward himself or herself (Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995), which might include aspects such as self-confidence, self-worth, and self-image. Self-esteem is related to psychological well-being (Rosenberg et al., 1995) and is believed to play an important role in youths' developmental

process (Block & Robins, 1993). The longitudinal course of self-esteem in adolescence through young adulthood has been found by some to stay consistent, with slight increases over time in the mean level of self-esteem for males and slight decreases for females (Block & Robins, 1993; Chub & Fertman, 1997). Low self-esteem has been related to stressful events (Hoffman, Ushpiz, & Levy-Shiff, 1988), whereas high self-esteem has been linked to positive events (Baumeister, Campbell, Krueger, & Vohs, 2003).

Self-esteem may be a schema that suffers during a youth's cancer given the range of stressors associated with diagnosis, treatment, and recovery. Some studies have found that youth with pediatric cancer report significantly lower self-esteem than healthy controls (Li et al., 2013). Others, however, have found that youth with cancer view their self-esteem similar to that of controls or healthy samples; for example, one study found that children with cancer, most of whom were actively in treatment during the study, reported self-esteem scores typical to that of the normative sample (Kellerman, Zeltzer, Ellenberg, Dash, & Rigler, 1980; Ritchie, 2001). Although findings are mixed, youths' perceptions of themselves have been found to be influenced by their cancer experience (Brown et al., 2016).

After treatment, some youth report discomfort with changes in their physical appearance, which is associated with heightened self-consciousness, and likely impacts self-esteem (Brown et al., 2016; Larouche & Chin-Peuckert, 2006; Williamson et al, 2010). Youth who are not able to hide side effects from cancer treatment (e.g., poor hair regrowth after chemotherapy or more pronounced scaring from surgery) and youth with limitations in functioning report feeling low self-confidence (Brown et al., 2016). Furthermore, some youth report a sense of inadequacy associated with loss of control over their health and life during cancer treatment (Wicks & Mitchell, 2010). Academic achievement might suffer both from school absences and impacts of

treatment on cognitive functioning and school performance (Baumeister et al., 2003; Brown, 2014), which has been found to impact self-esteem (Baumeister et al., 2003).

In contrast, survivors of pediatric cancer may view their self-esteem as higher than do healthy controls after treatment has ended suggesting they may have turned their experience into a growth opportunity (Bessell, 2001). Some adolescents reflect more positively on their self-image during survivorship after having been concerned and anxious about their appearance during treatment (Wallace et al., 2007). Other survivors report feeling good about themselves (Zebrack & Chesler, 2001) and indicate good views of their self-esteem (Mattsson, Ringner, Ljungman, & von Essen, 2007) or self-esteem comparable to individuals who did not have pediatric cancer (Langeveld, Grootenhuis, Voute, De Haan, & Van Den Bos, 2004). In summary, self-esteem is an important factor in adolescent development. Data suggest that cancer and treatment might influence the trajectory of how youth perceive their self-esteem over the course of the disease. However, how self-esteem perspectives change across the phases of cancer, and whether that change relates to the PTG outcome, is unclear.

1.7 Current Study

In summary, pediatric cancer can be challenging or traumatic and young adult survivors might experience a range of outcomes, including positive outcomes such as PTG. It has been suggested that the PTG process involves a depreciation and subsequent rebuilding of one's worldview (Pre-PTG) and results in the PTG outcome (Jannoff-Bullman, 1992; Tedeschi & Calhoun, 2004). To date, no study has empirically evaluated the underlying theoretical process of PTG in youth with cancer. Two key worldview schemas important for youth with cancer are perceptions of peer relationships and self-esteem. Although data suggest that peer relationships and self-esteem might fluctuate across pediatric cancer phases, there are no studies of these

patterns of change. In the current study, I evaluated the patterns of change in perceptions of peer relationships and self-esteem across cancer, and examined how these patterns relate to the PTG outcome.

1.7.1 Aim 1 and Hypotheses

In this study, I asked young adult survivors of adolescent cancer to evaluate their peer relationships and self-esteem at three time points: before cancer diagnosis (retrospectively); during the period they identify as the most traumatic time of their cancer experience (retrospectively); and the current time period, which reflects the survivorship phase. I hypothesized that adolescents would have unique patterns of changes in their perspectives of peer relationships and self-esteem across the three phases. Specifically, I expected a subset would evaluate their peer relationships and self-esteem relatively more negatively during the time period they identify as the most traumatic time during their cancer experience compared to before their diagnosis. I hypothesized that this group would evaluate peer relationships and self-esteem more positively during the current survivorship time period than both the most traumatic time and the time before diagnosis (Pre-PTG; see Figure 1). This pattern follows the theorized Pre-PTG process trajectory (Tedeschi & Calhoun, 2004) and aligns with research on resilience patterns in youth following adversity (Kroneberg et al., 2010; Masten & Obradovic, 2008; Tillery et al., 2016).

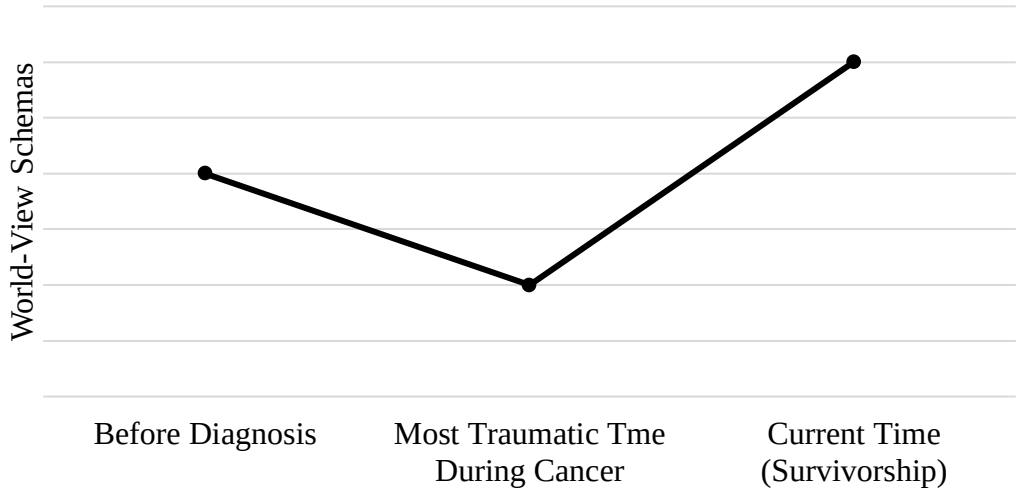

Figure 1. Theorized Posttraumatic Growth Process Pattern (Pre-PTG)

Given the variability of response to the pediatric cancer experience and literature on various trajectories of recovery for youth in the aftermath of adversity (e.g., Masten & Obradovic, 2008), I expected other patterns of change in perspectives on peer relationships and self-esteem would emerge, such as a stress resistant pattern indicating minimal or no change across each phase, or a pattern of depreciation showing continuous decrease across each phase (Kroneberg et al., 2010; Masten & Obradovic, 2008). Given inconsistencies in the sparse literature, no specific hypotheses for these other patterns were posed.

1.7.2 Aim 2 and Hypotheses

I proposed to evaluate how the patterns of change in peer relationships and self-esteem perspectives established in Aim 1 relate to the PTG outcome. On the basis of my assumption that a pattern mirroring the theoretical PTG process would emerge (i.e., Pre-PTG), I hypothesized that the Pre-PTG process pattern group (Figure 1) would be associated with the highest PTG outcome levels; whereas, I expected other patterns that emerged in Aim 1 to be associated with lower PTG outcome levels.

2 METHODS

2.1 Participant Sample and Recruitment

Ninety young adult survivors of adolescent cancer were recruited from a cancer survivor program at an urban children's hospital in the southeastern U.S. Participant demographic information is presented in Table 1. Participants who were eligible for the current study were recruited as part of a larger open study on survivorship factors. To be eligible for the current study, participants had to be English-speaking survivors of adolescent cancer, between the ages of 18 and 25 years, and diagnosed with cancer between the ages of 10 and 17 years. Due to the retrospective nature of the study and focus on how memories of how cancer impacts adolescents, participants who were diagnosed with cancer prior to the age of 10 were not included.

Table 1 Participant Demographic Information (N = 90)

Variables	*M (SD)*
Current Age	20.92 (2.25)
Age Pre-Cancer Diagnosis	13.59 (2.45)
Age During Most Traumatic Time of Cancer	14.02 (2.85)
	n (%)
Gender	
Male	42 (46.7)
Female	48 (53.3)
Race	
White	44 (48.9)
Black or African American	34 (37.8)
Asian	3 (3.3)
Native American	2 (2.2)
Other	3 (3.3)
N/A	4 (4.4)
Ethnicity	
Non-Hispanic	79 (87.8)
Hispanic	11 (12.2)

2.2 Procedure

Participants were identified through the program's database, which included individuals who had pediatric cancer and were eligible for the program's survivor clinic, meaning they had been off of cancer treatment therapies for a minimum of two years. Potential participants were contacted via phone or email by research staff to be recruited for the study. Patient contact information was collected from the patients' electronic medical record in EPIC®. Of those recruited for the larger study, 54 percent of youth returned completed or partially completed surveys. Once participants agreed to participate in the study, they received an email link containing information on how to access the secure electronic consent and survey battery via the Research Electronic Data Capture (REDCap®) platform. Consent was completed online before completing the study questionnaires. All participants who agreed and signed the consent were directed to the survey battery. The survey contained questionnaires from the larger study and this current study and took approximately 20-40 minutes to complete. As compensation for their time, participants were offered a $20 gift card or the opportunity to donate $20 to a family for a meal at the children's hospital.

This retrospective study required participants to respond to survey questions on peer relationships and self-esteem for three different time points: prior to cancer diagnosis (T1); the time they identified as the most traumatic cancer-related time period during their cancer experience (T2); and the current time period, which represents survivorship (T3). Specifically, for T1, participants were told, "Recall the time-period right before your cancer diagnosis." For T2, participants read, "Recall the most traumatic cancer-related time-period during your cancer experience." For T3, participants received the prompt, "Think about the present time and respond to each statement considering how things have been in the past two weeks." Thus, reports about

peer relationships and self-esteem for T1 and T2 necessitated that the participant retrospectively reflect on and answer questions representative of their experience and feelings during those periods in their past. Participants were asked to report their age and the year during which they experienced T1 and T2, by responding to "How old were you?" and "What year was it?" before they completed the peer relationships and self-esteem measures. These two questions were added to help the participants anchor themselves in the time periods and also to better understand at what point in each participant's cancer trajectory they may have experienced trauma and changes in their peer relationships and self-esteem. To capture the PTG outcome, participants reported their perceived PTG only for T3, the current time-period.

In terms of the order of the surveys, first participants completed measures for peer relationships and self-esteem for T3 and PTG; next, participants completed measures for peer relationships and self-esteem for T1; and last, measures were completed for T2. The questionnaires were sequenced to reduce bias that may be associated with reporting on independent and dependent variables in a sequential order. Additionally, T2 questionnaires were presented last in the survey battery to increase the chances that participants would finish all questionnaires and not discontinue, due to fatigue or potential distress, after recalling their most traumatic time during cancer. All data were collected from the REDCap® platform and coded into SPSS statistical software for analysis.

2.3 Measures

2.3.1 Pediatric Peer Relationships

Perspectives on peer relationships were measured using the PROMIS (Patient-Reported Outcomes Measurement Information System) Pediatric Item Bank v2.0 - Peer Relationships – Short Form 8a (DeWalt et al., 2013). The Peer Relationships form is an eight-item scale with a 5-

point Likert response format that asks participants to rate the degree to which they experienced an item ranging from *never* to *almost always*. This measure evaluates youth's perceptions of the quality of their peer relationships (DeWalt et al., 2013). PROMIS scales were developed and evaluated with National Institutes of Health funding to be psychometrically sound and appropriate for both the general population and individuals living with medical conditions (Ader, 2007). Several PROMIS scales, including the Peer Relationships form, have been found to be feasible and valid indicators of patient-reported outcomes in adolescent cancer patients and survivors (Hinds et al., 2013). The Peer Relationships form has been validated among over three thousand youth for assessing the peer relationship aspect of adolescent social health and has strong psychometric characteristics (DeWalt et al., 2013); test retest reliability, $r = 0.81$ and internal consistency, $\alpha = 0.83$ are both good (Varni et al., 2014). Internal consistency in the current sample was excellent at T1, $\alpha = 0.95$, T2, $\alpha = 0.96$, and T3, $\alpha = 0.94$. Peer Relationships form was completed by participants for all three time points, retrospectively for T1 and T2, and presently for T3. Item scores were summed to generate a total score for each of three time points. Higher scores represented more positive evaluation of peer relationships and the highest possible total score on this scale was 40. Total scores on the Peer Relationships measure were treated as an independent variable for this study.

2.3.2 Self-Esteem

Perspectives on self-esteem were measured using the Rosenberg Self-Esteem (RSE) scale. The RSE scale is a 10-item instrument that measures global self-worth by capturing both positive and negative attitudes the participant has about his or herself (Rosenberg, 1965). The survey asked participants to respond to questions on a four-point Guttman scale ranging from *strongly agree* to *strongly disagree* (Rosenberg, 1989). Internal consistency for the RSE scale

ranges from α = 0.85 - 0.91 (Deihl et al., 1997) and test-retest reliability is r = .61 (Byrne, 1983). The RSE scale is a widely used self-report instrument for evaluating individual self-esteem. It has received strong psychometric validation for many populations including adolescents and survivors of adolescent cancer (Bagley, Bolitho, & Bertrand, 1997; Falk et al., 2015; Gray-Little & Carels, 1997; Salerno, Ingoglia, & Lo Coco, 2017; Wylie, 1989). Internal consistency in the current sample was excellent at T1, α = 0.91, T2, α = 0.90, and T3, α = 0.91. The RSE scale was completed for all three time points: retrospectively for T1 and T2 and presently for T3. Item scores were appropriately reversed and summed to generate a total score for each of three time points. Higher scores represented higher self-esteem and the highest possible total score was 40. Total scores of the RSE were treated as an independent variable for this study.

2.3.3 Posttraumatic Growth

Posttraumatic Growth was measured using the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996), which is a 21-item scale that asks respondents to report the extent to which they perceive positive changes as a result of their traumatic experience. The inventory response format includes a 6-point Likert scale ranging from *I did not experience this change as a result of my cancer* equating to a score of 0, to *I experienced this change to a small* (1), *moderate* (2), *great* (4), or *very great* (5) *degree as a result of my cancer*. Higher total scores represent greater PTG, and the highest possible total score was 105. Test-retest reliability has been acceptable (r = .71) and internal consistency of the PTGI is excellent (α = .90) (Tedeschi & Calhoun, 1996). The PTGI has been widely used in studies with a variety of populations and has appears to be a valid measure of posttraumatic growth (Tedeschi & Calhoun, 1996; Shakespeare-Finch & Barrington, 2012; Smith & Cook, 2004). Internal consistency in the current sample was excellent, α = 0.967. The PTGI was completed at T3 only as a measure of the participants'

current perception of posttraumatic growth as a result of their experience with cancer and was treated as the dependent variable of this study.

2.4 Data Analyses

2.4.1 Preliminary Analyses

First, the dataset was evaluated for missing data. Participants who had incomplete questionnaires were removed listwise. Eight participants were removed due to missing data. All other missing data were imputed at the item level using the EM Estimation. Total scores for PROMIS Pediatric Peer Relationships and Rosenberg Self-Esteem Scale questionnaires at T1, T2, and T3 and the Posttraumatic Growth Inventory total score for T3 were computed for each individual. One participant, whose age at T1, T2, and T3 was the same, was removed to ensure that the analyses captured different time points for before diagnosis, the most traumatic time during cancer, and the current time. Thus, 90 participants were evaluated in the current study. Means, standard deviations, and ranges were calculated to characterize demographics (i.e., age, sex, race, and ethnicity) and tendencies on primary variables (i.e., peer relationships at all three time points, self-esteem at all three time points, and posttraumatic growth) of the sample. To better understand the temporal relationships between participants' experiences at T1, T2, and T3, the average times from T1 to T2 and T2 to T3 were also displayed. Correlational analyses and chi-square tests were used to examine potential relations among demographic variables and study variables.

2.4.2 Primary Analyses

2.4.2.1 Analyses for Aim 1. To examine how perspectives on peer relationships and self-esteem change for adolescents from before cancer, to a traumatic time during cancer, to survivorship, each individual's trajectory for peer-relationships and self-esteem were displayed

graphically across the three time points (Figures 2 through 7 and 9 through 14, respectively).

Visual inspection of the plots was conducted as the method for identifying patterns of change. This approach was preferable to other commonly used analyses of change (e.g., latent growth mixture modeling, latent class growth analysis) given the small sample size (N = 90), the retrospective nature of the data versus longitudinal or prospective, the lack of clinical cut-off points for the chosen measures (Galatzer-Levy, Huang, & Bonanno, 2018), and the ability to evaluate each trajectory at an individual case level. Visual analysis has been argued to be as accurate or more accurate than statistical approaches (Cohen, Feinstein, Masuda, & Vowles, 2014) and is recommended as an appropriately conservative way of drawing conclusions about relationships among graphically displayed information (Parsonsons and Baer, 1986).

Two independent coders visually inspected each participant's graphed trajectory for peer relationships and self-esteem and categorized them into groups, based on likeness of directionality of change (trend) and degree of change among the three time points. Coders referred to trajectories of change commonly observed in the resilience literature (Galatzer-Levy, Huang, & Bonanno, 2018; Kroneberg et al., 2010; Masten & Obradovic, 2008; Tillery, Sharp, Okado, Long, & Phipps, 2016) as guidelines for forming groups. When complete, coders compared their results for reliability. Independent coders agreed on 89% of the trajectories for peer relationships and 88% of the trajectories for self-esteem. Trajectories that were not blindly categorized into the same groups by the independent coders included trajectories that had smaller changes between the three time points and thus, were more difficult to categorize based on visual inspection alone. Although some have argued that visual analysis is sufficient as the primary or sole method for analyzing single case graphical data, others recommend that statistical analysis be used as a supplement in some cases (Brossart, Parker, Olson, & Mahadevan, 2006; Cohen et

al., 2014). Methods proposed to detect meaningful changes in cross-sectional data include anchor-based approaches, which involves comparing mean values of groups that differ on some criterion (e.g., a disease related criterion) and using the difference in mean scores to estimate a value for clinically important differences for measures that do not have established clinical cut-offs (Crosby, Kolotkin, & Williams, 2003).

To establish a value for a meaningful difference in self-esteem total scores, statistically significant differences in mean scores on the Rosenberg Self-Esteem Scale between cancer survivors versus controls (Greenfield et al., 2010), healthy males versus females (Chubb, Fertman, & Ross, 1997), and male survivors of cancer versus female survivors of cancer (Langeveld, Grootenhuis, Voute, De Haan, & Van Den Bos, 2004) were found to be between 2.90, 2.89, and 2.80, respectively. Thus, a value change of greater than three points on an individual's self-esteem trajectory was used to qualify whether the change was meaningful among the participants in this sample. The self-esteem trajectories were evaluated according to this criterion and categories were adjusted to reflect meaningful changes of greater than 3 for trajectories that were ambiguous during visual analysis. As a supplementary validation, all previously identified patterns via visual inspection were found to meet this 3-point criterion.

Statistical methods of evaluating meaningful change were not used for the peer relationships measure given the inability to utilize an anchor-based method due to sparse use of the measure thus far in the literature. Thus, a third blind coder was used to categorize the unmatched peer relationships patterns into their final groups.

2.4.2.2 Analysis for Aim 2. The goal of Aim 2 was to compare PTGI scores across the trajectory-groups that emerged from Aim 1. The PTGI scores were examined to determine if they satisfied assumptions of normality, equality of variance, and independence. Q-Q plots and

Kolmogorov-Smirnov test indicated that PTGI scores deviated significantly from normal $D(90) = 0.108$, $p = .011$. PTGI scores were negatively skewed (*skewness* = -.899, *SE* = .254), indicating a build-up of high scores. However, this skewness was not entirely unexpected given that higher PTGI scores tend to be reported by youth who have been cured of their illness (Devine, Reed-Knight, Loiselle, Fenton, & Blount, 2010) and all participants in this study are current survivors of pediatric cancer. Levene's test revealed that across self-esteem groups, variances were equal for PTGI scores, $F(5, 84) = 0.785$, $p = 0.564$. However, across peer relationships groups, variances were unequal for PTGI scores, $F(5, 84) = 2.267$, $p = 0.010$. The groups that emerged in Aim 1 for both peer relationships and self-esteem were compared on levels of PTGI. Non-parametric tests were used to compare PTGI scores to reduce the impact of the non-normal distribution on the test statistics. The Kruskal-Wallis and Mann-Whitney tests were chosen to examine differences in PTGI scores between the groups.

3 RESULTS

3.1 Preliminary and Descriptive Analyses

The sample is characterized by descriptive statistics (e.g., means, standard deviations, frequencies) of age, sex, race, and ethnicity (Table 1), primary study variables, and time from T1 to T2 and T2 to T3 (Table 2). Spearman's rho correlations (Table 3) revealed that PTG was positively correlated with peer relationship and self-esteem at all three time points. Interestingly, peer relationships at T1 was positively correlated with self-esteem at T1 and other relationships between these variables at various time-points are further described in Table 3. There were no significant differences in PTGI scores between males ($M = 72.74$, $SD = 25.96$) and females ($M = 71.40$, $SD = 25.41$), $U = 1{,}060.50$, $z = .425$, $p = 0.671$, nor among race, $H(5) = 8.185$, $p = 0.146$.

Hispanics (M = 86.73, SD = 14.89) did endorse significantly higher PTG than did non-Hispanics (M = 69.97, SD = 26.09) in this sample, U = 269.00, z = -2.04, $p < .05$, r = -0.21.

Table 2 Descriptives of Study Variables

Variables (Measures)	*M (SD)*	Minimum	Maximum
Posttraumatic Growth (PTGI)[a]	72.02 (25.53)	0	105
Peer Relationships (PPR)[b]			
T1 (Pre-Cancer)	32.52 (6.39)	17	40
T2 (During-Cancer)	27.20 (8.68)	8	40
T3 (Post-Cancer)	31.22 (6.58)	13	40
Self-Esteem (RSE)[c]			
T1 (Pre-Cancer)	32.01 (6.24)	18	40
T2 (During-Cancer)	26.22 (6.80)	13	40
T3 (Post-Cancer)	31.18 (6.24)	16	40
Years from T1 to T2[d]	0.64 (1.13)	0	6
Years from T2 to T3[e]	6.73 (2.82)	2	13

Note. [a]PTGI scores ranged from 0 to 105, with higher scores indicative of more posttraumatic growth. [b]PPR scores ranged from 8 to 40 with higher scores indicative of better peer relationships. [c]RSE scores ranged from 13 to 40, with higher scores indicative of higher self-esteem. [d]Years from T1 to T2 represent the average number of years between diagnosis and the participant's self-identified most traumatic time during their cancer experience. [e]Years from T2 to T3 represent the average number of years between the participant's self-identified most traumatic time during their cancer experience and the current time, during which all participants are in survivorship.

Table 3 Intercorrelations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Current Age	-										
2. Age at T1	.27**	-									
3. Age at T2	.27**	.83**	-								
4. Years from T1-T2	.02	-.22*	.16	-							
5. Years from T2-T3	.51**	-.57**	-.65**	-.10	-						
6. Self-Esteem T1	.03	-.25*	-.18	-.01	.24*	-					
7. Self-Esteem T2	-.13	-.12	-.09	.01	-.00	.45**	-				
8. Self-Esteem T3	.02	-.15	-.15	.05	.15	.45**	.49**	-			
9. Peer Relationships T1	.05	.07	.06	-.05	.03	.48**	.27*	.19	-		
10. Peer Relationships T2	-.13	.10	.16	.05	-.27*	.17	.51**	.43**	.41**	-	
11. Peer Relationships T3	-.10	.07	.13	.13	-.19	.24*	.40**	.55**	.52***	.82**	-
12. Posttraumatic Growth	-.05	.13	.12	.02	-.15	.28**	.24*	.53**	.28*	.43**	.55**

Note. Spearman's rho correlations *$p < .05$. **$p < .01$

3.2 Primary Analyses

3.2.1 Primary Aim 1

The first primary goal of this study was to identify patterns of change in peer relationships and self-esteem across the cancer experience. The following six patterns were identified from the plots: 1. No-Change, 2. Recovery, 3. Partial Recovery, 4. Decreasing, 5. Increasing, and 6. Pre-PTG. The No-Change group demonstrated no change or only minimal change in their ratings of peer relationships and self-esteem across the 3 times points. The Recovery group followed a pattern of decline in perception of peer relationships and self-esteem from T1 to T2, and an improvement back to the T1 (baseline) level at T3. The Partial Recovery group declined from T1 to T2 and improved from T2 to T3, but not all the way back to original baseline levels. The Decreasing group showed a pattern of decline from T1 to T2 to T3. The Increasing group showed a pattern of improvement from T1 to T2 to T3. Lastly, the Pre-PTG group demonstrated decline from T1 to T2 and then subsequent improvement from T2 to T3 beyond initial baseline levels, which is consistent with the pattern that is described in theory as predicting PTG.

For the Peer Relationships trajectories, 24 (27%) participants fell into the No-Change group (Figure 2), 22 (24%) into the Partial Recovery group (Figure 4), 17 (19%) into the Increasing group (Figure 6), 15 (17%) into the Recovery group (Figure 3), seven (8%) into the Decreasing group (Figure 5), and five (6%) into the Pre-PTG group (Figure 7). Each peer relationship pattern is characterized in Table 4 in terms of average PTG (see also Figure 8), average ratings of peer relationships and age at all three time points, gender, race, and ethnicity. Chi-squared tests revealed that the distribution of males and females differs across the six peer

relationship patterns (χ^2 = 13.99, p = .016). These differences are likely driven by the overrepresentation of females (n = 13, 87%) compared to males (n = 2, 13%) in the Recovery pattern, and the overrepresentation of males (n = 16, 67%) compared to females (n = 8, 33%) in the No-Change pattern. There were no significant differences among race (χ^2 = 24.40, p = .497) or ethnicity (χ^2 = 4.97, p = .419) across the six peer relationship patterns. Current age did not differ significantly across the six peer relationship groups, $H(5)$ = 10.15, p = 0.071, nor did age at diagnosis, $H(5)$ = 1.21, p = 0.944. Peer relationship ratings at T1 (baseline) significantly differed among the six groups, $H(5)$ = 28.51, p < 0.001, and significant post-hoc two-group comparison differences are displayed in Table 4. Peer relationship ratings at T3 (survivorship) also significantly differed among the six groups, $H(5)$ = 25.71, p < 0.001, and post-hoc comparisons are displayed in Table 5.

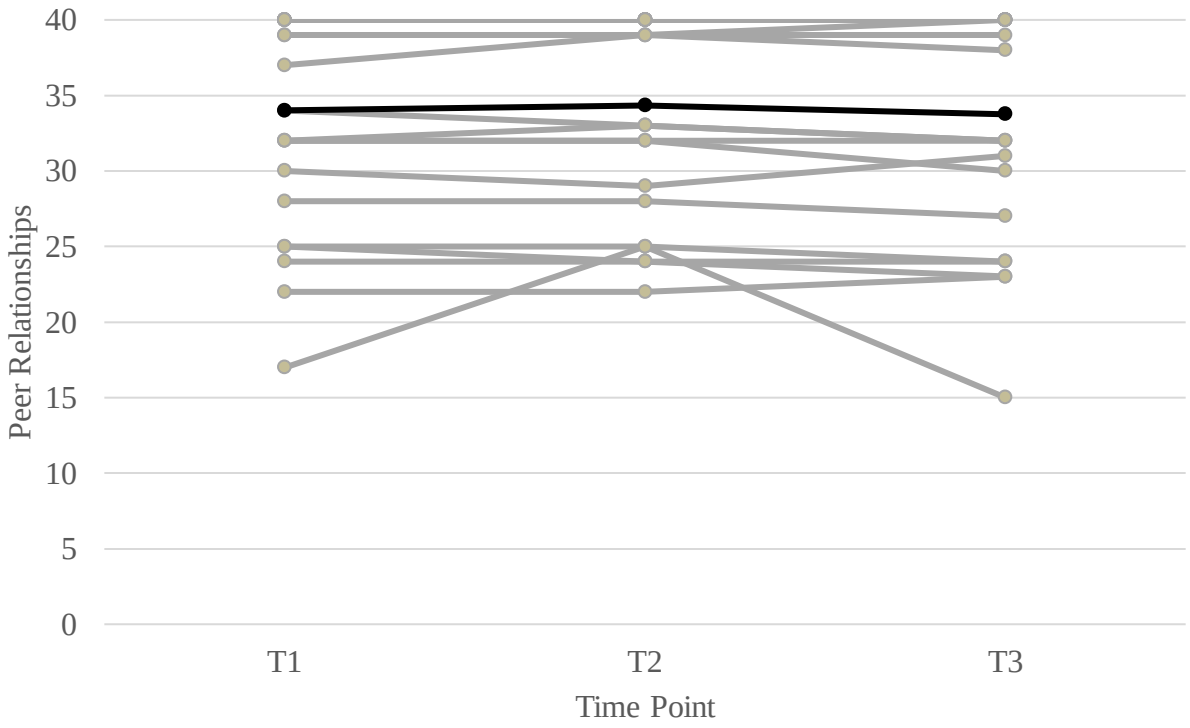

Figure 2. No-Change pattern for peer relationships.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

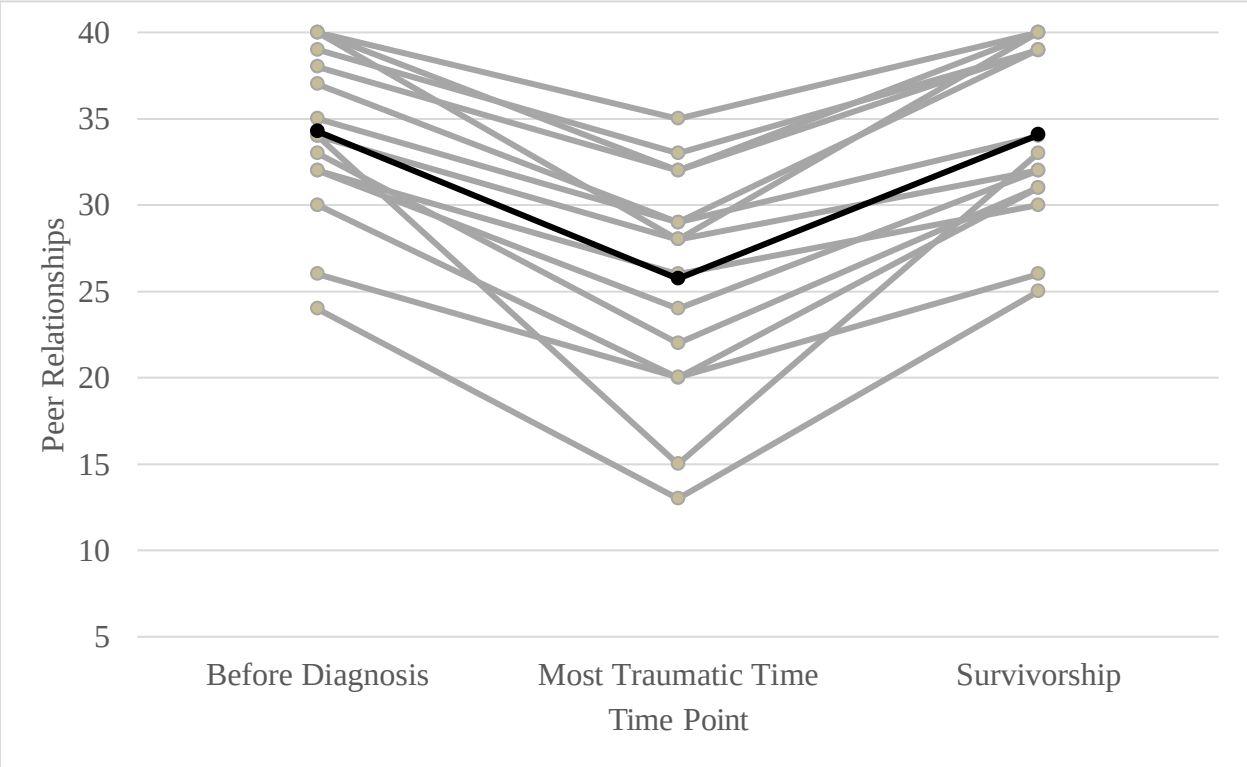

Figure 3. Recovery pattern for peer relationships.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

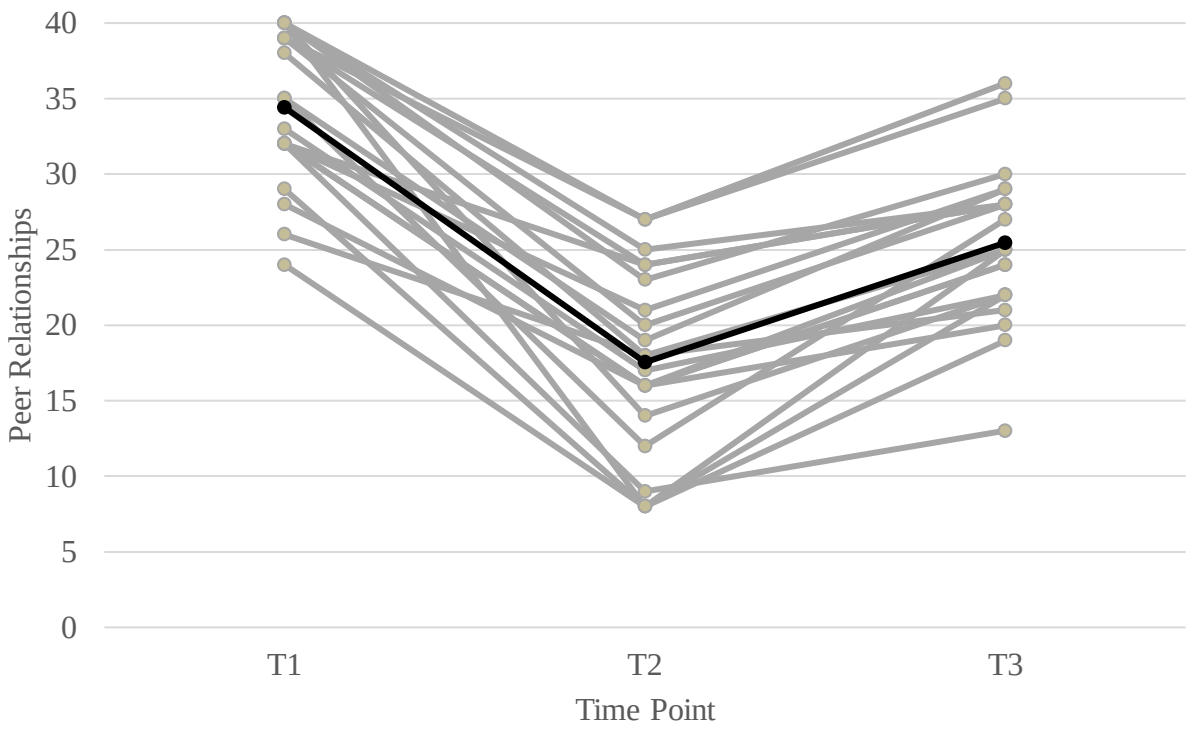

Figure 4. Partial Recovery pattern for peer relationships.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

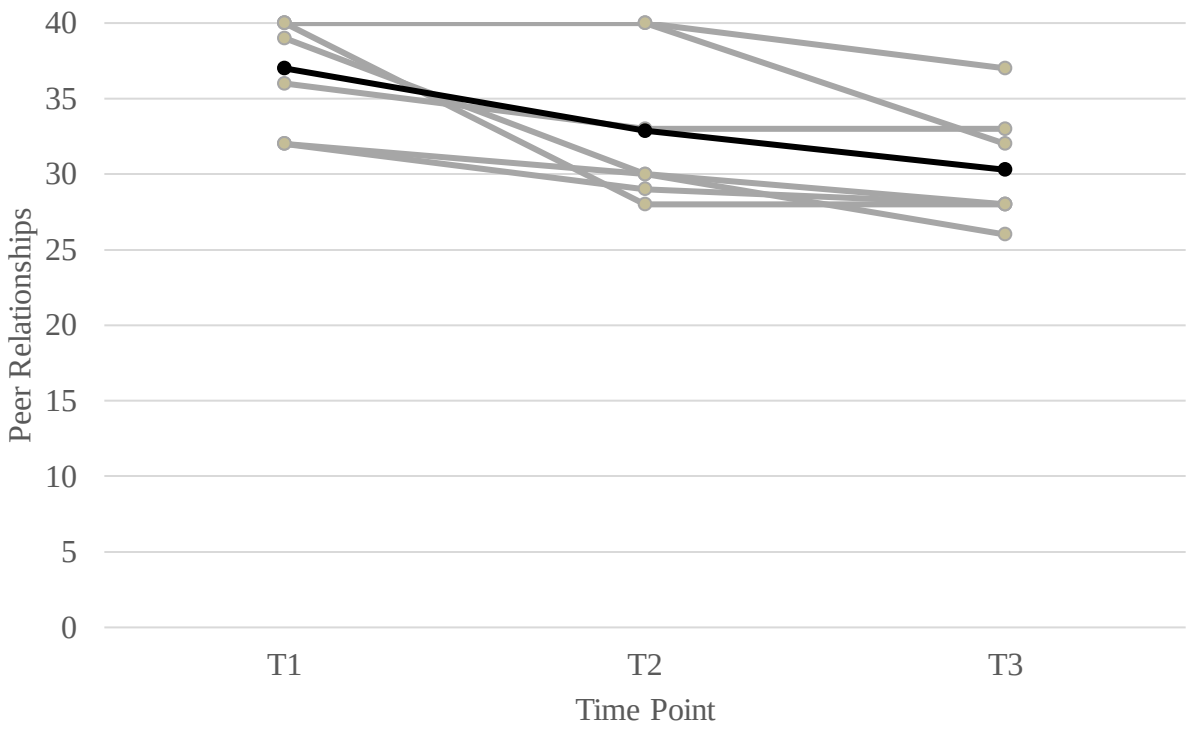

Figure 5. Decreasing pattern for peer relationships.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

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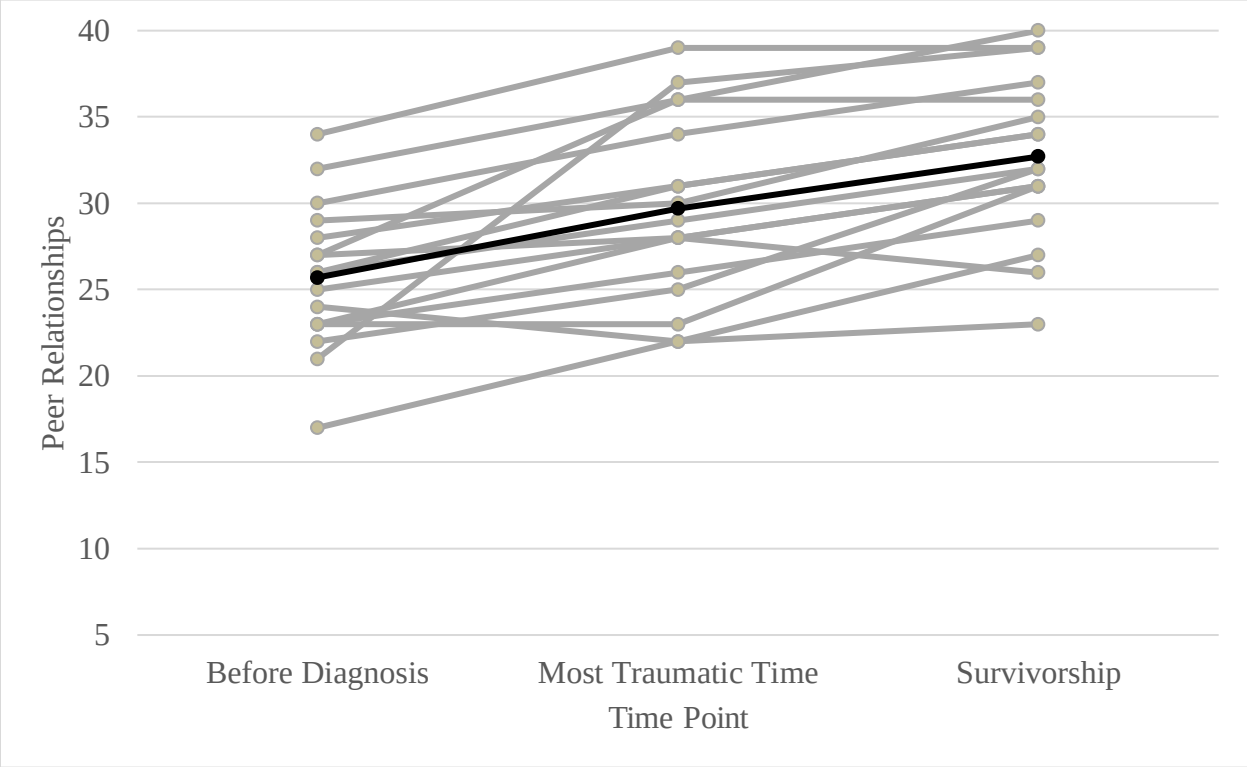

Figure 6. Increasing pattern for peer relationships.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

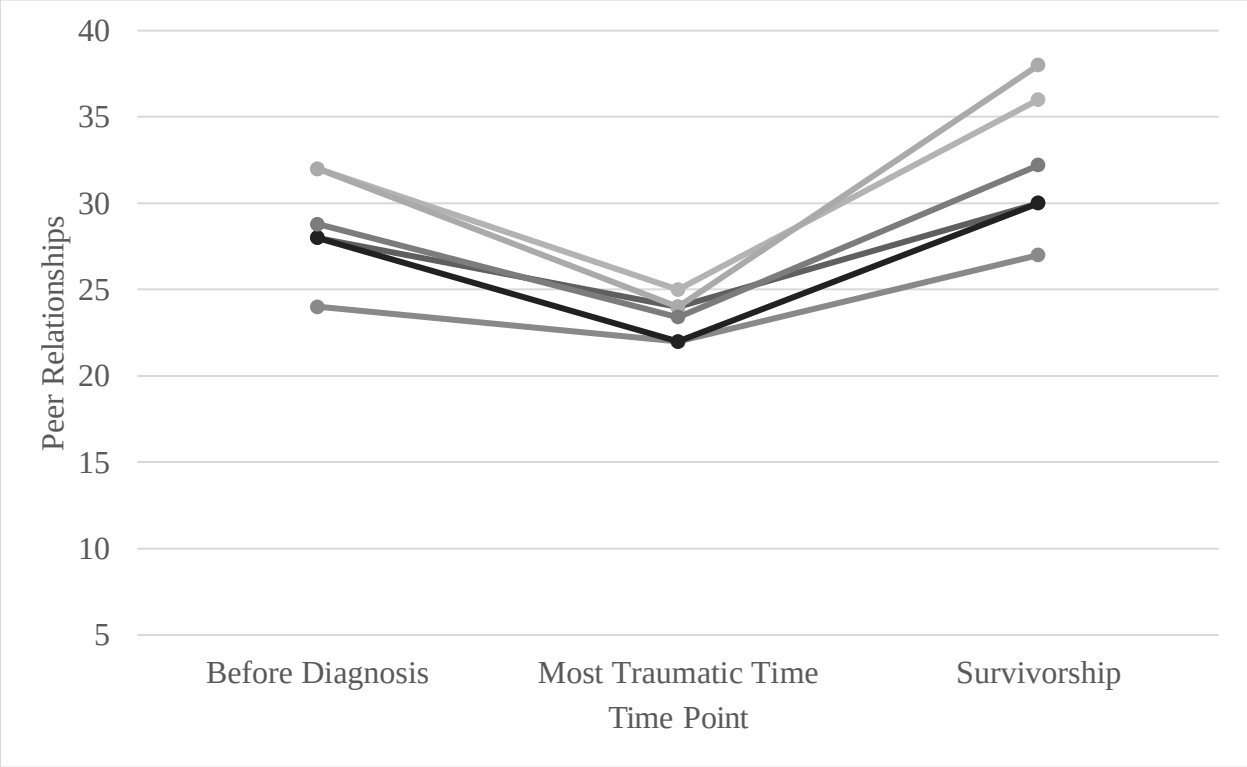

Figure 7. Pre-PTG pattern for peer relationships.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

Table 4 Group Descriptives for Patterns in Peer Relationships

Variables	No-Change (*n* = 24); *M (SD)*	Recovery (*n* = 15); *M (SD)*	Partial Recovery (*n*=22); *M (SD)*	Decreasing (*n* = 7); *M (SD)*	Increasing (*n* = 18); *M (SD)*	Pre-PTG (*n* = 5); *M (SD)*
Current Age	19.96 (2.07)	21.21 (2.33)	21.50 (2.35)	22.29 (0.95)	21.00 (2.37)	19.80 (2.17)
Age T1	13.33 (2.20)	12.93 (2.43)	13.59 (2.20)	14.29 (3.50)	14.00 (2.57)	13.40 (2.79)
Age T2	13.92 (2.41)	13.36 (2.17)	14.27 (2.35)	14.71 (3.20)	15.00 (2.40)	13.80 (2.86)
PR T1	34.00 (7.16)$_{a}$	34.86 (5.59)$_{b}$	34.41 (4.97)$_{c}$	37.00 (3.70)$_{d}$	25.71 (4.21)$_{a,b,c,d}$	28.80 (3.35)
PR T2	34.33 (6.62)	26.14 (6.64)	17.54 (6.05)	32.86 (5.11)	29.70 (5.30)	23.40 (1.34)
PR T3	33.75 (7.59)$_{a}$	34.64 (4.81)$_{b}$	25.45 (5.18)$_{a, b, c}$	30.29 (3.86)	32.71 (4.78)$_{c}$	32.20 (4.60)
PTG	68.42 (34.57)	81.86 (16.70	63.14 (18.53)	78.43 (19.58)	76.00 (25.90)	77.00 (25.18)
Years from T1-T2	0.58 (0.93)	0.43 (0.94)	0.68 (1.29)	0.43 (1.13)	1.00 (1.46)	0.40 (0.55)
Years from T2-T3	6.04 (2.97)	7.86 (2.51)	7.23 (2.71)	7.57 (3.15)	6.00 (2.47)	6.00 (3.54)
	n	*n*	*n*	*n*	*n*	*n*
Gender						
Male	16	2	10	4	6	4
Female	8	13	12	3	11	1
Race						
White	11	9	11	3	7	3
Black	11	3	8	2	8	2
Asian	0	0	1	2	0	0
Native American	0	1	1	0	0	0
Other	1	1	0	0	1	0
N/A	1	1	1	0	1	0
Ethnicity						
Non-Hispanic	22	11	19	7	15	5
Hispanic	2	4	3	0	2	0

Note. PR = Peer Relationship. Subscripts of the same letter represent significant differences in a row for post-hoc two-group comparisons; for example, the Increasing group at PR T1 significantly differs from the No-Change group at PR T1.

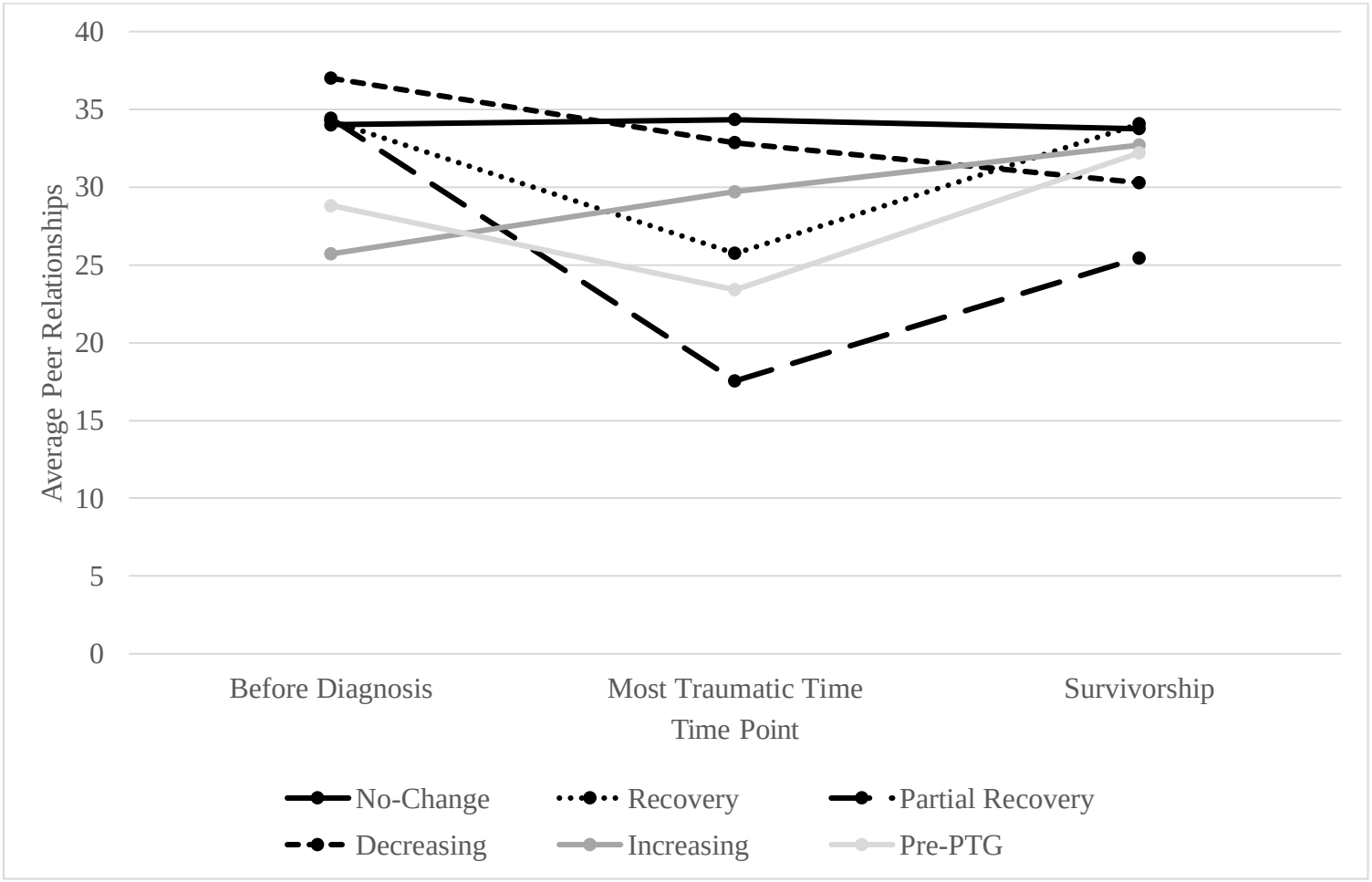

Figure 8. Plots of pattern averages for peer relationships.

For the Self-Esteem trajectories, 30 (33%) participants fell into the No-Change group (Figure 9), 23 (26%) into the Recovery group (Figure 10), 10 (11%) into the Increasing group (Figure 13), 11 (12%) into the Decreasing group (Figure 12), nine (10%) into the Partial Recovery group (Figure 11), and seven (8%) into the Pre-PTG group (Figure 14). Self-esteem patterns are characterized in Table 5 in terms of average PTG (see also Figure 15), average ratings of peer relationships and age at all three time points, gender, race, and ethnicity. Chi-squared tests revealed that there were no significant differences in the number of males and females across the six patterns ($\chi^2 = 4.33$, $p = .503$) nor among race ($\chi^2 = 22.87$, $p = .585$). The distribution of Hispanic and Non-Hispanic participants did differ significantly across patterns ($\chi^2 = 15.59$, $p = .008$). Current age did not differ significantly across the six self-esteem groups, $H(5) = 6.72$, $p = 0.243$, nor did age at diagnosis, $H(5) = 4.05$, $p = 0.543$. Noticeably, the number of years in age from pre-diagnosis (T1) to the most traumatic time during cancer (T2) was at or under 1 year for all groups, and time from T2 to T3 ranged from a little over 5.5 – 7.5 years. Self-esteem ratings at T1 (baseline) significantly differed among the six groups, $H(5) = 16.07$, $p < 0.05$, and significant post-hoc two-group comparison differences are displayed in Table 5. Self-esteem ratings at T3 (survivorship) also significantly differed among the six groups, $H(5) = 23.40$, $p < 0.001$, and post-hoc comparisons are displayed in Table 5.

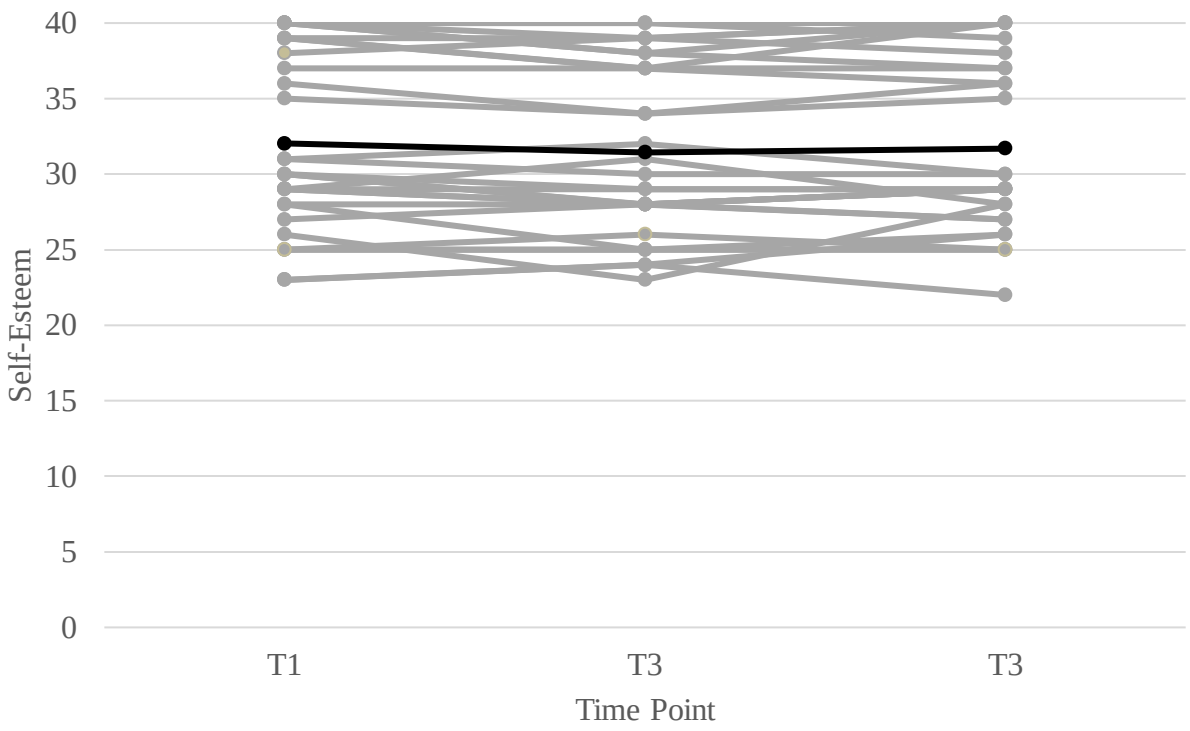

Figure 9. No-Change pattern for self-esteem.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

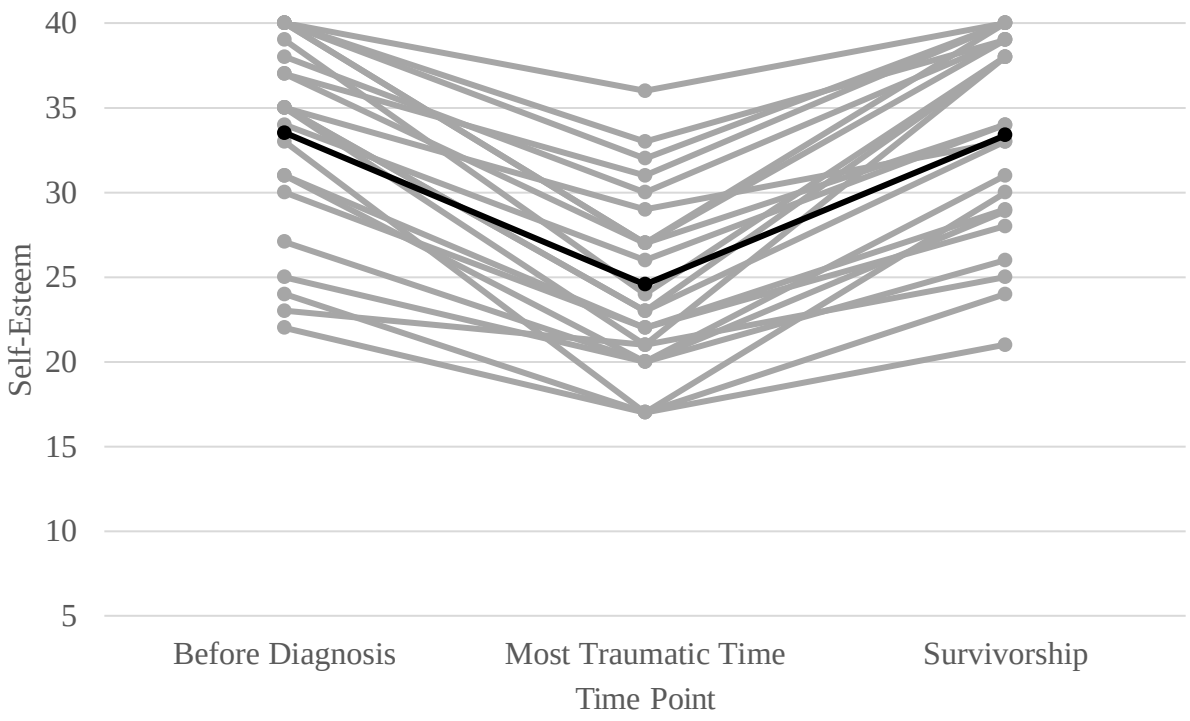

Figure 10. Recovery pattern for self-esteem.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

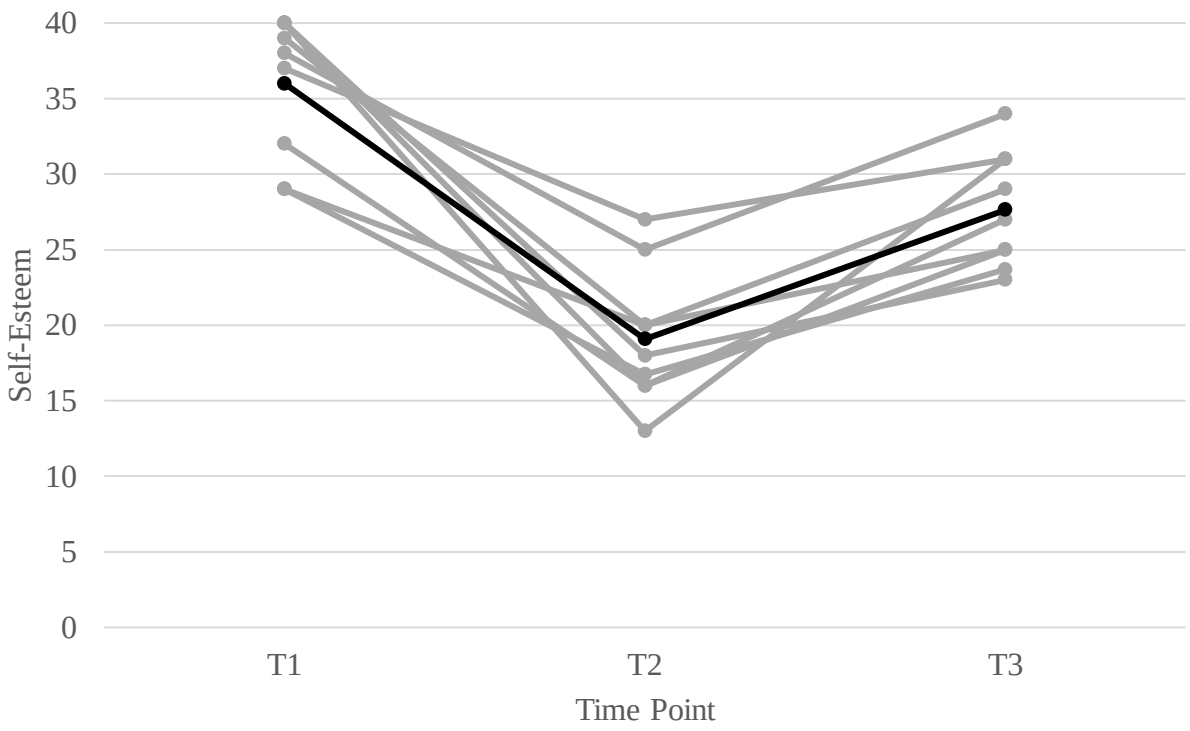

Figure 11. Partial Recovery pattern for self-esteem.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

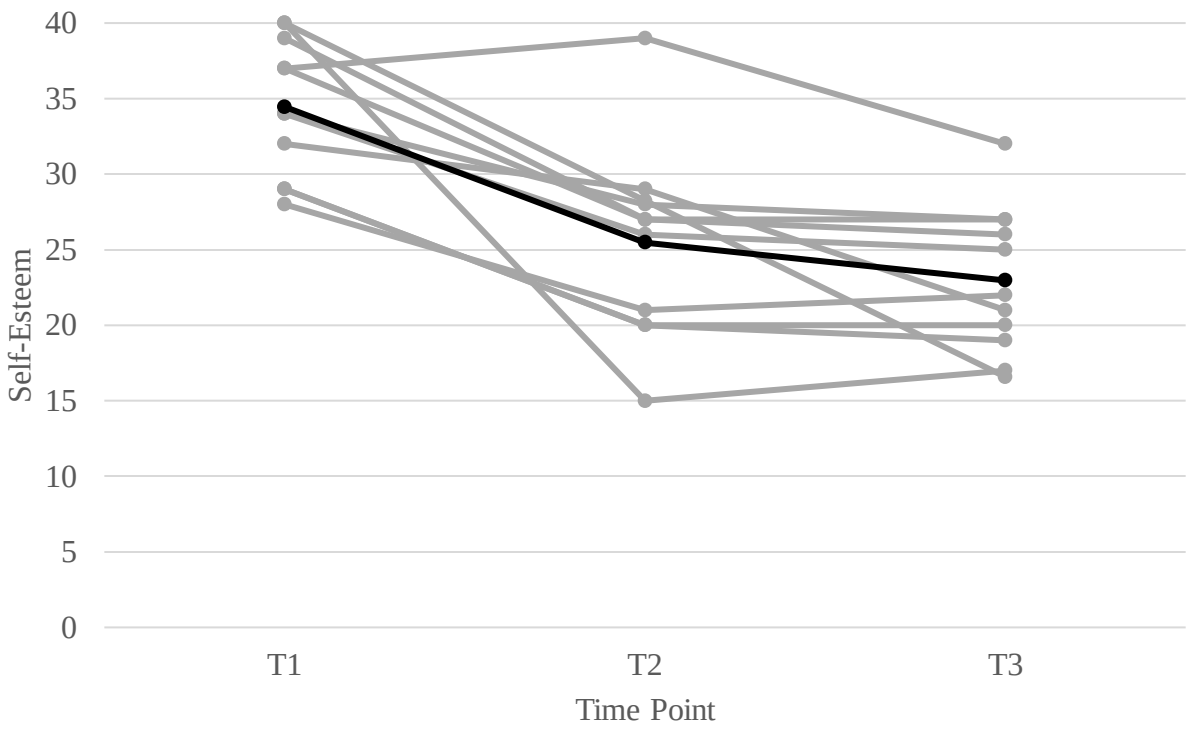

Figure 12. Decreasing pattern for self-esteem.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

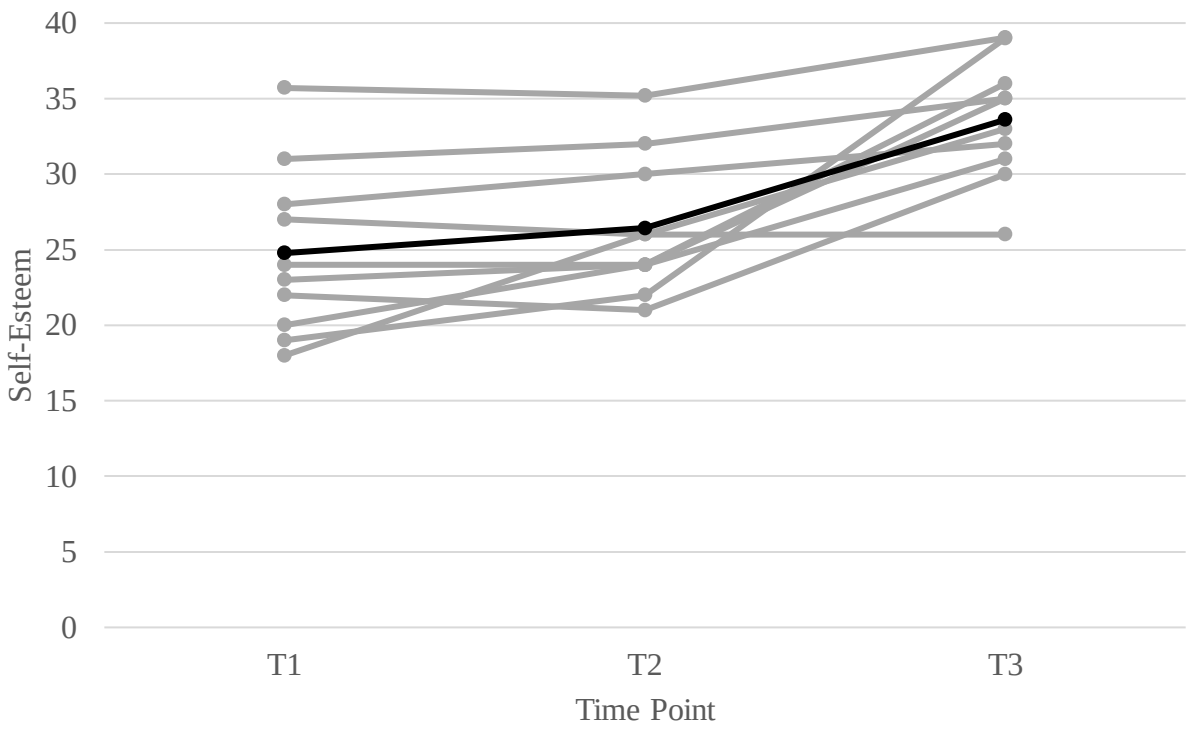

Figure 13. Increasing pattern for self-esteem.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

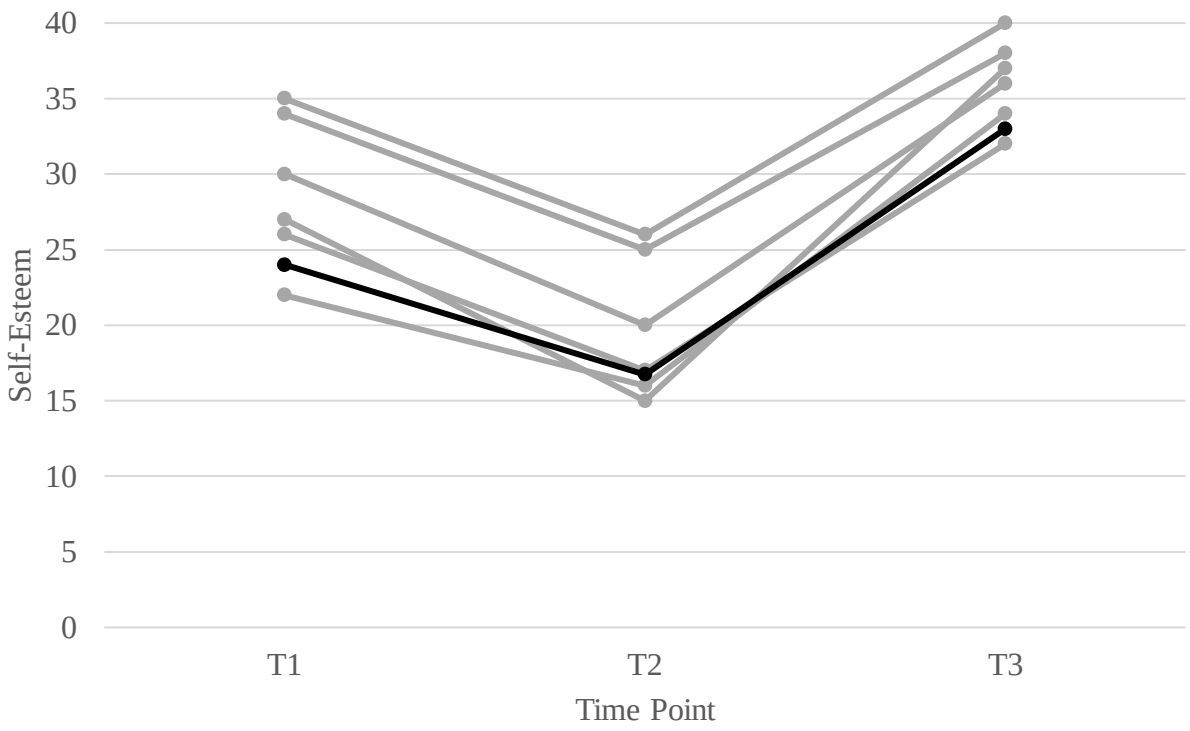

Figure 14. Pre-PTG pattern for self-esteem.

Note. Grey lines represent each individual who endorsed this pattern; and, some individuals may have overlapping lines. Black line represents the average trajectory of all individuals in this pattern.

Table 5 Group Descriptives for Patterns in Self-Esteem

Variables	No-Change (*n* = 30); *M (SD)*	Recovery (*n* = 23); *M (SD)*	Partial Recovery (*n* = 9); *M (SD)*	Decreasing (*n* = 11); *M (SD)*	Increasing (*n* = 10); *M (SD)*	Pre-PTG (*n* = 7); *M (SD)*
Current Age	20.07 (2.07)	21.22 (2.11)	21.44 (2.46)	21.46 (2.25)	21.50 (2.76)	21.29 (2.14)
Age T1	13.60 (2.40)	13.39 (2.39)	12.78 (2.68)	13.73 (2.37)	13.40 (2.07)	14.83 (3.25)
Age T2	14.33 (2.37)	13.65 (2.39)	13.78 (3.03)	14.27 (2.72)	14.50 (2.07)	15.33 (2.50)
SE T1	32.03 (5.89)	33.53 (5.90)$_{a}$	36.00 (4.69)$_{b}$	34.45 (4.50)$_{c}$	24.77 (5.65)$_{a, b, c}$	28.29 (4.92)
SE T2	31.43 (5.67)	24.57 (5.42)	19.08 (4.50)	25.48 (6.35)	26.42 (4.57)	19.39 (4.46)
SE T3	31.70 (5.74)	33.39 (5.98)$_{a}$	27.63 (3.81)$_{d}$	22.96 (5.83)$_{a, b, c}$	33.60 (4.06)$_{b}$	35.71 (2.87)$_{c, d}$
PTG	69.53 (28.75)	75.96 (24.53)	59.22 (24.27)	68.63 (23.68)	73.10 (22.70)	90.00 (15.49)
Years from T1-T2	0.73 (1.20)	0.26 (0.45)	1.00 (1.94)	0.55 (0.93)	1.10 (1.20)	0.50 (1.22)
Years from T2-T3	5.73 (2.36)	7.57 (2.94)	7.67 (3.57)	7.18 (2.71)	7.00 (3.23)	5.83 (1.72)
	n	*n*	*n*	*n*	*n*	*n*
Gender						
Male	17	9	5	6	3	2
Female	13	14	4	5	7	5
Race						
White	17	11	5	5	2	4
Black	10	9	3	3	7	2
Asian	1	1	1	0	0	0
Native American	0	1	0	1	0	0
Other	1	1	0	0	1	0
N/A	1	0	0	2	0	1
Ethnicity						
Non-Hispanic	28	22	9	7	9	4
Hispanic	2	1	0	4	1	3

Note. SE = Self-esteem. Subscripts of the same letter represent significant differences in a row for post-hoc two-group comparisons; for example, the Increasing group at SE T1 significantly differs from the Recovery group at SE T1.

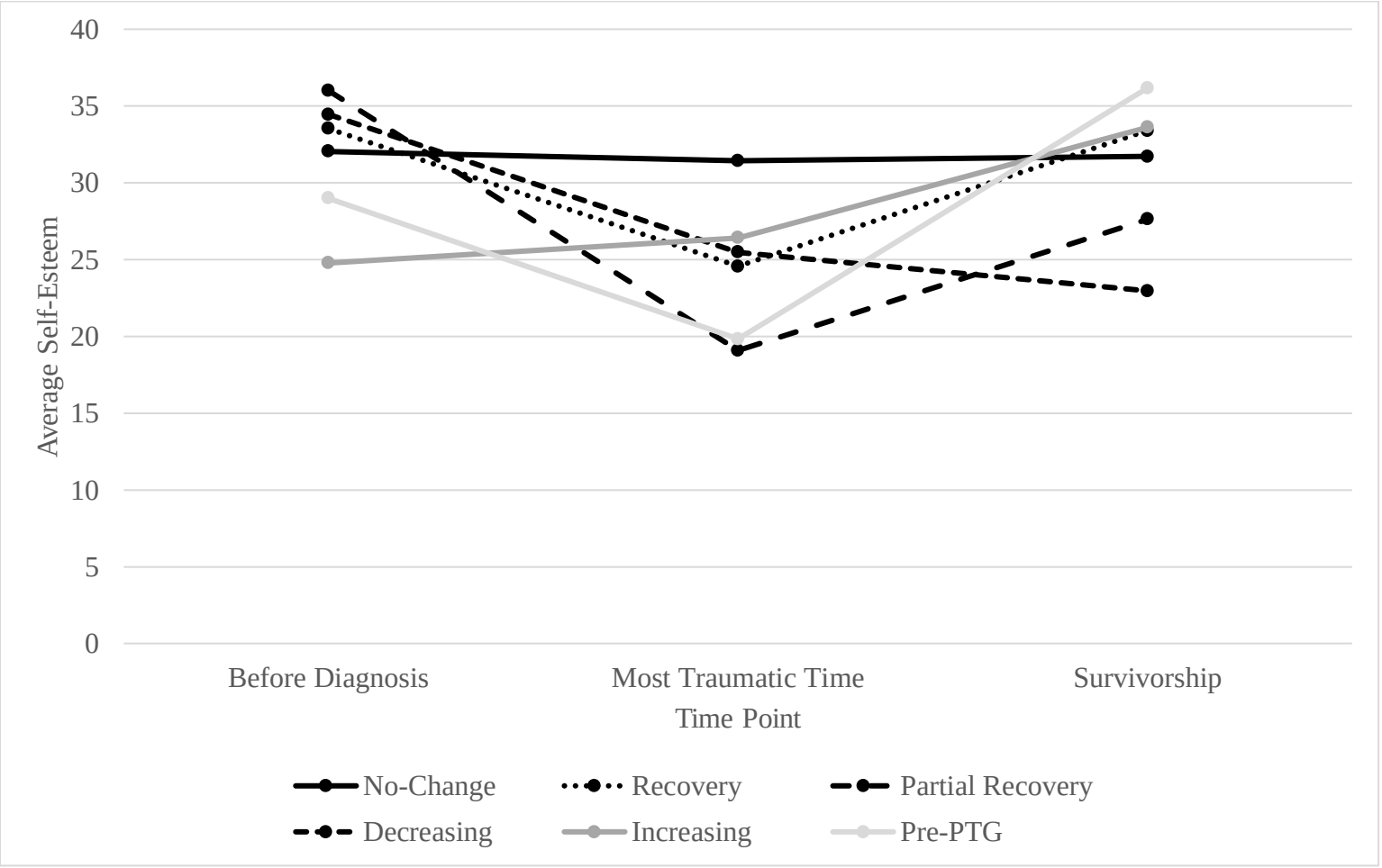

Figure 15. Plots of pattern averages for self-esteem.

3.2.2 Primary Aim 2

The goal of the second primary aim was to determine if the identified patterns of change differed on levels of PTG; specifically, it was hypothesized that participants who followed a Pre-PTG pattern for their peer relationships and self-esteem would endorse higher levels of PTG than participants who followed other patterns of change. All six groups were compared separately for peer relationships and self-esteem on levels of PTG using a Kruskal-Wallis non-parametric test. Comparing all peer relationships trajectories, mean PTG scores were highest for the Recovery (M = 81.67, SD = 16.11) and Decreasing groups (M = 78.43, SD = 19.58), contrary to hypotheses. The lowest mean PTG scores were found among the Partial Recovery (M = 63.14, SD = 18.53) and the No-Change (M = 68.42, SD = 34.57) groups. However, Kruskal-Wallis test revealed that these differences in PTG scores were not significant across the six peer relationships patterns, $H(5) = 8.53$, $p = 0.129$. Among the six self-esteem trajectories, the mean PTG score was highest for the Pre-PTG group (M = 90.00, SD = 15.49), with the next highest score being in the Recovery group (M = 75.96, SD = 24.53). The Partial Recovery group was found to have the lowest mean PTG score (M = 59.22, SD = 24.27). Kruskal-Wallis test revealed, however, that PTGI scores did not differ significantly among the six self-esteem patterns, $H(5) = 8.44$, $p = 0.133$.

As proposed, the patterns were sub-grouped into two patterns. Patterns that followed a Pre-PTG trajectory formed one group, and all other five patterns that did not follow a Pre-PTG trajectory formed another group (Non-Pre-PTG). When comparing participants in the Pre-PTG group to participants in the Non-Pre-PTG group on levels of PTG, Mann-Whitney tests revealed that PTGI scores for participants in the peer relationship Pre-PTG pattern group (n = 5; M = 77.00, SD = 25.18) did not differ significantly from those in the Non-Pre-PTG pattern group (n =

85; *M* = 71.73; *SD* = 25.67), *U* = 242.50, *z* = 0.53, *p* = 0.597, *r* = 0.06. However, PTG of participants in the Pre-PTG pattern group for self-esteem (*n* = 7; *M* = 90.00; *SD* = 15.49) were significantly greater than those in the Non-Pre-PTG pattern group for self-esteem (*n* = 83; *M* = 70.51; *SD* = 25.69), *U* = 426.50, *z* = 2.05, *p* = 0.040, *r* = 0.21.

In an exploratory fashion, subgroups were formed among patterns to increase power for additional analyses. Patterns were subgrouped based on the overall trend of the pattern, from baseline to T3, as criteria for categorizing the six groups into three sub-groups. The Increasing and Pre-PTG patterns reflected an overall increasing trend from baseline to survivorship, thus individuals in those groups were combined to form a subgroup called "Growth." The No-Change and Recovery patterns reflected an overall flat trend from baseline to survivorships, thus they were combined to form a subgroup called "Resilient." The Partial Recovery and Decreasing patterns reflected an overall decreasing trend, thus they were combined to form a subgroup called "Depreciation." The Resilient pattern represented 39 (43%) of the participants for changes in peer relationships and 53 (59%) of participants for changes in self-esteem. The Growth sub-group for peer relationships contained 22 (24%) participants and 17 (19%) for changes in self-esteem. The Depreciation pattern represented 29 (32%) of the participants' changes in peer relationships and 20 (22%) for self-esteem.

Among the three sub-groups in peer relationships, the Growth sub-group, which demonstrated a tendency to improve throughout their cancer experience or decrease initially and then improve beyond baseline, had the highest average PTG (*M* = 76.23, *SD* = 29.39). The Resilient sub-group had the second highest average PTG (*M* = 73.51, *SD* = 29.35). The peer relationships Depreciation sub-group demonstrated a tendency to decline throughout their cancer experience to now, or to decline initially and then show subsequent improvement but never back

to baseline levels, and had the lowest PTG (M = 66.83, SD = 19.60). Kruscal-Wallis test comparisons of PTG revealed these differences among the three peer relationship pattern sub-groups were not significant , $H(2) = 5.61$, $p = 0.060$. For self-esteem, the Growth sub-group had the highest mean PTG (M = 80.06, SD = 21.29), followed by Resilient (M = 72.32, SD = 26.94), then Depreciation (M = 64.40, SD = 23.79); however, Kruscal-Wallis test revealed that these differences were not significant, $H(2) = 5.18$, $p = 0.075$.

4 DISCUSSION

4.1 Purpose and Overview

The literature indicates that both within and across youth, there is considerable variability, from negative to positive, in their cancer experiences and survivorship outcomes. Many pediatric cancer survivors, even in spite of negative experiences, report positive outcomes, such as posttraumatic growth (PTG; Barakat et al., 2006; Picoraro, et al., 2014; Zebrack, et al., 2012). PTG is an important outcome to consider for survivors because it has been linked to reduced emotional distress and posttraumatic stress symptoms in survivors of cancer (Ochoa, Casellas-Grau, Vives, Font, & Borras, 2017), and it has been argued to prepare individuals to face subsequent adversities with reduced anxiety or maladaptive psychological responses (Janoff-Bullman, 2006; Tedeschi & Calhoun, 2006). This is particularly important for survivors of pediatric cancer, given that they often deal with additional adversity post-cancer, such as late health effects or cancer recurrence (National Cancer Institute, 2018; Weiner & Simone 2003).

Whereas there is a growing body of literature to inform what is known about the outcome of PTG in survivors of pediatric cancer, the process that precedes or predicts PTG for youth has yet to be studied empirically. PTG has been theorized to be preceded by an initial decline or shattering of world views and schemas when trauma occurs, and a subsequent rebuilding and

enhancement of those world views beyond baseline levels, which results in the perception of growth as a result of one's trauma (Pre-PTG; Jannoff-Bullman, 1992; Tedeschi & Calhoun, 2004). The current study explored this proposed theoretical process for youth with cancer via isolating two aspects of world view that may be particularly important and sensitive to change during an adolescent's cancer experience: peer relationships and self-esteem. How young adult survivors of cancer reflect on patterns of changes in their peer relationships and self-esteem is important for understanding which pattern(s) may be most related to PTG. If the process that precedes PTG can be better understood, perhaps healthcare professionals and caregivers of youth with cancer can identify when a young person may be on a trajectory that is more or less likely to lead to growth, and even facilitate PTG for these youth.

This study had two primary aims. The first was to explore the process that may precede PTG in youth with cancer; specifically, this aim involved exploring patterns of change in peer relationships and self-esteem across youths' cancer experience, from before cancer, during the most traumatic time of cancer, and in survivorship. The second aim was to evaluate which pattern(s) of change in peer relationships and self-esteem are most highly associated with the outcome of PTG.

4.2 Preliminary Analyses

With regard to the sample, participants were on average 21 years old and ranged from 18 to 25. Compared to the broader literature on PTG in pediatric cancer survivors, the current study included only young adult survivors, which represents a narrower age range than many studies that tend to include either adolescent and young adult survivors of pediatric cancer, or adult survivors for whom the average age is older than the current study's sample. Thus, it is important to note that the current sample of individuals is unique and narrow in their stage of life. The

number of males and females was relatively equivalent, which is consistent with much of the literature. The sample was primarily White in terms of race (50%); however, had a greater percentage of Black participants than other studies of PTG in pediatric cancer survivors in the United States. Very few individuals were of Asian, Native American or Other races, and a minority of the sample was Hispanic.

The average time span between their cancer diagnosis and their self-identified most traumatic time during cancer was about approximately six months, and roughly 60% of participants reported being the same age at diagnosis and at their self-identified most traumatic time during cancer, suggesting that many participants identified the time period closely following diagnosis as the most traumatic time during their cancer experience. This is important for future researchers interested in the traumatic impact of pediatric cancer to consider, and could be due to the fact that the diagnosis period in itself is very stressful and involves many diagnostic procedures, treatments immediately following diagnosis, and stress for the young patient (Allen-Rhoades & Steuber, 2016; Heerema-McKenney, Cleary, & Arber, 2016, as cited in Pizzo, Poplack, Adamson, Blaney, & Helman, 2016; Jadvar, Connolly, Fahey, & Shulkin, 2007). The potential for cancer to be traumatic early on highlights the importance of assessing for acute trauma in youth during the diagnosis phase and providing psychosocial support through at least the first six months following diagnosis.

Given the short lapse in time between diagnosis and most traumatic period of cancer, it is important to recognize that there might be less dramatic changes in reports on peer relationships and self-esteem between those two time periods. In addition, the changes reported across those times may be more likely attributable to perceptions of the impact of cancer. The average number of years in age between the sample's most traumatic time point and the current time

point (survivorship) was about six and a half years; thus, changes in perceptions of peer relationships and self-esteem might be tied to either natural maturational changes or shifts more directly linked to cancer progression. Thus, these changes should be compared to data regarding natural changes in perceptions of peer relationships and self-esteem from adolescence to young adulthood.

Average PTG for this sample was somewhat higher compared to existing literature on young adult survivors of pediatric cancer (Klosky et al., 2014; Yi & Kim, 2014) and might be a function of the sample's current age (young-adulthood) and age at diagnosis (adolescence). Young adults, who are fewer years from the end of their treatment tend to endorse more PTG than individuals later in adulthood (Gunst, Kaatsch, Goldbeck, & Gunst, 2016) as do individuals who were diagnosed as adolescents, as opposed to children (Klosky et al., 2014). It is also possible that the 54 percent recruitment rate for the larger study contributed to higher reports of PTG, such that those individuals who opted to complete surveys may represent a sample of survivors who experience higher PTG. Hispanic participants reported significantly higher PTG than non-Hispanic participants, which is consistent in both the pediatric cancer (Tobin, Allem, Slaughter, Unger, Hamilton, & Milam, 2017) and adult cancer literature, and may be attributed to greater spirituality among Hispanic individuals (Smith, Dalen, Bernard, & Baumgartner, 2008).

4.3 Patterns of Change in Peer Relationships and Self-Esteem

The first aim of this project was to identify if there were distinguishable patterns of change in peer relationships and self-esteem in youth with cancer. Although there was variability in survivors' reports about their peer relationships and self-esteem across the cancer experience – from baseline (prior to their cancer diagnosis) to the most traumatic time during their cancer

experience to survivorship – clear patterns were found. I reliably identified the following six patterns of change in peer relationships and self-esteem: No-Change, Recovery, Partial Recovery, Decreasing, Increasing, and Pre-PTG. These patterns are consistent with those found in the extant trauma and resilience literature. For example, in line with former findings on trauma survivors, most individuals in the current study reported patterns of No-Change or Recovery in both peer relationships and self-esteem, which are similar to patterns labelled resilient or stress-resistant, and recovery, in the broader trauma-trajectory literature (Galazter-Levy, Huang, & Bonanno, 2018; Lai et al., 2017; Masten, 2014; Price, Kassam-Adams, Alderfer, Christofferson, & Kazak, 2016). Masten (2014) concluded that children follow a trajectory of posttraumatic growth, improvement, decline, or depreciation overtime, which appear similar to the current study's patterns of Pre-PTG, Increasing, and Decreasing. Although the patterns in the trauma and resilience literature are similar to those found in the current study, and serve as a helpful guide for how to conceptualize individuals' experiences during and post adversity, it is important to recognize that the previous literature observes patterns of change in negative or maladaptive outcomes (such as Posttraumatic Stress) overtime and generally uses established clinical cut off points to qualify change and determine group membership. In contrast, I evaluated changes to aspects of an individual's world-view (peer relationships and self-esteem) for which clinical cut off points are not established or relevant. This study instead emphasized the degree of change across each participant's perceived cancer experience, for the purpose of evaluating how those perceptions may have been impacted by pediatric cancer and may relate to PTG in survivorship. Although, not a particular aim of this study, the variability in youths' perceptions of experiences raises additional questions about what factors may contribute to the particular changes reported by the young adults in this sample. I will discuss possible reasons for why individuals report

different patterns and future directions for better understanding the factors that might influence youths' trajectories across the cancer experience.

4.3.1 No-Change Pattern

Among patterns of change in both peer relationships and self-esteem, the No-Change pattern represented the majority of participants, which is consistent with the trauma and resilience literature (e.g., Galazter-Levy, Huang, & Bonanno, 2018). Fourteen participants endorsed this pattern for both peer relationships and self-esteem, demonstrating resilience in the face of stress and suggesting that these individuals may have been resistant to the effects of their cancer experience on multiple aspects of their world-view.

Participants who reported a pattern of No-Change in their peer relationships reflected on their peer relationships as being relatively good at all three time points, suggesting that even though they did not perceived changes in their peer relationships, they perceived their relationships to be good relative to other patterns at any of the three time points. This might suggest that interpersonal characteristics related to positive peer relationships (Wilson, Harris, & Vazire, 2015) stay consistent across the cancer experience, even though peer relationships may shift throughout young adulthood for most healthy youth (Fischer, 1981). One participant endorsed an inverted-V pattern of change in their peer relationships, indicating improvement during their most traumatic time of cancer compared to baseline and survivorship. This participant was forced into the no-change pattern based on overall trend from baseline to survivorship which reflected no-change; however, it should be acknowledged that their cancer experience is not fully represented by any of the six identified patterns.

Participants who reported a pattern of No-Change in their self-esteem may demonstrate resistance to the stress of their cancer experience on their self-esteem. Relative to average self-

esteem ratings across all time points for other patterns of change, the individuals who reported No-Change endorsed an average self-esteem in the mid-range, suggesting that although they did not report changes, their self-esteem remained neither high nor low compared to other patterns. Because the majority of young-adults reported a No-Change pattern, perhaps self-esteem is not the particular schema that is challenged for the majority of youth during cancer, or the particular challenges of cancer does not compromise self-esteem for many youth. It is also possible that self-esteem in general is more resistant to change, not surprisingly, as many have found self-esteem to stay rather consistent across the life-span from adolescence to young-adulthood (Robins & Trzesniewski, 2005).

4.3.2 Recovery Pattern

Many of the participants reported a pattern indicative of Recovery in their peer relationships and self-esteem across the cancer experience. Participants who reported this pattern of change appear to have experienced a shattering in their perspectives and a subsequent increase back to initial baseline (pre-diagnosis) levels. Resilience is often described as the ability to recover from adversity; thus, the individuals who report this pattern of change might embody resilience in the face of cancer-related adversity. Six participants in this study reported a Recovery pattern of change in both peer relationships and self-esteem.

The 15 participants who reported a pattern of Recovery in their peer relationships endorsed the highest average PTG among all the groups, suggesting that perhaps a recovery back to baseline in peer relationships may be most important for the perception of PTG, as opposed to the hypothesized growth beyond baseline. Individuals in this pattern also reported relatively high average baseline and survivorship ratings of peer relationships compared to other groups, which likely impacted their high perceptions of PTG.

Participants who reported a pattern of Recovery in their self-esteem comprised 26% of the participants, being the second highest pattern of change in self-esteem. Interestingly, the average amount of time between baseline and the most traumatic time during cancer for these participants was about three months, suggesting that they experienced a potential shattering of their self-esteem very soon after diagnosis. That self-esteem has the potential to decrease so quickly during the months immediately following an adolescent's cancer diagnosis, may be important for future researchers and clinicians to consider. Average PTG among individuals in this pattern was the second highest among all patterns, suggesting that recovery back to baseline in self-esteem may also be important for the perception of growth after trauma.

4.3.3 Partial Recovery Pattern

A pattern of Partial Recovery emerged among participants, five of whom endorsed this pattern for changes in both their peer relationships and self-esteem. Individuals who reported Partial Recovery in either peer relationships or self-esteem experienced the least adaptive outcomes of participants, and thus may be a critical group to evaluate further in future research and attend to in clinical practice. These individuals reported the lowest average PTG and among the lowest average views on peer relationships and self-esteem during survivorship. Perhaps only partial recovery was realized for this group, because they appeared to have the most decline in perspectives to recover from; for example, these individuals decreased from the highest of self-esteems to the lowest among all groups and therefore had more self-esteem to recover. This unique pattern reflects an overall post-traumatic decline from baseline, rather than resilience or growth, and indicates that although perspectives improved from the most traumatic time during cancer, perhaps in comparison to perspectives before diagnosis, an overall depreciation was felt among these individuals.

Individuals who experienced a pattern of Partial Recovery in their peer relationships were characterized by having a relatively high baseline perception of their peer relationships. During their most traumatic time of cancer, however, their perceptions decreased substantially, on average by close to half and reflected the lowest average T2 rating for peer relationships of any group, being well below all other groups at T2. Unfortunately, this group was not able to return from such a decline and resulted in the lowest average ratings for peer relationships at T3. This represents an overall great decline from baseline and a current perception that is low; thus, it is no wonder that individuals in this pattern reported the lowest average PTG of any of the patterns. Twenty-four percent of the sample reported this pattern in their peer relationships, second only to the No-Change pattern, which may speak to the critical nature of social support and potential benefits of therapy to facilitate increases in social support during survivorship. Perhaps working with these individuals who experience such a drastic decrease in their peer relationships during their cancer experience to positively rebuild their relationships back to baseline would result in the perception of more PTG and adaptive outcomes.

Participants who reported a pattern of Partial Recovery in their self-esteem, endorsed the highest average baseline self-esteem and decreased to the lowest average of any of the groups during the most traumatic time in their cancer experience. Although these participants averaged the longest amount of time between T2 and T3 for rebuilding, they were unable to increase back to baseline levels, which likely influenced their low PTG relative to all other groups. Again, this is a very compelling group to study and highlights the importance of gaining a better understanding of how to support growth in the aftermath of trauma.

4.3.4 Decreasing Pattern

A subset of individuals endorsed a Decreasing pattern in perspectives on peer relationships or self-esteem across the cancer experience, although no participants endorsed this pattern of change in both peer relationships and self-esteem. This pattern may be conceptualized similarly to Partial Recovery, as post-traumatic decline or depreciation and may be important to study further for better understanding why these individuals are particularly vulnerable to decline overtime. It is possible that this group of individuals were unable to demonstrate resilience in the face of challenges to their peer relationships or self-esteem and understanding vulnerability factors that contribute to their decline should be addressed in future research.

Participants who endorsed a Decreasing pattern of change in their peer relationships reported a perspective of continuous decline over time; however, the scores during survivorship were not much lower than other patterns. Interestingly, the average PTG for individuals who reported the Decreasing pattern was greater than for all other patterns, except for Recovery, raising questions about whether a decline in perspectives on peer relationships could have been accompanied by positive changes in other aspects of these participants' world-view. For example, compared to the No-Change pattern, which experienced lower PTG on average, perhaps a loss in peer support caused individuals in the Decreasing pattern to grow in other ways that would lead to the perception of higher PTG in survivorship.

Participants who reported a pattern of Decreasing in their self-esteem were characterized by a high average baseline self-esteem and the lowest average survivorship self-esteem relative to other patterns. It is possible that this group was more vulnerable to declines in self-esteem over the course of their cancer experience because they simply had more room to decline than others because their baseline was high. However, it is possible that other psychosocial factors,

for example, anxiety, depression, or PTSS, might have influenced these individuals' decline in self-esteem and are vulnerability factors that should be considered in clinical work with youth with cancer and in future studies.

4.3.5 Increasing Pattern

Participants also reported changes that reflect a pattern of Increasing. This pattern of change differs from the Pre-PTG pattern by slightly increasing, rather than declining during the most traumatic time of cancer, and then a subsequent greater increase into survivorship. Seven of the 90 participants in the study endorsed an Increasing pattern of change in both their peer relationships and self-esteem, suggesting mutual influence between these constructs (Bishop & Inderbitzen, 1995; Keefe & Berndt, 1996). For both peer relationships and self-esteem, the average baseline reports were lower among those in the Increasing pattern than in all other patterns, suggesting that they simply had the most room for improvement. This may also indicate, especially for the seven participants who reported increases in both peer relationships and self-esteem, that cancer may not have been conceptualized as traumatic, perhaps in comparison to other aspects of their life, and thus simply resulted in growth, rather than PTG.

Participants who reported an Increasing pattern of change in their peer relationships endorsed the lowest average baseline perception of peer relationships compared to any other pattern, but increased to an average current perception almost as high as the highest patterns' averages (Recovery and No-Change) by survivorship. Although this group of participants reported a steady increase in their peer relationships, they did not endorse higher average PTG scores than Pre-PTG, Recovery, or Decreasing groups, perhaps, because in line with the theory of the process that precedes PTG, this group did not experience a shattering or decline during the

most traumatic time of cancer. Thus, perhaps their growth was perceived as simply maturation and not conceptualized as following or being the result of their adversity or trauma.

Participants who reported an Increasing pattern of change in their self-esteem endorsed average PTG ratings that were in the mid-range compared to averages for other patterns. These participants reported the lowest average baseline perceptions of their self-esteem and did not endorse a shattering during the self-identified most traumatic time of cancer, but rather a steady increase. The 10 participants who endorse steady increase in self-esteem are a compelling group that raise future research questions about how their cancer experience may have impacted their increase in self-esteem. Perhaps these individuals experienced a sense of empowerment as a result of having endured the hardship of cancer, or gained resources such as supportive family communication, which may have contributed to increases in self-esteem (Birndorf, Ryan, Auinger, & Aten, 2005).

It is also possible that these individuals' particular cancer diagnoses did not result in changes to their physical body, which may have otherwise impacted body dissatisfaction, which has been related to lower self-esteem (van den Berg, Mond, Eisenberg, Ackard, & Neumark-Sztainer, 2010). This pattern may have also been impacted by racial factors, given that more than twice as many Black participants as White participants reported this increasing pattern of change in their self-esteem, and studies of self-esteem in healthy populations have consistently shown Blacks to endorse higher self-esteem and increasing self-esteem into young adulthood compared to Whites (Sprecher, Brooks, & Avogo, 2013; Twenge & Crocker, 2002). Self-esteem has been shown to predict hopefulness in youth with cancer (Ritchie, 2001); thus, this group in particular and the factors that may have contributed to their increase in their self-esteem even during the most traumatic time in their cancer experience will be important to consider in future research.

4.3.6 Pre-PTG Pattern

Analysis of the patterns of change revealed that, in line with the hypothesis, a sub-group of young adult survivors reported changes to their peer relationships and self-esteem that reflect the pattern that has been proposed to precede and result in PTG (Tedeschi & Calhoun, 2006). This Pre-PTG pattern indicates a potential shattering of views on peer relationships and self-esteem during the most traumatic time of the cancer experience and a subsequent growth beyond baseline levels in the aftermath of the trauma. The percent of young adults who experienced this pattern of change in both peer relationships and self-esteem, however, was relatively low and comprised the fewest percent of any of the patterns that emerged. It is important to note, that for the Pre-PTG pattern, no participants who reported this pattern of change in their peer relationships were the same participants who reported this pattern in their self-esteem, suggesting that a shattering of one aspect of an individual's world-view does not necessarily relate to other aspects. This may also suggest that it is important to take an individualistic perspective to assessing various and multiple aspects of a youth's well-being during their cancer experience to best isolate vulnerability and protective factors unique to each youth.

Participants who reported the Pre-PTG pattern in their peer relationships endorsed among the highest average PTG scores across all six patterns; however, not as high as participants in the Recovery group. The similar PTG ratings between these two groups might suggest that recovery of peer relationships can be just as powerful as is growth beyond baseline in influencing perceptions of PTG. The PTG reports may also be similar because the current survivorship perceptions of peer relationships in both the Pre-PTG pattern and Recovery pattern were similar, indicating that perhaps perception of peer relationships in survivorship, regardless of baseline, is important for the perception of PTG. Participants who reported the Pre-PTG pattern in their self-

esteem, as expected, endorsed the highest average PTG compared to other patterns of change in self-esteem, being 14 points different from the next highest group (Recovery). This finding provides additional support that the proposed process that precedes PTG (e.g., Tedeschi & Calhoun, 1996) may exist for some individuals, especially for changes in self-esteem.

4.3.7 Peer Relationship Patterns

The broader literature on peer relationships and friendships indicate that from adolescence to young adulthood, peer relationships become more intimate, friendly, and real, and involve greater empathy, self-disclosure, and selectiveness, with few differences among males and females (Fischer, 1981). Reciprocity in friendships is emphasized as being important across the lifespan and life transitions are noted to be less psychologically disturbing when they occur in the company of friends (Hartup & Stevens, 1999). Thus, it is expected that perceptions on peer relationships would naturally shift. The variability in changes across the current sample highlight the importance of gaining a deeper understanding of the unique changes in individual's patterns and potential protective or vulnerability factors that are at play. For example, individuals who experienced No-Change or Recovery, but endorsed high perceptions of peer relationships at baseline and survivorship, might have different experiences than those who endorsed those same patterns but reported low perceptions of their peer relationships at baseline and survivorship. For individuals who reported Increasing or Pre-PTG patterns of change in their peer relationships, it would be interesting to know if their perceptions grew more positive due to making new friends who shared a cancer experience or if their relationships with the same friends at baseline improved overtime.

Individuals who endorsed Partial Recovery of their peer relationships, and the lowest PTG, may be the most vulnerable group of individuals, and should be a focus of future research.

Perhaps for these youth, they experienced a loss in time spent with peers during their cancer treatment and important aspects of friendship, such as reciprocity, empathy, and intimacy, were as not as prevalent or possible in their peer relationships due to their disease. As part of typical development, during adolescence, individuals begin to spend more time with their friends, a developmental event that may be delayed or missing from a Partial Recovery cancer survivors' adolescent experience. These are possible explanations for why some adolescents would endorsed patterns of overall decline; however, vulnerability factors should be studied further in future research. Additionally, clinical assessments should seek to reveal youth who are particularly vulnerable to depreciation during their cancer experience, and support for these youth during survivorship should focus on rebuilding positive peer relationships in the aftermath of cancer.

4.3.8 Self-Esteem Patterns

The broader literature on self-esteem indicates that healthy adolescents' self-esteem can be expected to increase slightly through young adulthood for males and decrease slightly for females (Block & Robins, 1993; Chub & Fertman, 1997). The No-Change pattern was the most endorsed pattern for young adults in this study, which is consistently a majority pattern of change found in the broader trauma and resilience literature (Galatzer-Levy, Huang, & Bonanno, 2018). All patterns of resilience or growth, (No-Change, Recovery, Increasing, and Pre-PTG) together were endorsed by 78% of this sample, indicating that in line with much of the literature on youth with cancer, the individuals in this sample are resilient, particularly in their ability to resist negative influences of their cancer experience on their self-esteem.

Although gender was not a primary question in this study, given that there are slight gender differences in self-esteem trajectories for healthy youth, it may be helpful to consider

how the various patterns of change may impact males and females differently. The 17 males who endorsed a pattern of No-Change in their self-esteem may have experienced a less positive trajectory of self-esteem development than healthy males, because, even though they remained resistant to negative change, they did not experience as much positive change as would be expected were they not to have had cancer. Thirteen females experienced no change in their self-esteem, which represents about 14% of females in the sample. These females may actually have experienced a more positive trajectory than healthy females, who typically experience a slight decrease in their self-esteem overtime from adolescence to adulthood. It is interesting to consider why, for the majority of females in this sample, the vulnerability to slightly decrease in self-esteem for healthy youth may have been mitigated by aspects of their cancer experience. Overall, across the various patterns, females who reported the No-Change, Recovery, Increasing, and Pre-PTG patterns likely experienced a more positive self-esteem trajectory than typical females, because they did not experience a slight decrease in self-esteem; whereas, females who endorsed Partial-Recovery or Decreasing patterns did experience a decrease in self-esteem, perhaps even more so than the typical female. Only males who reported Increasing and Pre-PTG patterns of self-esteem may have experienced typical or greater than typical self-esteem trajectories compared to healthy males; however, males who endorsed No-Change, Recovery, Partial Recovery, and Decreasing patterns may have experienced a more negative self-esteem trajectory than might be expected for a typical male from adolescence to young adulthood. Perhaps aspects of the cancer experience, such as changes to one's body, delayed puberty, and limitations in physicality impact males differently than females and could be partially explain why the male cancer survivors in this study may have experience less positive self-esteem development than female survivors.

A better understanding of vulnerability and protective factors that may impact changes in a youth's self-esteem will be important for future research, particularly for understanding differences among individuals who experienced more or less positive trajectories across the cancer experience compared to healthy peers. Understanding these factors may inform clinical practice to better support youth with cancer in adaptive and positive self-esteem development from adolescence into young adulthood.

4.4 Primary Aim 2

The second aim of this study was to evaluate differences in PTG among the various identified patterns of change in peer relationships and self-esteem. Contrary to hypotheses, participants in Pre-PTG pattern for peer relationships did not endorse the highest average PTG. Participants in the Pre-PTG pattern for self-esteem did endorse the highest average PTG; however, this difference was not statistically significant in the 6-group comparisons. This could be due in part to the small sample size, which was underpowered to detect significant differences among six groups. For peer relationships, in the 2-group comparison, PTG of the Pre-PTG group was not significantly different from PTG of the Non-Pre-PTG group, unsurprisingly, given that average PTG was not greater for the Pre-PTG pattern than for other patterns. This might suggest that shattering and rebuilding beyond baseline in peer relationships during the cancer experience is not critical for the perception of PTG during survivorship, and there are possibly other characteristics of peer relationship patterns, such as an overall trend of improvement or recovery, that are more important for the perception of PTG among young adult survivors. For self-esteem, the Pre-PTG group did endorse significantly higher PTG than the Non-Pre-PTG group. This suggests that perhaps for a minority of youth with cancer, the process of shattering and rebuilding that is theorized to precede PTG does occur in self-esteem. However, what is

important to acknowledge, is that even for the majority of youth who did not endorse a Pre-PTG pattern of change in their self-esteem, the outcome of PTG is still reported at relatively high levels for many of the participants. This might be interpreted as encouraging, that despite the various patterns of change in perceptions of one's world-view, many youth still report PTG related to their cancer. It is important to note, that across the PTG literature, not all individuals who endorse PTG endorse a traumatic experience; rather, individuals may experience events ranging from traumatic, to adverse, to significant yet manageable (Evans et al., 2018; Frazier et al., 2009; Kaye-Tzadok & Davidson-Arad, 2016). For youth with pediatric cancer, it may not be necessary to perceive their cancer as traumatic to experience PTG. Instead, cancer may be conceptualized as a significant event from which the perception of PTG may follow (Phipps et al., 2014; Picoraro et al., 2014).

Significant differences in PTG were not found among the subgroups formed for patterns of peer relationships (Growth, Resilience, and Depreciation). Perhaps, for changes in peer relationships, there are other combinations of patterns that may result in more or less PTG, that should be explored in future research. Alternatively, these findings may indicate that changes in peer relationships are not as critical for the perception of PTG as hypothesized.

When comparing the three self-esteem subgroups (Growth, Resilient, and Depreciation) on PTG ratings no differences were found, likely because when individuals in the Pre-PTG and Increasing patterns were combined to form a Growth pattern subgroup, their average PTG was lower compared to the Pre-PTG group alone. It could be that a Pre-PTG pattern (of shattering and rebuilding) for self-esteem may be more important and predictive of the outcome of PTG than a more general Growth pattern. If accurate, this is relevant to clinicians and caretakers of youth with cancer because it suggests that even if young adults reflect back upon a great decrease

in their self-esteem during the most traumatic time of their cancer, they may still perceive adaptive outcomes if, during survivorship, they report a subsequent rebuilding of their self-esteem beyond baseline levels. Thus, when working with survivors it may be critical to support the individuals who experienced a decline in their self-esteem in rebuilding it beyond baseline levels, as this pattern may be even more related to the perception of PTG than individuals who only increase overtime without experiencing a decline during their cancer experience.

Overall, this study allows us to gain an understanding of how young adults reflect on and remember their peer relationships and self-esteem during their adolescent cancer experience. This is important because, according to much of the literature on effective treatments for those who have experienced trauma or adversity, the way individuals construct their self-narrative and make meaning of their past experience is important for healing and adjustment (Greenberg, 2011; Uy & Okubo, 2018; Zeligman, Varney, Grad, & Huffstead, 2016). The data collected in this study included retrospective reflections as well as current perspectives on peer relationships and self-esteem, and current perceptions of PTG. In other words, these data highlight perceptions and reflections on prior perspectives. This is critical, however, given that research on autobiographical memory highlights the bidirectional influence of our current and past perceptions of our former selves (Wilson & Ross, 2003). In other words, how individuals construct their past self-narrative influences how they view their current selves and circumstances (Wilson & Ross, 2003). According to some theories of memory, when individuals believe that self-attributes generally remain stable overtime, they tend to construct a narrative that reflects no-change or consistency in their past; whereas, people who expect to improve or decline overtime in an area of their life are more likely to remember a past narrative that reflects that respective improvement or depreciation (Wilson & Ross, 2003). Given that reflections on

past events and perspectives influence current opinions and views; and also that current perspectives color or impact reflections on the past (Wilson & Ross, 2003), it is important to better understand how young adult survivors both construct their past cancer narratives and how adjusted they perceive themselves to be during survivorship. The current study shows that individuals who reflect on growth in their self-esteem generally indicate greater PTG than those who endorse other narratives across the cancer experience. Thus, supporting cancer survivors in improving their current self-esteem may allow them to reflect back on, and expect, a trend of improvement, which is likely to positively influence their current perceptions of self. Integrating the current study's findings with how memory impacts current views, it appears important to assess how survivors report changes in aspects of their world-view over the course of their cancer experience and target individuals who endorse a narrative of partial recovery or decline, particularly in self-esteem, to support them in realizing more adaptive outcomes. Thus, when working with survivors, especially those who appear to view their cancer experience as traumatic or particularly adverse, part of treatment might include helping them shift their narratives to those of resilience and growth by increasing their present self-esteem, to increase PTG and positive adaptation in survivorship.

4.5 Limitations and Future Directions

One limitation of this study is that it relied on retrospection, thus, the data do not allow the evaluation of how youth experience their peer relationships and self-esteem in real time as they progress through their cancer experience and, due to the cross-sectional nature of the study, causal relations cannot be drawn. To understand youths' experiences in real time and potential predictors of adaptive outcomes, researchers should conduct longitudinal studies, which will better inform interventions that might support youth throughout their cancer experience.

Another limitation of this study is that it assumes that the most traumatic time during a youth's cancer experience is isolated to one time point, which is unlikely to allow for a comprehensive and thorough picture of how youth's cancer experiences can be traumatic and impact their world-views, given that the cancer experience is often a series of multiple traumas or hardships (Stuber, Christakis, Houskamp, & Kazak, 1996). Therefore, it is important for future studies to assess aspects of world-view across multiple time points during the cancer experience, as youth may have experienced more fluctuations in their views than this study was able to capture by only evaluating three time-points.

As noted previously, the size of the sample may have limited this study's ability to detect significant differences in PTG among the various patterns of change; thus, future studies could seek to enroll more survivors to evaluate larger samples of individuals who fall into each of the identified patterns. Another limitation is that this study only evaluated two aspects of youths' world-view – peer relationships and self-esteem – however, future studies may consider evaluating additional aspects of world-view, such as body image (Pinquart, 2013; Vuotto et al., 2018), optimism (Michel, Taylor, Absolom, & Eiser, 2009), loss of control (Wicks & Mitchell, 2010), and relationships with family and parents (Koutna, Jelinek, Blatny, & Tomas, 2017; Long & Marshland, 2011; Sultan, Leclair, Rondeau, Burns, & Abate, 2015) to better isolate aspects that may influence adaptive outcomes for youth with cancer. Furthermore, studying other adaptive outcomes, such as benefit finding (Heeyeon, 2019; Phipps, Long, & Ogden, 2007; Wicks & Mitchell, 2010) or meaning making (Parry & Chesler, 2005), in addition to PTG may be helpful for understanding and promoting positive adjustment during survivorship. To more deeply understand the shifts in peer relationships and self-esteem, qualitative studies should be employed. This may provide insight into details that are important about the patterns observed.

Another limitation of this study was that outcomes for each of the patterns were evaluated in terms of their average PTG, and because there was variability in PTG even among the patterns, this limited a more detailed understanding of adaptive outcomes for individuals. It would be interesting in a future analysis to establish cut off points for PTG and reverse-evaluate which patterns of change tend to be associated with higher or lower PTG. In order to do this, meaningfully important differences in PTG may need to be identified, so that cut off points are not arbitrary and are relevant for how survivors' views of their current selves, circumstances, and adjustment to life as a survivor differ.

4.6 Summary and Conclusions

Findings from this study confirm that many young adult survivors perceive PTG as a result of their cancer experience and indicate that there is variability in the way survivors reflect on changes in their peer relationships and self-esteem across their cancer experience. Six distinct patterns of change were identified in this sample. Given that some patterns were more related to PTG than others, findings inform what types of changes may be important to identify in youth as they experience cancer or in survivors when they reflect on their past cancer experience. This study highlights the importance of identifying survivors who may report past patterns of depreciation in their peer relationships and self-esteem throughout cancer given that those individuals may be most vulnerable to experiencing less adaptive outcomes. Findings also demonstrate that a decrease in perspectives during cancer may not be maladaptive if followed by a subsequent increase, thus indicating the value of supporting young adults in the survivorship phase in improving their peer relationships and especially their self-esteem back to or beyond baseline levels. These findings might imply that when treating survivors, it will be important for clinicians to understand survivors' cancer narratives by assessing baseline, during-cancer, and

survivorship perspectives, particularly on self-esteem, and work with survivors to improve their current perspectives. This may increase survivors' perceptions of the extent to which they experience PTG, which will potentially protect them against future life challenges and increase their positive adaptation post cancer.

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APPENDICES

Appendix A

Posttraumatic Growth Inventory

Instructions: Indicate for each of the statements below the degree to which this change occurred in your life as a result of your cancer, using the following scale.

0 = I did not experience this change as a result of my cancer.
1 = I experienced this change to a very small degree as a result of my cancer.
2 = I experienced this change to a small degree as a result of my cancer.
3 = I experienced this change to a moderate degree as a result of my cancer.
4 = I experienced this change to a great degree as a result of my cancer.
5 = I experienced this change to a very great degree as a result of my cancer.

1. I changed my priorities about what is important in life.	**0**	**1**	**2**	**3**	**4**	**5**
2. I have a greater appreciation for the value of my own life.	**0**	**1**	**2**	**3**	**4**	**5**
3. I developed new interests.	**0**	**1**	**2**	**3**	**4**	**5**
4. I have a greater feeling of self-reliance.	**0**	**1**	**2**	**3**	**4**	**5**
5. I have a better understanding of spiritual matters.	**0**	**1**	**2**	**3**	**4**	**5**
6. I more clearly see that I can count on people in times of trouble.	**0**	**1**	**2**	**3**	**4**	**5**
7. I established a new path for my life.	**0**	**1**	**2**	**3**	**4**	**5**
8. I have a greater sense of closeness with others.	**0**	**1**	**2**	**3**	**4**	**5**
9. I am more willing to express my emotions.	**0**	**1**	**2**	**3**	**4**	**5**
10. I know better that I can handle difficulties.	**0**	**1**	**2**	**3**	**4**	**5**
11. I am able to do better things with my life.	**0**	**1**	**2**	**3**	**4**	**5**
12. I am better able to accept the way things work out.	**0**	**1**	**2**	**3**	**4**	**5**
13. I can better appreciate each day.	**0**	**1**	**2**	**3**	**4**	**5**
14. New opportunities are available which wouldn't have been otherwise.	**0**	**1**	**2**	**3**	**4**	**5**
15. I have more compassion for others.						

	0	**1**	**2**	**3**	**4**	**5**
16. I put more effort into my relationships.	**0**	**1**	**2**	**3**	**4**	**5**
17. I am more likely to try to change things which need changing.	**0**	**1**	**2**	**3**	**4**	**5**
18. I have a stronger religious faith.	**0**	**1**	**2**	**3**	**4**	**5**
19. I discovered that I'm stronger than I thought I was.	**0**	**1**	**2**	**3**	**4**	**5**
20. I learned a great deal about how wonderful people are.	**0**	**1**	**2**	**3**	**4**	**5**
21. I better accept needing others.	**0**	**1**	**2**	**3**	**4**	**5**

Appendix B

PROMIS Pediatric Item Bank v2.0 – Peer Relationships – Short Form 8a

1. Prompt for Current Time Period: Think about the present time and respond to each statement considering how things have been in the past two weeks:

2. Prompt for Before Cancer Time Period: Recall the time period right before your cancer diagnosis:

   How old were you? ____
   What year was it? ____

3. Prompt for Most Traumatic Cancer-Related Time Period: Recall the most traumatic cancer-related time period during your cancer experience:

   How old were you? ____
   What year was it? ____

INSTRUCTIONS: Please respond to each statement below by marking either *Never, Almost Never, Sometimes, Often,* or *Almost Always* for the **current time period || time period right before your cancer diagnosis || most traumatic cancer-related time period during your cancer experience**.

1. I felt accepted by others my age	**Never**	**Almost Never**	**Sometimes**	**Often**	**Almost Always**
2. I was able to count on my friends	**Never**	**Almost Never**	**Sometimes**	**Often**	**Almost Always**
3. I was able to talk about everything with my friends	**Never**	**Almost Never**	**Sometimes**	**Often**	**Almost Always**
4. I was good at making friends	**Never**	**Almost Never**	**Sometimes**	**Often**	**Almost Always**
5. My friends and I helped each other out	**Never**	**Almost Never**	**Sometimes**	**Often**	**Almost Always**
6. Others wanted to be my friend	**Never**	**Almost Never**	**Sometimes**	**Often**	**Almost Always**
7. Others wanted to be with me	**Never**	**Almost Never**	**Sometimes**	**Often**	**Almost Always**
8. Others wanted to	**Never**	**Almost**	**Sometime**	**Often**	**Almost**

talk to me		**Never**	**s**		**Always**

Appendix C

Rosenberg Self-Esteem Scale

1. Prompt for Current Time Period: Think about the present time and respond to each statement considering how things have been in the past two weeks:

2. Prompt for Before Cancer Time Period: Recall the time period right before your cancer diagnosis:

   How old were you? ____
   What year was it? ____

3. Prompt for Most Traumatic Cancer-Related Time Period: Recall the most traumatic cancer-related time period during your cancer experience:

   How old were you? ____
   What year was it? ____

INSTRUCTIONS: Please respond to each statement below by marking either *Strongly Disagree, Disagree, Agree,* or *Strongly Agree* for the **current time period || time period right before your cancer diagnosis || most traumatic cancer-related time period during your cancer experience**.

1. On the whole, I was satisfied with myself	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
2. At times I thought I was no good at all	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
3. I felt that I had a number of good qualities	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
4. I was able to do things as well as most other people	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
5. I felt I did not have much to be proud of	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
6. I certainly felt useless at times	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
7. I felt that I was a person of worth, at least on an equal plane with others	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
8. I wished I could have more respect for myself	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
9. All in all, I was inclined to feel that I am a failure	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**

10. I took a positive attitude toward myself	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**