

That's Not What Your Friends Say:

Does Self-reported Posttraumatic Growth Translate into Friend Ratings of Improvement?

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ABSTRACT

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Posttraumatic growth (PTG) is a prolific construct under study within both trauma and positive psychology literature alike. Many of these studies rely predominantly on cross-sectional, retrospective self-report data. Recent studies have attempted to subject PTG to more rigorous scientific standards of measurement. In this study, we examined posttraumatic growth measured longitudinally among survivors of the September 11th, 2001 terrorist attack, in order to explore whether participants' reports of posttraumatic growth were associated with, supported or contradicted by friend ratings of improvement. In this context, participant-reported posttraumatic growth was consistently linked with friend ratings of deteriorating functioning, providing evidence that posttraumatic growth is undermined by friend ratings. These findings suggest that self-reported PTG may inadequately predict functioning as rated by alternative, more objective measures, and that PTG may reflect negative psychological adjustment.

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DEDICATION

My parents, Dr. Allen Goorin and Linda Goorin, have supported my work in psychology in general and my academic pursuit of understanding trauma in particular in capacities both told and untold. Dr. George Bonanno has served both as an advisor and unremittingly, an inspiration since I first read his studies and was fortunate enough to be among his students.

**That's Not What Your Friends Say: Does Self-reported Posttraumatic Growth
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“Let me embrace thee, sour adversity, for wise men say it is the wisest course.”

- William Shakespeare (1597), Part 3, Act 3, Scene 1

“The only true voyage of discovery ... would be not to visit strange lands but to possess
other eyes, to behold the universe through the eyes of another.”

– Marcel Proust (1923), p. 657

Over the last half-century, psychology research and case studies alike have documented the potential for undergoing positive change in the aftermath of adversity (Andreason & Norris, 1973, Finkel, 1974, Frankl, 1961, Sheikh, 2008). With the growing threat of terrorism over the past decade and exceedingly in a post-9/11 era, narratives of trauma as they appear in popular culture media are increasingly accompanied by compelling descriptions of survivors' personal growth and improved psychological functioning after potential trauma. The construct of self-reported posttraumatic growth (PTG) has also garnered significant attention in the fields of positive psychology and trauma research, where a growing body of literature has indicated the frequency of psychological growth as reported by individuals who have been exposed to the atrocities of terrorism, natural disaster, bereavement, sexual assault, and illness, among other potentially traumatic events (Calhoun & Tedeschi, 1998, Shakespeare-Finch & Enders, 2008). The attractiveness of the posttraumatic growth construct within popular culture media and psychology studies alike rests in part on its potential to convey hope in the face of horror. Nevertheless, PTG and related constructs have progressively been subject

to precise scientific inquiry, and in recent years, findings from several studies raise questions about what, specifically, PTG measures.

In efforts to unpack posttraumatic growth as a construct, a series of studies have subjected PTG to the same rigorous standards of scientific inquiry as other psychological constructs (e.g., depression, Frazier, Tennen, Gavian, Park, Tomich, Tashiro, 2009). Meta-analyses of PTG indicate inconsistent findings regarding whether PTG is an indicator of objective positive change (Helgeson, Reynolds, & Tomich, 2006, Zoellner & Maercker, 2006). In a related vein, the use of cross-sectional designs with retrospective self-report questionnaires to measure PTG raises a host of questions about generalizability (Frazier et. al., 2009). Alternate measures of functioning, including collecting longitudinal data and interviewing survivors' closest friends and family members would provide alternative and potentially more objective measures of the construct of PTG, and would allow for an exploration of its associated outcomes. If trauma survivors report posttraumatic growth, do their closest friends and loved ones corroborate their reports? The primary aims of this study are to investigate posttraumatic growth longitudinally among survivors of the September 11th, 2001 terrorist attack in New York City to explore whether survivors' reports of posttraumatic growth are associated with, supported or contradicted by friend ratings of improvement, in order to determine whether or not PTG is reflected by corresponding friend ratings of improvement, an indicator of positive coping, or associated with negative psychological adjustment.

Posttraumatic Growth and Genuine Growth: Terminology distinctions

Posttraumatic growth and related constructs (Tedeschi & Calhoun, 1996), alternately referred to as benefit finding, (Tennen & Affleck, 2002) stress-related growth, (Park, Cohen & Murch, 1996) thriving (O'Leary, Alday, & Ickovics, 1998) or adversarial growth (Linley & Joseph, 2004) may be defined as self-reported positive psychological change in the aftermath of potentially traumatic events. In the late 1980s and thereafter, Tedeschi and Calhoun pioneered a series of studies which have supported the notion of PTG as an indicator of positive adaptation, and their literature prompted a burgeoning of posttraumatic growth studies among positive psychology researchers and trauma researchers alike. Even popular media has embraced the notion of PTG, as revealed in a headlining article in the *New York Times* on mental stress training with United States soldiers, in which Seligman is quoted as saying, "Most people who experience trauma don't end up with [Posttraumatic Stress Disorder] PTSD; many experience posttraumatic growth" (Carey, 2009, A1).

Despite the considerable enthusiasm generated by this construct, in recent years, a series of studies have cast doubt on PTG as an indicator of positive adaptation after potential trauma. Several studies indicate that PTG may, in fact, be associated with increased Posttraumatic Stress Disorder (PTSD) or PTSD symptoms (Park et. al, 1996; Shorr & Romer, 2002; Zoellner & Maerker, 2006). The majority of cross-sectional PTG studies to date find no significant associations between PTG and PTSD (See Zoellner & Maerker, 2006). Longitudinal studies, however, indicate mixed findings. It is noteworthy that those studies that found negative associations between PTG and PTSD symptoms consistently utilized interview formats or newly developed measures.

However, the studies which used validated measures of PTG, including the most commonly utilized instrument, the Posttraumatic Growth Inventory (PTGI, Tedeschi & Calhoun, 1996) or the Stress Related Growth Scale (SRGS, Park et. al, 1996) found that self-reported PTG was consistently associated with increased PTSD symptoms (Zoellner & Maercker, 2006). For example, Frazier and colleagues' 2001 study of sexual assault survivors indicated that PTG was associated with fewer PTSD symptoms over time; however, this study utilized a life change measure that had not been validated. McMillen, Smith and Fisher's 1997 study of survivors of three types of disasters (tornado, mass killing and plane crash) found that while PTG at Time 1 (4-6 weeks after the incident) predicted fewer PTSD symptoms at Time 2 (3 years after later), PTG did not predict a change in PTSD diagnoses from Time 1 to Time 2. These authors found a potential buffering effect, which was the severity of trauma exposure. However, again, these authors utilized an open-ended benefit interview question. In contrast, two other studies of undergraduates utilized the SRGS and the PTGI, respectively, (Park et. al, 1996; Schorr and Roemer, 2002), and each study found that PTG was related to increased PTSD symptoms at Time 2. These findings indicate that to date, PTG as measured in longitudinal studies by either the PTGI or SRGS is associated with increased PTSD symptoms.

While some individuals demonstrate genuine psychological growth in the face of stressors and adversities (e.g. Frazier et. al, 2009), the term posttraumatic growth is problematic not only because of the ways in which the construct has been measured to date, but also because of its literal linguistic meaning. The term "posttraumatic growth" denotes growth in the aftermath of an event which is psychologically traumatic.

According to the Diagnostic and Statistical Manual of Mental Disorders IV-TR, in order for an event to be considered a trauma, an individual must be exposed to actual or threatened death, serious injury, or the threat to the physical integrity of self or others. The individual's response to the traumatic event may be characterized by intense fear, helplessness, and/or horror (American Psychological Association, 2000). By its very definition, what may be traumatizing for one individual will not necessarily be traumatizing for another. In fact, an increasing number of prospective studies show that anywhere from 50% to the majority of individuals exposed to potentially traumatic events and loss exhibit a stable pattern of healthy functioning, also known as resilience (See Bonanno, Wortman, Lehmann, Tweed, Haring, Sonnega, Carr & Nesse, 2002b; Bonanno, Galea, Bucciarelli, & Vlahov, 2006; Bonanno, Moskowitz, Papa, & Folkman, 2005; Bonanno, Rennieke, & Dekel, 2005). Posttraumatic growth, as it has been conceptualized in various studies, assumes both a threatening event (Tedeschi & Calhoun, 2004) and some degree of psychological suffering. Several authors equate PTG with resilience (Hobfoll, Hall, Canetti-Nisim, Galea, Johnson, Palmieri, 2007; Patton, Violanti & Smith, 2003). However, for people who exhibit a resilient trajectory of functioning after a potentially traumatic event, not only may psychological improvement be unwarranted, but these individuals often did not actually experience the event as traumatic (Westphal & Bonanno, 2007). Evidence supporting this view comes from several studies which find that resilient individuals are significantly less likely to search for meaning compared to non-resilient individuals exposed to the same event, including potentially traumatic events and loss (Bonanno, Wortman, & Nesse, 2004; Davis, Nolen-Hoeksema, & Larson, 1998).

In the current study, we use the term *posttraumatic growth* to refer to self-reported growth after a potentially traumatic event, as measured by a questionnaire, including the PTGI or the SRGS. We use the term *genuine growth* to refer to growth as measured longitudinally by other self-report measures of functioning on corresponding life domains. We use the term *friend ratings of improvement* to refer to growth as measured longitudinally by friend reports of participant functioning.

Posttraumatic Growth and Measurement Issues

Despite the wide popularity of posttraumatic growth and the many studies which presume that it indicates adaptive functioning, the construct of PTG remains controversial when subject to two interrelated questions: first, does PTG translate into genuine growth? Secondly, how is PTG best measured?

The first empirical question has gained traction in the past few years in studies examining PTG as a theoretical construct. Authors who argue in favor of PTG as an indicator of positive change are supported by various accounts of survivors reporting significant growth (Cordova, Cunningham, Carlson, & Andrykowski, 2001; Tedeschi, Park & Calhoun, 1998). However, findings indicate discrepancies between PTG and genuine growth as self-reported on corresponding life domain measures (Frazier et. al, 2006; Frazier et. al, 2009). In an effort to examine whether PTG involves self-protective and self-enhancing processes (Wilson & Ross, 2000), several studies indicate a need to unpack the construct of PTG. McFarland and Alvaro (2000) conducted a series of experimental studies to test whether survivors of trauma are using temporal comparisons between their pre- and post- trauma functioning when they report growth. In an experimental paradigm, the study compared participants' perceptions of psychological

growth while manipulating their focus on mildly negative life events versus traumatic events, comparing their pre and post- event ratings of well-being, and comparing their ratings to those of observers. Not only did trauma survivors have illusory notions of self-improvement from pre- to post- traumatic event when compared to observers, but they constructed their notions of personal growth by derogating their earlier psychological functioning, as opposed to exaggerating their current psychological functioning (McFarland & Alvaro, 2000).

In a series of studies, Frazier and Kaler (2006) assessed the validity of posttraumatic growth as measured by the Posttraumatic Growth Inventory (PTGI, Tedeschi & Calhoun, 1996). The PTGI contains 5 subscales to measure the following domains: relating to others, personal strength, new possibilities, appreciation of life, and spirituality. PTG as reported on the PTGI subscales had no association with genuine growth as determined by self-report on comparable domains assessed with validated measures. In an attempt to further delineate the constructs of posttraumatic growth versus genuine growth as assessed by corresponding self-report measures, Frazier and colleagues (2009) conducted a prospective online questionnaire for undergraduates who had experienced a potentially traumatic event during the course of their participation in the study, between baseline (Time 1) and after 8 weeks (Time 2). PTG as measured by the PTGI was not associated with genuine growth on comparable measures, and in fact, it was not even associated with growth on a change score of the same PTGI questionnaire when given at Time 2 (C-PTGI). Findings indicated a link between PTG and negative psychological consequences; distress was assessed using the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) at both time points. PTG was associated

with an increase in self-reported distress; genuine growth, in contrast, correlated with a decrease in distress. Additionally, PTG (and not genuine growth) was associated with positive reinterpretation coping. This pattern of findings reveals that PTG and genuine growth likely reflect two distinct constructs, and that while genuine growth is linked with adaptive benefits, PTG is associated with negative psychological outcomes.

The second research question to stir debate surrounds the manner in which posttraumatic growth is measured. Most questionnaires on PTG require retrospective self-reports of personal change over time, and the designs of these studies are generally cross-sectional. Methodologists have noted that measuring change over time in cross-sectional studies increases the likelihood of reliability concerns in measurement (e.g. Cronbach & Furby, 1970; Rogosa, 1988), and the complexity of measurement is compounded when utilizing self-report data of personal change (e.g., Schneiderman, 1980). Frazier and colleagues (2009) underscore the complexity of the task of retrospective self-reports of personal change through cross-sectional studies by delineating the multiple cognitive processes required of participants. Namely, participants must assess their current functioning on a given domain, recall their previous functioning, compare their current to their previous functioning, estimate the degree of change, and then decide how much of that change may be a direct effect of the potential trauma (Frazier et. al, 2009). As such, retrospective self-report of personal change is vulnerable to recall bias, and may be influenced by one's emotional state (Watson, Dritschel, Obonsawin & Jentsch, 2007).

Retrospective self-report of personal change over time may also be vulnerable to self-protective strategies, as Wilson and Ross found in a study where they experimentally

manipulated self-evaluation and self-enhancement goals of participants, and findings indicated that retrospective self-report of personal change was biased towards positive personal change under these conditions (2000). Similarly, in Davis and McKearney's 2003 study, priming potentially traumatic episodes from one's past elicited participants' subsequently stronger beliefs that life is meaningful; similarly, when being primed about death and a threat to their worldview, the participants reported greater meaning in their lives. These findings indicate that self-enhancement strategies are likely at work when potential trauma, death or a threat to one's world view is elicited (Davis & McKearney, 2003). Indeed, an extensive body of literature on self-enhancement indicates that positive illusions around coping, that is, the perception of superior coping capacity in spite of competing evidence, may be beneficial in helping individuals to adapt positively to potentially traumatic events (Bonanno, Field, Kovacevic, & Kaltman, 2002a; Bonanno, Rennie & Dekel, 2005; Taylor, 1983; Taylor & Brown, 1988).

Similar to findings on PTG as a global construct, studies of relationships indicate that retrospective self-report of relationship functioning, which constitutes one of the five domains of PTG, is subject to bias towards improvements over time (Frazier et. al, 2009). In several studies, when couples were asked to report retrospectively on the quality of their relationships, they indicated positive change over time; however, prospective reports indicated no change, or even decreasing relationship quality over the same time frame (e.g., Karney & Coombs, 2000; Kirkpatrick & Hazan, 1994; Sprecher, 1999). Robertson and Clore theorize that retrospective self-report on relationship functioning taps into peoples' identity-related beliefs about social codes, which leads individuals, in turn, towards tending to overestimate their current functioning (2002).

Recommendations for Posttraumatic Growth Measurement

Cross-sectional designs measuring retrospective self-report of personal change over time are likely vulnerable to recall bias, along with self-protective processes such as self-enhancement and social desirability. It is possible that PTG, rather than accurately measuring a participant's change over time since the event, engages the participant in retrospectively attributing their distress during the recovery process to subsequent growth ("I am better now, so I must have grown") (Bonanno, 2005, p. 267). Given the complexity of attaining participants' perceptions of personal change over time with a retrospective self-report measure, a better approach would be first, to measure PTG using prospective and longitudinal data design; and second, to use more objective means of measuring growth, including report by one's friends (Bonanno, 2005; Cohen, Hettler, Pane, 1998; Frazier et. al, 2009).

Prospective data designs in trauma studies. In conducting a literature search on studies aiming to carry out the first research recommendation, it is evident that despite the challenge involved in attaining prospective data designs in studies of potentially traumatic events, a small handful of researchers have done so. Once again, as is evident throughout the body of research on PTG, when comparing prospective, longitudinal studies of potential trauma samples against one another, a pattern of mixed findings emerge on the adaptive benefits of PTG.

Cheng, Wong & Tsang's 2006 prospective study of SARS patients utilized the Benefit Finding questionnaire (Davis, Nolen-Hoeksema, & Larson, 1998), and found that SARS survivors who reported a pattern of mixed personal costs and benefits were the most healthily adjusted 18 months later on measures of self-esteem and social support.

Additionally, the group who reported personal costs and benefits had significantly lower levels of defensiveness than those participants who reported benefits or costs exclusively. These findings suggest that posttraumatic growth measures should also address cost-finding related to the event, and that otherwise, questions about benefits or growth alone may bias the participants towards reporting positive outcomes (Cheng et. al, 2006).

Another example of prospective data design with potential trauma samples comes from our own bereavement studies and those of our colleagues, where we collected prospective data on 205 participants several years prior to the death of their spouse, and 6 and 18 months after the loss through the Changing Lives of Older Couples (CLOC) study (Bonanno, et al., 2002b). While we did not collect PTG data through use of self-report measures with these participants, we were able to estimate their levels of functioning over time through use of trajectory patterns of reaction to loss. Among the five core bereavement patterns that we identified to capture participants' functioning before, and at 6 and 18 months after the death of their spouse, approximately 10% of the sample exhibited improved functioning post-loss; however, because we were able to assess pre-morbid functioning, we found that these participants exhibited high pre-loss depression, and subsequent improvement during the course of bereavement. Therefore, unlike a trajectory that resembles self-reported PTG descriptions with improving symptoms over time post-loss, these individuals were depressed before the deaths of their spouses, and only after their spouses passed away did their functioning improve. Rather than exhibiting superior coping, our colleagues hypothesized that the depressed-improved symptom trajectory is common among individuals who were caretaking for their

terminally ill spouses prior to their deaths and therefore experienced relief and reduction of distress symptoms after the losses (Bonanno, et. al, 2002b).

In a series of prospective, longitudinal studies among potential trauma samples, Hobfoll and colleagues' 2008 studies utilized large representative samples of individuals in Israel during several years of terrorism. The studies measured PTG and compared PTG scores to multiple validated measures of objective functioning on an array of dimensions. Findings not only failed to support the notion of PTG as an indicator of genuine positive change, but PTG was associated with increased levels of PTSD and depression over time. Moreover, findings indicated that PTG was related to ethnocentrism and the promotion of violence.

Corresponding friend reports of growth. Despite proponents of PTG, Cohen and colleagues (1998), recommending the use of more objective means of measuring growth, specifically through collecting data from participants' significant others, very few studies to date, to the best of our knowledge, have collected collaborative friend ratings of improvement. Much like the body of literature on posttraumatic growth, the studies that do compare PTG to friend ratings have generated conflicting findings.

Providing evidence in favor of PTG translating into friend ratings of improvement, Shakespeare-Finch and Enders conducted a cross-sectional study of trauma survivors from universities in Australia, and found a significant correlation between participants' PTG as reported on the PTGI, and their friend ratings of growth on a friend ratings version of the PTGI (2008). However, it is crucial to note that this study suffers from several limitations; namely, as has been underlined by several investigators, posttraumatic growth is not a valid construct when measured cross-sectionally (Bonanno,

2005; Cohen, et. al, 1998; Frazier et. al, 2009). Furthermore, the type of potentially traumatic event that the participants reported varied greatly, which compounds measurement issues (Cohen et. al, 1998; McMillen, Smith & Fisher, 1997). Finally, this study examined potentially traumatic event survivors with a significant time range since the trauma (anywhere within 5 years), without controlling for time since the potentially traumatic event. As previous studies indicate, time since the event is an important area of study, and likely accounts for significant variations in functioning (Cohen et. al, 1998; Linley & Joseph, 2004).

Other studies comparing PTG and friend ratings of growth have generated mixed findings. Park and colleagues (1996), for example, developed the Stress-Related Growth Scale (SRGS), and in a study of undergraduates, they asked participants to complete a self-report version of SRGS, comparing their scores to those of friend ratings on the same measure (SRGS friend/relative rating version). Mean benefit scores for participants and their friends were significant, but the correlation was low ($r = .21$). Notably, the hypotheses regarding several aspects of friend ratings were rejected; for example, characteristics of the negative event, including its initial and current stressfulness, were not correlated with PTG or friend ratings. Likewise, the prediction that PTG would correlate with self-reported ratings of personal coping was not supported.

In another study comparing PTG and friend ratings, McMillen and Cook collected data on a group of spinal cord injury patients between 18 and 36 months after their injuries (2003). Reminiscent of Park and colleagues' 1996 study, this study generated a mixed pattern of findings regarding the relationship between posttraumatic growth and friend ratings of growth. While on average, friend informants' global ratings of growth

supported the participants' global ratings of PTG, there was low agreement on the specific domains of growth. The authors hypothesized that the discrepancy between participant-rated PTG and friend ratings of growth domains is likely due either to the domains of PTG being private in nature and participants refraining from discussing these topics with their friends, or PTG representing a positive illusion (McMillen & Cook, 2003).

Owing to the mixed findings on the construct of posttraumatic growth, as well as the interrelated questions on whether PTG corresponds to friends' ratings of improvement, further study of the relationship between PTG and friend ratings is warranted (Cohen et. al, 1998; McMillen & Cook, 2003; Park et. al, 1996). A significant limitation with the current body of research on posttraumatic growth thus far is the heavy reliance upon retrospective self-report questionnaires in cross-sectional studies. Rather than measuring superior functioning, PTG may be tapping into cognitive coping strategies (Garnefski, Kraaij, Schroevers & Somsen, 2008), or to self-enhancing processes (Davis & McKearney, 2003; Wilson & Ross, 2000). A series of studies have contributed to the examination of PTG as a scientific construct in need of precise measurement and evaluation (e.g., Frazier et. al, 2009; Zoellner & Maerker, 2006) and our aim is to further explore the construct by providing a longitudinal study of survivors of the September 11th, 2001 terrorist attack, and to compare participant-reported PTG to friend ratings of improvement.

The Current Study

The primary aim of the current study is to explore posttraumatic growth among survivors of the September 11th, 2001 terrorist attack in New York City, and to compare

participants' PTG ratings to friend ratings of improvement, in order to subject PTG to an alternate source of measurement. To achieve this aim, we recruited a small sample of participants who had all survived the same potentially traumatic event: the September 11th, 2001 terrorist attack in New York City. We chose to investigate a group of individuals who had experienced the same potentially traumatic event in order to decrease the variance that different types of events might engender (Cohen et. al, 1998; McMillen, Smith & Fisher, 1997).

Methods

Participants

Recruitment occurred within a 2-month period beginning approximately 5 months after September 11, 2001; we disseminated information about the study and encouraged individuals interested in participating to contact the researchers. To achieve this, we (a) contacted companies that had been located in the World Trade Center and asked them to distribute a flyer about the study to their employees; (b) posted flyers about the study in various locations south of 14th Street in Manhattan; and (c) arranged for public service announcements describing the study to be aired on local radio stations.

Our final sample was composed of 61 participants. The mean age was 38.6 (SD = 10.4). Approximately 1/2 of the sample was female (29) and 1/2 male (32). The racial-ethnic composition of participants was 82.2% Caucasian, 6.2% Asian-American, 2.5% other, and 2.2% African-American. Among participants, 2.2% graduated from high school, 55.6 % graduated from college, 42.2% began/completed graduate education, and 2.2% attained an equivalent higher education degree. The mean family income for the year before participation was \$69,000 (52,000).

Procedure

We interviewed these participants at approximately 7 months (Time 1) and 18 months (Time 2) after the attack. Use of two time points allowed us the advantage of a longitudinal design to measure PTG and friend ratings of improvement as they change over time. By electing an event that occurred on a specific day and measuring participant functioning as close to the 7 month and 18 month time points as possible, we were able to ensure that equivalent duration of time passed in order to decrease the likelihood that time since the event differentially impacted participant functioning (Cohen et. al, 1998; Linley & Joseph, 2004). At both time points, we asked the participants to fill out a survey of posttraumatic growth items adapted to the September 11th terrorist attack utilizing 9 items from the Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996).

In order to provide independent assessment of participants' functioning at 7 and 18 months post-September 11th, we asked each participant's close friends and relatives to evaluate the participant's mental, social, achievement and coping-related functioning, both prior to and following the September 11th attack. One of the few areas within the PTG literature that, to the best of our knowledge, has not been studied to date, is friend ratings of improvement and how friend informants' ratings predict the potential adaptive benefits or negative consequences of PTG. Are friend ratings of improvement associated with posttraumatic growth? If associated, do friend ratings support or contradict posttraumatic growth? The view of PTG as merely associated with potential trauma exposure during 9/11 but unrelated to friend ratings predicts a negligible correlation between PTG and friend ratings of improvement. A previous study that in part supports this prediction is McMillen & Cooks' study of spinal cord injury patients, and the low

agreement found between self-report and friend ratings of improvement on specific growth domains (2003). The view of PTG as adaptive predicts that the friends of individuals reporting PTG would rate them as undergoing significantly more positive changes than other participants after September 11th. This view would be supported by a positive correlation between posttraumatic growth and friend ratings of growth, providing corroborating evidence for PTG from survivors' friends. Previous studies that support this prediction include the general association found between posttraumatic growth and friend ratings of growth on global measures (McMillen & Cook, 2003; Park et. al, 1996), and by findings that PTG predicts positive change over time (Tedeschi et. al, 1998). Conversely, the view of PTG as maladaptive makes the prediction that the friends of participants reporting PTG would rate them as deteriorating in functioning after September 11th. The relationship between self-reported growth and negative outcomes has generated mixed findings (Zoellner & Maerker, 2006). In a community sample similar to ours of Israeli individuals exposed to terrorist attacks, Hobfall and colleagues' study yielded positive associations between self-reported PTG and negative outcomes including PTSD and aggressive behaviors (Hobfall et. al, 2007; Hobfall et. al, 2008).

Data for the current study comes from both waves of data collection, which occurred approximately 7 months and 18 months after September 11th, 2001. At both time points, each participant completed a questionnaire packet at home, distributed anonymous rating forms to three self-selected close friends or relatives, and visited our research office for an interview, in which they were asked to describe at length their experiences during and after the attack.

Measures

Self-reported posttraumatic growth (PTG). We adapted a scale of posttraumatic growth, measured at both time points of the study, by combining items with the highest factor loadings on relevant subscales of the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). Items were measured on a 0 (not at all) to 5 (extremely) scale, and were reworded for application to the specific context of September 11th, 2001. Alpha for these 9 items in the current study was .78 at T1 and .81 at T2.

Friend ratings of improvement. At 7 and 18 months post-September 11th, participants were provided with three packets containing consent materials and ratings forms and asked to distribute these materials to three close friends or relatives whom they felt knew them well and with whom they had relatively consistent contact. To ensure confidentiality, we requested that friends return these ratings directly to our office using stamped, preaddressed envelopes. At Time 1 (at 7 months), friends were asked to rate the participant on *Friend ratings of functioning prior to September 11th* as compared with “most other people” using a 7-point scale (1 = *much worse than most people*; 4 = *about the same as most people*; 7 = *much better than most people*) for four dimensions (mental health, quality of social interactions, ability to accomplish goals, and coping ability). At both Time 1 and Time 2, Friend ratings of improvement since 9/11 (at 7 and 18 months) was rated “in comparison to his or her usual level” using a 7-point scale (1 = *much worse than usual*; 4 = *about the same as usual*; 7 = *much better than usual*) for the same four dimensions.

Posttraumatic stress symptoms (PTS). The PTSD Symptom Scale, Self-Report Version (PSS-SR; Foa, Riggs, Dancu, & Rothbaum, 1993) is a 17-item self-report measure corresponding to PTSD items from the DSM-III. At Time 1 and Time 2, participants were asked to assess the frequency with which they experienced each item on the PSS-SR in the past month using a 0 (*not at all or only one time*) to 3 (*5 or more times per week/almost always*) scale. Internal consistency in the present study was .91.

Self-enhancement. The Self-Deceptive Enhancement scale (SDE; Paulhus, 1984, 1991a, 1991b) consists of 20 self-descriptive statements (e.g., “I am fully in control of my own fate”, “I always know why I do things”) endorsed on a 1 (*not true*) to 7 (*very true*) scale. Only extreme responses (e.g., 6 or 7) were scored as self-enhancing. Participants were given the SDE scale at Time 1. The SDE scale is comparable with other measures of self-enhancement (Bonanno et al., 2002; Paulhus, 1998; Taylor et al., 2003a). Factor analyses (Paulhus & Reid, 1991) have established the independence of SDE from the general tendency to deliberately present the self in a favorable or socially desirable light (impression management). Alpha for these items in the current study was .73.

Results

Posttraumatic Stress (PTS)

We anticipated that posttraumatic stress symptoms (PTS) at both times would correlate positively to PTG. This predicts that participants who endorsed greater levels of posttraumatic growth at both times would have more posttraumatic stress symptoms at each time point. PTS evidenced small positive correlations with PTG, though none were significant (T1 PTS and T1 PTG, $r = .21, p = .11$; T1 PTS and T2 PTG, $r = .17, p = .24$;

T2 PTS and T1 PTG, $r = .16, p = .29$; T2 PTS and T2 PTG, $r = .14, p = .34$) (see Table 1).

We expected that posttraumatic stress symptoms at both times would inversely correlate with friend ratings of improvement. As anticipated, T1 PTS significantly inversely correlated with T1 friend ratings of improvement ($r = -.34, p < .01$), indicating that higher levels of posttraumatic stress symptoms correlate with friend ratings of worsening adjustment. T1 PTS was also inversely correlated with T2 friend ratings of improvement, but not significantly ($r = -.12, p = .55$). T2 PTS was also negatively associated with T1 friend ratings of improvement ($r = -.30, p = .07$) and T2 friend ratings of improvement, ($r = -.20, p = .31$), but not significantly. See Table 1.

Self-reported Posttraumatic Growth (PTG) and Friend Ratings of Functioning

One of the competing predictions we evaluated was that friend informants of individuals who reported higher levels of posttraumatic growth would rate their friends as decreasing in functioning after 9/11. That is to say, we explored whether reporting posttraumatic growth at 7 months or 18 months after 9/11 would correspond with friend ratings of decreasing functioning at both Time 1 and Time 2. The results supported an inverse relationship between PTG and friend reports of participant functioning; T1 PTG was inversely associated with T1 friend ratings of improvement post-9/11 ($r = -.54, p < .01$); T2 PTG was negatively correlated with T1 friend ratings of improvement ($r = -.43, p < .05$); T1 PTG was negatively correlated with T2 friend ratings of improvement ($r = -.47, p < .01$), and T2 PTG correlated inversely with T2 friend ratings of improvement ($r = -.40, p < .05$). See Table 1.

Predicting T1 Posttraumatic Growth

In order to explore which variables would predict T1 PTG, we conducted a hierarchical linear regression, entering cross-sectional data collected from friends and self-reported clinical symptoms of posttraumatic stress into the model. See Table 2. On the first step of the analysis, we entered T1 friend ratings prior to 9/11 as a covariate. This step was non-significant, $F(1,36) = .89, p = .35$. On the second step, we entered T1 PTS. Although this step did not significantly increase the overall R^2 , $F\ change(1,35) = 4.04, p \leq .05$, the Beta value for T1 PTS was significant, and accounted for an additional 10% of the variance in T1 PTG. Finally, on the third step, we entered T1 friend ratings of improvement. The third step significantly increased the overall R^2 , $F\ change(1, 34) = 8.71, p < .01$, and accounted for an additional 18% of the variance in T1 PTG. In the final model, T1 PTS was no longer significant but T1 friend ratings of improvement was significant. In other words, at Time 1, friend ratings of worsening functioning predicted participant-reported posttraumatic growth over and above friend ratings of functioning prior to 9/11 and posttraumatic stress symptoms.

Predicting T2 Posttraumatic Growth

Next, we explored the predictors of T2 PTG. To investigate whether T1 friend ratings of improvement and T1 PTG predicted T2 PTG, we conducted a hierarchical linear regression. See Table 3. On the first step of the analysis, we entered T1 friend ratings of improvement as a covariate. This step was significant, $F(1,29) = 6.89, p \leq .01$, and accounted for 19% of the variance. On the second step, we entered T1 PTG. Forcing T1 PTG into the model significantly increased the overall R^2 , $F\ change(1, 28) = 19.15, p < .001$, and accounted for an additional 33% of the variance of T2 PTG. Of note,

however, with T1 PTG in the model, T1 friend ratings of improvement was no longer significant. Finally, on the third step, we entered T1 PTS and T2 PTS. Although the third step did not significantly increase the overall R^2 , F change (2,26) = .38, p = .69, the Beta value of T1 PTG was significant. That is to say, while T1 friend ratings of improvement inversely predicted participant-reported PTG at Time 2, T1 PTG predicted T2 PTG over and above T1 friend ratings of worsening functioning and posttraumatic stress symptoms at either time.

Predicting T1 Friend ratings of improvement

In order to explore which measures of participant functioning at Time 1 would predict T1 friend ratings of improvement, we conducted a hierarchical linear regression. See Table 4. On the first step of the analysis, we entered T1 PTS as a covariate. This step was significant; $F(1,36) = 6.23$, $p < .05$, and accounted for 15% of the variance of T1 friend ratings of improvement. On the second step, we entered T1 PTG, which significantly increased the overall R^2 , F change (1,35) = 10.00, $p < .01$, and accounted for an additional 19% of the variance of T1 friend ratings of improvement. Of note, however, with T1 PTG in the model, T1 PTS was no longer significant. In other words, at Time 1, while having clinical posttraumatic stress symptoms alone predicted that participants' friends would rate them as getting worse, when accounting for their PTG, posttraumatic stress symptoms were no longer significant in predicting worsening friend ratings. T1 PTG predicted worsening friend ratings of functioning over and above posttraumatic stress symptoms.

Predicting T2 friend ratings of improvement

A previous study with this sample showed that self-enhancement predicted better functioning, and correlated positively with T1 friend ratings of functioning prior to 9/11, and with worsening T2 ratings of social functioning (Bonanno, Rennie & Dekel, 2005). Could self-enhancement play a role in posttraumatic growth, as evidenced in experimental studies (Davis & McCearney, 2003; Wilson & Ross, 2000)? In the current study, T1 self-enhancement was uncorrelated with T1 PTG ($r = .07, p = .60$) and T2 PTG ($r = .06, p = .68$). As reported previously (Bonanno et. al, 2005), while self-enhancement was uncorrelated with T1 friend ratings of improvement and T2 friend ratings of improvement, self-enhancement correlated positively to T1 friend ratings of functioning prior to 9/11. See Table 1.

In order to further examine the relationship between T1 PTG and self-enhancement in predicting T2 friend ratings of improvement, we conducted a final hierarchical linear regression. See Table 5. On the first step of the analysis, we entered T1 self-enhancement as a covariate. This step was non-significant, $F(1,21) = .00, p = .99$. On the second step, we entered T1 friend ratings of improvement. While the Beta value of T1 friend improvement was non-significant, entering T1 friend ratings of improvement significantly increased the overall R^2 , $F \text{ change}(1,20) = 4.28, p \leq .05$, and accounted for an additional 18% of the variance of T2 friend ratings of improvement. On the third step, we entered T1 PTG. Entering T1 PTG significantly increased the overall R^2 , and accounted for an additional 16% of the variance of T2 friend ratings of improvement, $F \text{ change}(1,19) = 4.52, p < .05$. Of note, however, with T1 PTG in the model, T1 friend ratings of improvement no longer significantly predicted T2 friend ratings of

improvement. In other words, self-enhancement was not a significant predictor of friend ratings of improvement at Time 2. T1 participant-reported posttraumatic growth significantly predicted decreasing T2 friend ratings of improvement, over and above participants' self-enhancement and their friend ratings of improvement at Time 1.

Discussion

Posttraumatic growth is a burgeoning area of study in both trauma and positive psychology literature. Recent studies of the construct, however, have attempted to subject PTG to more rigorous scientific standards of measurement beyond retrospective self-report, in order to shed light on what, specifically, PTG captures, and whether it is adaptive. In the current investigation, we examined posttraumatic growth measured longitudinally among survivors of the September 11th, 2001 terrorist attack, in order to explore whether participants' reports of posttraumatic growth were associated with, supported or contradicted by friend ratings of improvement. In this context, participant-reported posttraumatic growth was consistently linked with friend ratings of deteriorating functioning, providing evidence that posttraumatic growth is undermined by friend ratings. Two interrelated hypotheses emerge from these findings: Firstly, this pattern of findings is likely indicative of the failure of retrospective self-report of PTG to accurately predict functioning as rated by alternate, more objective measures. Secondly, findings suggest that posttraumatic growth may reflect negative psychological adjustment (Hobfoll et. al, 2007).

The age-old adage about the nature of "sour adversity" and whether, as Shakespeare suggested, it is worth "embracing," (1597, Part 3, Act 3, Scene 1) directly

leads us to question, why, when we look through the “eyes of another,” (Proust, 1923, 9. 657) we see inverse change.

There is room for speculation as to the underlying reasons why it is that when we believe we are growing as the result of trauma, that’s not what our friends say, and in fact, our friends say we are deteriorating. Does posttraumatic growth carry negative psychological consequences? The inverse nature of the relationship between posttraumatic growth and friend ratings of improvement may be indicative of friends’ beliefs that participants are relying too heavily upon the trauma to define their identities. While viewing the world through the lens of having survived a trauma may aid the survivor in making sense of the event, our findings indicate that posttraumatic growth may come at the cost of accurate self-awareness regarding functioning.

Our findings suggest that while participants believe they are improving after the trauma, their friends note negative psychological adjustment. Retrospective self-report data often fails to accurately predict functioning when compared to friends who provide alternate, more objective measures of functioning. We consider these findings alongside those of Frazier and colleagues, who reported in their 2009 study that while a considerable subset of their sample did in fact experience genuine growth after trauma, PTG was unrelated to genuine growth as measured by multiple reliable measures of functioning. Thus, some people grow after traumas and genuine growth is adaptive. However, PTG questionnaires as currently utilized do not appear to adequately measure genuine growth.

What, then, do PTG questionnaires such as the PTGI measure? Theorists who argue that PTG is a coping strategy underscore meaning-making as a way to make sense

of life-changing events that are otherwise unexplainable (Davis, Nolen-Hoeksema, & Larson, 1998; Park & Folkman, 1997). In a similar vein, Frazier and colleagues found that positive reinterpretation coping – that is, the effort to view a negative event positively – was related to PTG and not to genuine growth (2009). Other research suggests that PTG is a form of self-enhancement, which involves positive illusions around coping (Taylor, 1983; Taylor & Armor, 1996). Interestingly, our own findings showed no significant associations between trait self-enhancement and posttraumatic growth, indicating that self-enhancers do not exaggerate growth. Rather, PTG appears to be a more general phenomenon related to experiencing trauma. We speculate that PTG involves retrospectively attributing one's distress during recovery to subsequent growth (Bonanno, 2005), a process independent of genuine growth.

It is also possible that the discrepancy between self and friend reports of functioning is related to an alternate factor, such as the need to view the world as just. The literature on meaning-making among trauma survivors indicates that survivors who engage in meaning-making following trauma have better emotional adjustment and fewer PTS symptoms than those who do not (Davis, Wortman, Lehman & Silver, 2000; Updegraff, Silver & Holman, 2008). In contrast, literature on observers of trauma shows the opposite trend, where observers who believe in a just world tend to blame victims for their adversities (Hafer & Bogue, 2005). This discrepancy may echo the discrepancy found between self report of posttraumatic growth and friend report of deteriorating functioning in the current study, where friends function ostensibly as observers. However, findings from a recent study indicate that people whose justice motive was enhanced perceived greater meaning in the lives of trauma survivors than in the lives of

non-survivors, but this pattern did not replicate in observers who did not hold a strong justice belief (Anderson, Kay & Fitzsimmons, 2010). Future studies of posttraumatic growth and friend ratings of improvement should attempt to measure justice motivation, in efforts to further deconstruct posttraumatic growth and its underlying mechanisms.

Clinical implications of an inverse relationship between self-reported posttraumatic growth and friend ratings of functioning merit discussion. Collateral meetings in therapy with patients' families and/or significant others may serve to shed light on the discrepancies between self and friend reports on various domains. The findings of this study remind us of patients' possible tendency to overemphasize the impact of a particular adverse life event, and perhaps, to misattribute current improved functioning to subsequent growth. While the expression of positive emotions in therapy as related to loss and trauma should be encouraged in therapy, the overemphasis on posttraumatic growth may be monitored by therapists, and alternate explanations for positive emotions explored.

Strengths and Limitations

A predominant critique of psychology research is the use of relatively homogeneous college student samples, where trends of findings are generalized to community samples. By using a naturalistic sample exposed to a common, sudden and violent adversity, we were able to enhance the ecological validity of this study, and decrease the outcome variance that divergent types of potentially traumatic events might generate (Cohen et. al, 1998; McMillen, Smith & Fisher, 1997). A limitation of the current literature on posttraumatic growth is the overreliance on cross-sectional data to determine change over time. A major strength of the study was the use of two time points

at 7 months and 18 months after 9/11, which allowed us to examine posttraumatic growth and its associated outcomes as they change over time. A further strength of our study was the use of multiple measures, including participant self-report, in addition to independent observations on participant functioning made by close friends, which allowed us to directly examine the accuracy and/or bias inherent in self-reported retrospective change data.

Although our study offered a new perspective on the significant discrepancies between self and friend reports of posttraumatic growth, several limitations warrant discussion. A common limitation in trauma research and in studies of posttraumatic growth in particular is the use of retrospective data to measure change since the event. While our use of friend ratings of baseline functioning and improvement since 9/11 offset some of the biases inherent in retrospective self-report data, our first wave of data collection came at 7 months after 9/11, which increases the likelihood that friends were using the participants' current functioning to estimate baseline functioning and change over time. Likewise, retrospective study of a population exposed to adversity increases the likelihood of selection bias among participants, favoring those who wish to discuss their traumas. Furthermore, our study had no control sample of individuals who were not exposed to the 9/11 terrorist attack. To preserve the ecological validity inherent in studying community samples, future prospective studies could utilize known high-exposure populations, such as were used in Hobfoll and colleagues' Israeli community samples (2007) and our own CLOC study of older adults (Bonanno et. al, 2002b), and measure current functioning among self and friends at various time points, in addition to

measuring PTG immediately following the event and over time. A prospective design would decrease selection bias and form naturalistic exposed and control samples.

Maximizing the ecological validity of the current study came at the expense of experimental precision, and an additional limitation of our study was the reliance on questionnaire data. While friend ratings are likely more objective measures than self-report, future studies comparing participant questionnaire data to experimental data would enhance our understanding of the cognitive processes at work when participants report PTG and their friends rate their functioning. Much like McFarland & Alvaro (2000) studies in which participants were primed on mild vs. severe traumas, future studies could prime participants by asking them to discuss traumas versus more neutral every day events and then measure PTG. Similarly, friends could be primed for trauma vs. neutral conditions and then asked to report on participant functioning pre-event and improvement over time. Such data would enhance our understanding of the processes at work when participants and friends are considering the impact of potential traumas.

A further limitation of our study was the small sample size, which made statistical significance difficult to attain and limited generalizability. While we requested three friend ratings per participant in order to increase the likelihood of attaining two friend ratings each, the number of participants who attained two friend ratings at Time 1 was small, and decreased exponentially at Time 2. The difficulty in attaining friend data likely explains in part why so few trauma studies examining posttraumatic growth to date have attempted to compare self and friend data despite PTG proponents, Cohen and colleagues, making recommendations to do so over a decade ago (1998). Furthermore, we did not ask participants' friends about their own exposure to 9/11, which might have

biased their perspectives on their friends' functioning, and could have been controlled for statistically. Despite these limitations, our study was an important step in the direction of comparing self-data on posttraumatic growth to friend data using a community sample, and future studies of larger community samples should attempt to include longitudinal friend data.

An additional limitation of the current study was the use of an abridged version of the PTGI scale, limited to 9 items. Zoellner & Maerker's (2005) meta-analysis of the PTG literature found significant discrepancies between outcome associations when utilizing either of the validated PTG instruments, the PTGI or the SRGS, versus open-ended benefit questionnaires which had not been validated. In the case of the relationship between PTG when measured longitudinally and posttraumatic stress symptoms, for example, the studies using the validated PTG measures showed positive associations between PTG and PTS, whereas the studies using PTG instruments which had not been validated evidenced negative correlations with PTS. In efforts to enhance the validity of our PTG scale, we utilized a scale of 9 items adapted from the PTGI scale only, not analyzing more open-ended benefit questionnaire items. We adapted the current scale by finding the 9 items with the highest reliability. Nevertheless, future studies exploring the relationship between posttraumatic growth and friend ratings should attempt to preserve the complete version of the PTGI, in order to examine whether the negative association found between self-report and friend ratings replicates in this context.

Conclusion

Within the context of these limitations, our study explored the relationship between posttraumatic growth and friend ratings of improvement among 9/11 survivors. Our findings suggest that while participants reported growth related to the trauma on the PTGI, that's not what their friends say; rather, their friends judged them as deteriorating in functioning. Retrospective self report questionnaires such as the PTGI might not accurately capture participant functioning when compared to their friends' more objective ratings, and what these questionnaires do capture appears to reflect negative psychological adjustment. Future research is needed to compare self and friend ratings of PTG and functioning within a larger sample, using a prospective data design, and it is recommended that focus on the trauma be experimentally manipulated among both self and friends, in order to explore whether the inverse relationship between self report and friend ratings sustains under these conditions.

Table 1. Intercorrelations, Means, and Standard Deviations of Study Variables

	M	(SD)	N	1.T1 PTG	2.T2 PTG	3. T1 friend prior	4.T1 friend improve	5. T1 PTS	6. T2 PTS	7. T2 friend improve	8.T1 Self-enh
1. T1 PTG	2.81	.73	58	-							
2. T2 PTG	2.78	.78	49	.77***	-						
3. T1 friend prior	48.68	7.72	44	-.16	-.13	-					
4. T1 friend improve	3.94	.68	44	-.54***	-.47**	.34*	-				
5. T1 PTS	16.13	10.52	63	.21	.17	-.03	-.38*	-			
6. T2 PTS	13.77	10.5	52	.16	.14	-.05	-.30	.78***	-		
7. T2 friend improve	3.87	.80	29	-.43*	-.40*	-.24	.41*	-.12	-.20	-	
8. T1 Self-enh	5.78	3.52	65	.07	.06	.34*	-.01	-.25*	-.14	-.01	-

Note. * $p < .05$, ** $p < .01$, *** $p \leq .001$

Table 2. Summary of Regression Analysis for Variables Predicting T1 PTG ($N = 37$)

Variable	B	$SE B$	β	sr^2
Step 1				
T1 Friend prior	-.01	.02	-.16	.03
Step 2				
T1 Friend prior	-.01	.01	-.15	.02
T1 PTS	.02	.01	.32*	.10
Step 3				
T1 Friend prior	.00	.01	-.04	.002
T1 PTS	.01	.01	.14	.02
T1 Friend improve	-.52	.18	-.47**	.18

Note. * $p \leq .05$; ** $p < .01$. Step 1: $F(1,36) = .89$, $R^2 = .02$; Step 2: $F(2, 35) = 2.5^*$, $R^2 = .13$

Step 3: $F(2, 34) = 4.9^{**}$, $R^2 = .30$.

Table 3. Summary of Regression Analysis for Variables Predicting T2 PTG (N =30)

Variable	B	SE B	β	sr^2
Step 1				
T1 Friend improve	-.57	.22	-.44**	.19
Step 2				
T1 Friend improve	-.19	.19	-.14	.02
T1 PTG	.70	.16	.64***	.32
Step 3				
T1 Friend improve	-.17	.21	-.13	.01
T1 PTG	.74	.17	.68***	.32
T1 PTS	.01	.02	.17	.01
T2 PTS	-.01	.02	-.20	.01

Note. * $p < .05$; ** $p \leq .01$; $p \leq .001$ ***. Step 1: $F(1, 29) = 6.89^*$, $R^2 = .19$;

Step 2: $F(2, 28) = 15.18^{***}$, $R^2 = .52$; Step 3: $F(4, 26) = 7.44^{***}$, $R^2 = .53$.

Table 4. Summary of Regression Analysis for Variables Predicting T1 Friend improve (N =37)

Variable	<i>B</i>	<i>SE B</i>	β	<i>sr</i> ²
Step 1				
T1 PTS	-.03	.01	-.38*	.14
Step 2				
T1 PTS	-.02	.01	-.24	.05
T1 PTG	-.42	.13	-.46**	.19

Note. * $p < .05$; ** $p < .01$; *** $p \leq .001$. Step 1: $F(1, 36) = 6.23^*$, $R^2 = .15$;

Step 2: $F(2, 35) = 8.96^{***}$, $R^2 = .34$.

Table 5. Summary of Regression Analysis for Variables Predicting T2 Friend ratings of improvement (N =22)

Variable	<i>B</i>	<i>SE B</i>	β	<i>sr</i> ²
Step 1				
T1 Self-enhance	-.001	.05	-.004	.0002
Step 2				
T1 Self-enhance	-.01	.04	-.05	.003
T1 Friend improve	.60	.29	.42*	.18
Step 3				
T1 Self-enhance	-.01	.04	-.04	.002
T1 Friend improve	.21	.32	.15	.01
T1 PTG	-.59	.28	-.48*	.16

Note. $p \leq .05^*$. Step 1: $F(1, 21) = .00, R^2 = .00$; Step 2: $F(2, 20) = 2.14, R^2 = .18$;

Step 3: $F(3, 19) = 3.19^*, R^2 = .34$.

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