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The PRAISE Scale of Posttraumatic Growth: Development, Validation and Exploration of its Relationship with Trait Resilience

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Abbreviations

BFI-S	Short Big Five Inventory
BSEM	Bayesian Structural Equation Modelling
C-PTGI	Current-Standing Post-Traumatic Growth Inventory
C-PTGI-C	Current-Standing Post-Traumatic Growth Inventory – Children
C-PTGI-SF	Current-Standing Post-Traumatic Growth Inventory – Short Form
CAS	Current Attribute Scale
CIOQ	Changes in Outlook Questionnaire
CFA	Confirmatory Factor Analysis
EEA	Engineering, Ecological, and Adaptive Capacity
ESM	Experience Sampling Methodology
FMS	Friendship Maintenance Scale
GMM	Growth Mixture Modelling
GQ6	Gratitude Questionnaire
LGCM	Latent Growth Curve Modelling
NGSE	New General Self-Efficacy Scale
OLS	Ordinary Least Squares
PBS	Perceived Benefit Scale
PWB	Psychological Wellbeing Scale
PWB-PTCQ	Psychological Well-Being – Post-Traumatic Change Questionnaire
PRAISE	Possibilities, Relationships, Appreciation of Life, Strength, Existence
PTG	Posttraumatic Growth
PTGI	Post-Traumatic Growth Inventory
PTGI-X	Post-Traumatic Growth Inventory – Expanded
RCT	Randomised Control Trial
SEM	Structural Equation Modelling
SRGS	Stress-Related Growth Scale

SRGS-N	Stress-Related Growth Scale – Neutral
SRGS-R	Stress-Related Growth Scale – Revised
STS	Spiritual Transcend Scale
SUR	Seemingly Unrelated Regression
TS	Thriving Scale
WEIRD	Western, Educated, Industrialised, Rich, Democratic

Abstract

Background: Individuals who adapt well to adversity (e.g., traumatic events) and recover quickly are often described as resilient. However, there are also individuals who report positive psychological changes beyond pre-adversity levels, referred to as posttraumatic growth (PTG). Existing research on the association between resilience and PTG yields conflicting results due to varied definitions and operationalisations of each construct. This thesis aims to explore whether trait resilience predicts the development of PTG over time.

As the traditional approach to measuring PTG is widely criticised to assess perceptions of PTG rather than actual 'veridical' changes in pre-to-post functioning, the Possibilities, Relationships, Appreciation of Life, Strength, Existence (PRAISE) scale is developed and psychometrically validated to examine veridical PTG as trajectories of psychological functioning over time. The PRAISE scale is used to test the main research question of this thesis.

Methods: In Chapter 2, a scoping review identified existing measures of veridical PTG, the study designs they were embedded in, and the research questions these studies addressed. As the six identified measures were considered unsuitable, the 28-item PRAISE scale was developed in Chapter 3 by adapting items from other PTG measures and revised after an initial psychometric analysis ($n = 569$). The psychometric validation of the PRAISE scale – including its factor structure, convergent validity and test-retest reliability and the predictive validity of the Relationship dimension – was conducted in Chapter 4 ($n_{T1} = 619$; $n_{T2} = 94$). In Chapter 5, the factor model fit of the PRAISE scale was compared to that of two other measures of veridical PTG ($n = 303$).

In Chapter 6, a longitudinal study ($n = 285$) examined the association between trait resilience and veridical PTG in individuals with recent adverse experiences. Trait resilience was measured at time point 1 using the Engineering,

Ecological, and Adaptive Capacity (EEA) resilience scale, while veridical PTG was measured via the PRAISE scale in three surveys over four months.

Results: The results of Chapter 2 demonstrated that existing measures of veridical PTG had limited applicability, psychometric validity, dimensionality, and conceptual breadth. In Chapters 4 and 5, the PRAISE scale demonstrated a correlated five-factor structure, better factor model fit indices than comparable measures, convergent validity and test-retest reliability. The relationships domain of PRAISE predicted supportive friendship behaviour.

No significant association between trait resilience and veridical PTG was found in the longitudinal study in Chapter 6. Latent growth curve analysis showed stability of PRAISE levels, indicating that change in veridical PTG was not observed in the 4-month design. However, cross-sectional associations revealed that trait resilience – particularly Ecological Resilience – correlated significantly positively with each PRAISE dimension.

Conclusions: Longitudinal studies on veridical PTG face study design challenges that need to be addressed to examine predictors effectively. This thesis describes the development and validation of the PRAISE scale, which is intended to be suitable for longitudinal studies. However, veridical PTG may be rare and only emerge after longer periods than a few months. Future studies should employ prospective study designs spanning at least two years and utilise statistical methods like growth mixture modelling to identify small subsamples who experience veridical PTG. Studies with limited budgets may focus on longitudinal case studies or examine single mechanisms outlined in the PTG model.

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Chapter 1 Introduction

The experience of adversity is an inevitable aspect of human existence, with most individuals experiencing various forms of hardship and challenges throughout their life (Bonanno & Mancini, 2008). While adversity can lead to negative outcomes in quality of life, such as posttraumatic stress or depression (Turner & Lloyd, 1995), some individuals seem to be better able to deal with adversity and adapt to challenging life circumstances. In the scientific literature, these individuals are described as resilient (Fletcher & Sarkar, 2013). However, resilience is not the only form of positive adjustment to adversity. Some individuals may even transform their negative experience into meaningful life lessons and find new meaning or purpose in life. This idea is at the core of posttraumatic growth (PTG), which suggests that even in the most challenging circumstances, individuals may derive positive changes and personal growth (Tedeschi & Calhoun, 2004).

The concepts of resilience and PTG emerged 20 years apart in different fields of psychology, and researchers have brought up the importance of exploring their relationship to advance scientific knowledge on successful adaptation to adversity (Infurna & Jayawickreme, 2019). However, initial attempts to explore the association between resilience and PTG were limited by methodological issues and provided somewhat contradictory findings, leaving this question unanswered. The aim of the present thesis is to address some of the methodological issues that may have contributed to the lack of consistent findings in previous studies and to provide an answer to the question of whether and how resilience predicts the development of posttraumatic growth.

This first chapter provides a summary of the constructs of PTG and resilience and their definition and assessment. Furthermore, it includes a brief review of the existing literature on how the two constructs may be associated.

1.1 Posttraumatic growth: conceptualization and assessment

The phenomenon of PTG has been described throughout human history, with many major world religions featuring stories of positive changes resulting from suffering and hardship (Tedeschi & Calhoun, 1995). More modern examples include Viktor Frankl's autobiographical account of his search for meaning (1959), which impressively illustrates the human ability to find purpose and meaning even in the most dire of circumstances. Nevertheless, academic attention towards this phenomenon remained limited until the 1990s when clinicians examined the lives of shipwreck survivors. The survivors reported that, in addition to the negative consequences that followed the traumatic event, their experience also led to meaningful positive changes in their lives (Joseph et al., 1993). This sparked a new line of research and inquiry on positive changes resulting from adversity, which has been expanding over the past three decades. The following sections will outline the definition and theory of PTG, the history of measuring PTG in quantitative study designs, and best methodological practices which arose over the years.

1.1.1 Defining posttraumatic growth

Posttraumatic Growth (PTG) is broadly defined as *"positive psychological change experienced as a result of the struggle with highly challenging life circumstances"* (Tedeschi & Calhoun, 2004, p. 1). These changes do not occur immediately after adverse experiences but develop over a longer period of time. Most existing PTG research focuses on single traumatic events (e.g., cancer or bereavement), but PTG is conceptually not limited to such events. To fully understand the idea behind the construct of PTG, a few misconceptions will be addressed. First, the term 'traumatic' can be misleading. The experience of PTG is not just limited to individuals who experienced events which qualify as clinically traumatic (Gold et al., 2005). The term was originally introduced to refer to 'seismic' experiences which challenge an individual's adaptive resources and their basic

assumptions and understanding of the world (Tedeschi & Calhoun, 2004). A more scientifically accurate term for these events is 'potentially traumatic events' (PTEs), as different individuals may show different responses to similar events (Bonanno & Mancini, 2008). Alternative terms used to describe PTG include adversarial growth (Linley & Joseph, 2004), benefit finding (Tennen & Affleck, 2002), or stress-related growth (Park et al., 1996). Second, the idea behind PTG is not that traumatic experiences are inherently good or in any form desirable. Instead, the construct focuses on the ability of individuals to find silver linings even in negative experiences and to adjust their thoughts, feelings, and behaviour in ways they find positive for moving forward in life. Third, PTG is conceptually different to recovery, as it reflects positive changes beyond pre-event levels of psychological functioning (Jordan et al., 2020). Finally, PTG is conceptually different to post-ecstatic growth (Mangelsdorf et al., 2019), as it focuses on positive changes emerging from severely negative rather than positive experiences.

1.1.1.1 Dimensions of PTG

PTG is a complex phenomenon, and whether an individual develops PTG, how their growth is expressed, and how strongly they experience positive changes is a highly individual experience. Different theories emphasize changes in different areas, such as identity and narrative (Pals & McAdams, 2004), eudaimonic well-being (Joseph & Linley, 2005), and social and psychological resources (Hobfoll et al., 2007). However, there is broad consensus over five dimensions of PTG proposed in the well-established and empirically tested model of Tedeschi and Calhoun (2004; see Section 1.1.1.2). The five dimensions were originally called 'New Possibilities', 'Relating to Others', 'Appreciation of Life', 'Personal Strengths', and 'Spiritual and Existential Change' (Tedeschi & Calhoun, 1996). For the sake of simplicity, they will be referred to as 'Possibilities', 'Relationships', 'Appreciation of Life', 'Strength', and 'Existence' in this thesis. First, individuals may identify new pathways and opportunities in their life. This may be a new career path or volunteering opportunity

for a cause they are passionate about, but also includes greater openness to explore new perspectives. Second, individuals may improve their social relationships, creating closer bonds with friends and family and becoming more empathetic. This may also be accompanied by the loss of less valuable connections. Third, individuals may develop a higher appreciation of life. This is often associated with a shift in how they approach and experience daily life, for example by prioritising smaller joys and recognising the value of things formerly taken for granted. Fourth, individuals may become more aware of their strengths and capabilities. This may be accompanied by the understanding that adversity can and will happen, and confidence to handle these challenges. Finally, individuals may experience spiritual growth, engage more with existential and spiritual questions, and gain a richer understanding thereof, including a stronger sense of purpose and meaning in life (Tedeschi & Calhoun, 2004).

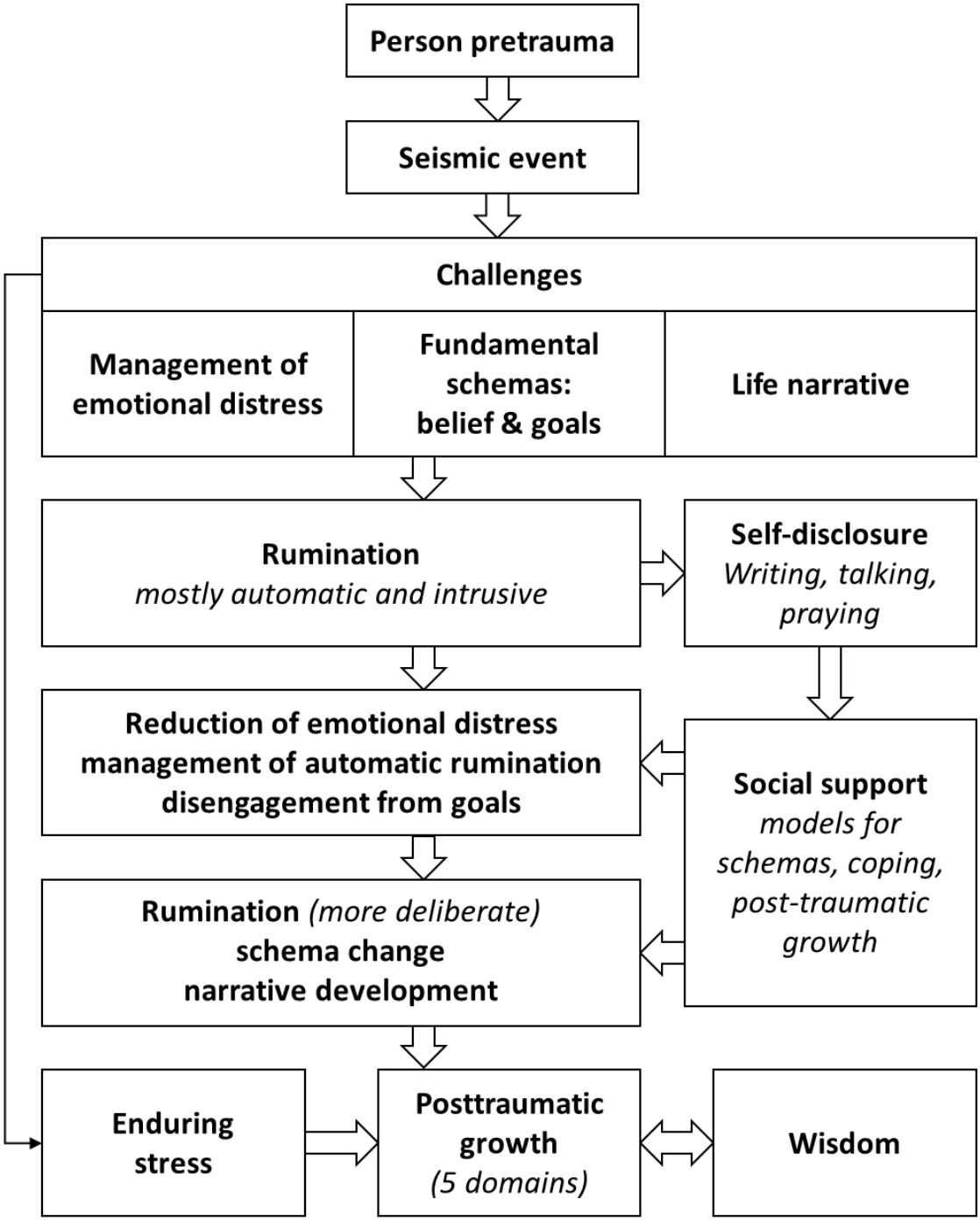
1.1.1.2 Tedeschi and Calhoun's model of PTG

The model of PTG proposed by Tedeschi and Calhoun (2004) is rooted in the shattered assumptions theory[1] and describes PTG as an outcome of a multi-step process, as shown in Figure 1.1.

[1] The shattered assumptions theory (Janoff-Bulman, 1992) posits that traumatic circumstances can threaten an individual's implicit and fundamental assumptions about the world. Individuals may rebuild their set of assumptions over time, disengaging from prior beliefs that the traumatic experience has severely disrupted. Positive psychological changes and a better understanding of the world may arise if an individual manages to accommodate some of the positive lessons and meaning from their traumatic experiences into their revised outlook in life (Joseph & Linley, 2006).

Figure 1.1

Tedeschi and Calhoun's Model of PTG (2004)



After an individual experiences significant adversity, their ability to manage emotional stress can be challenged and key elements of their beliefs, goals, and world views may be fundamentally questioned. As a result, individuals may first enter a period of mostly intrusive rumination to manage distress, characterised by frequent

involuntary thoughts about the adverse experiences (Cann et al., 2011). While this stage is often distressing and accompanied by negative emotions, it is also indicative to cognitive activities aimed at rebuilding their assumptive world. This process is influenced by the availability of internal and external resources, such as coping strategies and social support (e.g., in forms of providing comfort). Once individuals eventually start to disengage from goals that are not realistic anymore and beliefs that cannot accommodate the reality of the trauma, and in effect reduce (but not necessarily eradicate) their emotional distress, intrusive rumination decreases in favour of more effortful deliberate thinking about the adverse experience and its impact on one's life (Tedeschi & Calhoun, 2004). At this stage, individuals start to craft a coherent narrative and make meaning of their experiences. This can lead to changes in their beliefs, behaviour, wisdom, identity, and overall life narrative, ultimately expressing in the five dimensions outlined earlier.

Considering the central role of intrusive and deliberate rumination described above, PTG should not be expected to emerge immediately after an adverse event but rather after a longer period of time. Indeed, Tedeschi and Calhoun (2004, p. 8) note that *"a rapid resolution is probably an indication that the assumptive world was not severely tested"*. Empirical data on the time frame after which PTG may emerge are scarce and might greatly vary between individuals and events. Initial research suggests that it may take at least 18 months for PTG to emerge (Mangelsdorf et al., 2019).

1.1.2 Veridical and perceived PTG

Some aspects of Tedeschi and Calhoun's model of PTG have been contested. Notably, the shattered assumption theory was developed in the context of severely traumatic experiences (Janoff-Bulman, 1992), for which a disruption in functioning and a need to rebuild basic trust and the belief in a fair world are likely very prevalent. However, research on event centrality – the extent to which an

individual has integrated an event into their identity and life narrative (Berntsen & Rubin, 2006) – indicates that the type or severity of adversity is much less important for the report of posttraumatic changes than the perceived extent of struggle and impact of the event on an individual's sense of self (Boals et al., 2010; Groleau et al., 2013; Johnson & Boals, 2015). While the term 'shattering' implies very extreme and traumatic events, individuals may report PTG following much less severe experiences (Seery & Kondrak, 2014).

A study supporting the notion that not only individuals with a severely 'shattered' world view may perceive positive changes is a recent meta-analysis (Wu et al., 2019), which revealed that more than 50% of participants (*n* = 10,181) of PTG studies reported moderate to high levels of PTG after various different experiences, including childbirth, cancer, or road accidents. The meta-analysis also revealed that many individuals reported PTG after very brief time frames following a PTE. It is unlikely that individuals went through the whole process outlined by Tedeschi and Calhoun (2004) in time periods as short as one day.

To make sense of these observations, this section introduces an important theoretical milestone of PTG research: the idea that PTG consists of two different components. In their Janus-face model of PTG, Maercker and Zoellner (2004) propose that PTG consists of a constructive, self-transcending component (veridical PTG) and an illusory, self-deceptive component (perceived PTG). Conceptually, individuals may experience a decrease in perceived PTG and an increase in veridical PTG over time (Tedeschi & Calhoun, 2004).

Veridical PTG incorporates the actual (or 'genuine'; Frazier et al., 2009) positive transformation conceptualised in the original model of PTG. It describes the positive psychological changes emerging from the struggle with adversity and the long-term process of successfully integrating these experiences into an individual's perspective and identity, as illustrated in Figure 1.1. Veridical PTG is positively associated with mental health outcomes (Mangelsdorf et al., 2019).

Perceived PTG may aid individuals to maintain their assumptions and perceptions of the world and themselves (Taylor, 1983) but is negatively associated with mental health outcomes and (Zalta et al., 2017) positively associated with PTSD symptoms (Lowe et al., 2013). Perceived PTG is described as a form of self-deception which some people may develop in immediate response to threatening events or information (Zoellner & Maercker, 2006). Experiencing these 'positive illusions' is not problematic per se, as they can help individuals cope with short-term distress (Charney, 2004; Frazier et al., 2009). However, recent research suggests that individuals with greater levels of perceived PTG become more distressed over time (Boals et al., 2019).

Boals and colleagues (2022) have expanded on these initial ideas and argue that perceived PTG could reflect four different processes. First, perceived PTG might be a result of adherence to cultural scripts. Broad cultural narratives that individuals have grown up with may influence the extent to which individuals believe that they will experience PTG. An example for such a script is the popular story telling narrative of the hero's journey (Campbell, 1949), in which the protagonist faces a major challenge by which they transform into a stronger, heroic version (e.g., Batman, Harry Potter). Second, perceived PTG may be a form of reappraisal coping through secondary control or self-enhancement. The individual may adjust their beliefs about the world in order to accept or accommodate to new life circumstances (Sears et al., 2003). Re-interpreting an adverse event as the necessary step for the development of positive changes (a process coined 'benefit finding'; Tennen & Affleck, 2002) may let the experience seem less bad (Finkelstein-Fox et al., 2020), even if these improvements are unrealistic (Westphal & Bonanno, 2007). Third, perceived PTG may reflect changes in narrative identity. Experiencing adversity may lead some individuals to develop negative thoughts about themselves, threatening their positive autobiographical memory (Habermas & Bluck, 2000). In this case, they may reinterpret the experience in a way that reflects positively on themselves and

shows coherence with their pre-existing identity (e.g., “my life has been blessed”). Research showed, however, that perceived positive changes arising from this process are not related to improved outcomes (Wilson & Ross, 2003). Finally, perceived PTG may be an expression of violated post-recovery expectations. Individuals who maintained a stable level of psychological functioning may believe that they have changed positively when facing other individuals who shared similar experiences of adversity but experienced depreciation (negative changes following adversity). Their perceived improvements may be an explanation for their own lack of depreciation in response to the event, even though the ‘improved’ characteristics may have already been present to a similar extent prior to event exposure (Boals, Jayawickreme, et al., 2022).

While the empirical validation of the Janus-face model is limited, the conceptual differentiation between perceived and veridical PTG has important implications for how PTG is measured and interpreted. Possibly due to the relatively recent conceptual differentiation between perceived and veridical PTG, theoretical attention on PTG has mostly focused on its veridical component. Yet, a review on the conceptualization of PTG across the literature (Jayawickreme et al., 2018) showed that most empirical studies have used study designs and measures which mostly captured perceived PTG (see Section 1.1.3). Only a few studies distinguish between the two (often synonymously used) components, which is particularly problematic when reports of perceived PTG are misinterpreted as evidence for veridical PTG (Boals, Jayawickreme, et al., 2022).

Researchers who aimed to study PTG as originally hypothesized – that is in the form of genuine long-term changes in positive psychological functioning – have started to shift their methodological approaches in the recent years (see Section 1.1.3) and focus more on the assessment of veridical PTG over time. This does not mean that perceived changes are irrelevant in the examination of PTG – perceived PTG is associated with positive reinterpretation coping (Frazier et al., 2009), shows

protective effects against some maladaptive mental health outcomes such as suicidal ideation (Yasdiman et al., 2022), and is considered to be a precursor of veridical PTG (Jayawickreme & Blackie, 2014). However, researchers have called for more rigorous methodological approaches on PTG (Infurna & Jayawickreme, 2019, 2021), away from the use of cross-sectional study designs which retrospectively assess perceived PTG and towards more longitudinal research on veridical PTG (see Section 1.1.3).

To examine the association between trait resilience and PTG, this thesis focuses on the veridical component of PTG. More specifically, PTG is operationalised as positive (veridical) changes in the five PTG dimensions proposed by Tedeschi and Calhoun (2017; 2004) over time, following the experience of personally significant adversity. A brief definition of each PTG dimension is provided in Table 1.1.

Table 1.1

Working Definition of the Five Dimensions of Posttraumatic Growth

Dimension	Definitions Based on Tedeschi and Calhoun (2017; 2004)
Possibilities	Recognising new possibilities and entering new directions in life as a result of the event. Examples range from identifying new interests to changing one's profession and use one's experiences in meaningful ways.
Relationships	Characterized by experiencing more meaningful and close relationships and an increased sense of compassion and empathy. This includes the appreciation and understanding of others, especially those with similar experiences.
Appreciation of Life	Characterized by a shift in one's approach and experiences in daily life and is often accompanied by a changed sense of priorities. This includes an increased appreciation for what one still has, and the recognition of things formerly taken for granted.
Strength	Aims at the paradox combination of knowing that one is vulnerable to difficulties which can and will happen and simultaneously recognizing one's capabilities to handle these challenges.
Existence	Aims at the ability to make sense of life and is expressed by greater engagement with fundamental existential questions. This includes but is not limited to religious faith, understanding of the world, and meaning in life.

1.1.3 History and challenges of PTG assessment

The history of PTG assessment can broadly be categorised into three waves. In the first wave, researchers introduced a variety of cross-sectional measures based on qualitative research, clinical practice and theoretical considerations around positive psychological changes following trauma, stress and illness. In the second wave, researchers adapted existing measures to explore their limitations, improve their validity, and identify assessment strategies less affected by biases and measurement artifacts. In the third wave, researchers started to assess PTG longitudinally by using adjusted versions of existing PTG measures, proxy constructs, or by developing new measures. The three waves emerged at different times but are all still active today.

1.1.3.1 First wave of PTG assessment

The vast majority of PTG research relies on cross-sectional retrospective research designs and self-report measures of PTG (Park & Boals, 2021). Researchers typically recruit individuals who have experienced a highly distressful or

traumatic event during a specific time frame prior to the study. This time frame varies greatly across studies (ranging between days and decades; Wu et al., 2019), as only little empirical research has so far been carried out on the time frame of PTG. When completing the survey, participants are first either asked to briefly describe their adverse experience or – if the study is about a specific event – are informed that each item of the PTG measure is to be answered in reference to the event of interest. Participants are then asked to indicate the extent of PTG they believe to have experienced for each item in reference to the event. These cross-sectional study designs therefore assess PTG in the form of perceived PTG.

The first measure designed to assess positive changes following traumatic experiences was the Changes in Outlook Questionnaire (CIOQ; Joseph et al., 1993), which was developed based on the positive responses of shipwreck survivors to the question of how their view of life had changed following their traumatic experience. The measure includes 26 items, of which 11 measure positive changes. Along with the rising academic interest following this research, a range of new measures were developed to assess PTG in different contexts, such as stress-related hardship (offering a non-clinical perspective on traumatic events; Park et al., 1996), medical diagnoses (Mohr et al., 1999; Tomich & Helgeson, 2004), or social work research (McMillen & Fisher, 1998). The measures vary in terms of their target group (e.g., adults, children), dimensionality (some unidimensional, some multidimensional), and conceptual focus (e.g., individual or social resources). A more extensive list of PTG measures is provided in Section 3.1.

The most used measure of PTG is the Post-Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996), which includes 21 items addressing the five dimensions described in Section 1.1.1: New Possibilities, Relating to Others, Appreciation of Life, Personal Strength, and Spiritual Change. The items and dimensions of the PTGI were selected using a psychometric approach (principal component analysis) after generating a larger number of items based on literature

reviews on positive changes after adverse experiences (Tedeschi & Calhoun, 1996). The measure was later expanded by four new items which expand the content beyond religious faith to include engagement with spiritual and existential questions (PTGI-X; Tedeschi et al., 2017). The PTGI assesses PTG cross-sectionally by asking individuals to retrospectively indicate how much they believe they have changed as a result of their adverse experience on a scale from 0 (“I did not experience this change as a result of my crisis”) to 5 (“I experienced this change to a very great degree as a result of my crisis”). The PTGI was included in around 94% of all PTG studies published between 2016 and 2017 (Jayawickreme et al., 2018).

1.1.3.2 Second wave of PTG assessment

After a few years of initial PTG research, researchers started to question the validity of retrospective self-report measures of PTG and increasingly focused on examining their limitations (Coyne & Tennen, 2010; Frazier et al., 2009). For instance, the PTGI and other self-report measures seemed to detect PTG where none should be expected (Silverstein et al., 2017). This became particularly evident in studies on individuals who reported their PTG after watching an unpleasant movie in the past few months (22% reported moderate or great levels of PTG; Boals & Liu, 2020) or cracking their smartphone screen in the past five years (26% reported moderate or greater levels of PTG; Boals & Schuler, 2019). Some researchers argued that the frequent report of PTG across studies may be partially explained by wording effects and other measurement artifacts (Boals & Glidewell, 2023). In an attempt to solve the issue of overreporting, neutrally worded versions of existing measures were developed, such as the Stress-Related Growth Scale – Revised (SRGS-R; Boals & Schuler, 2018) and the Stress-Related Growth Scale – Neutral (SRGS-N; Boals & Glidewell, 2023). Participants reported significantly less PTG in these measures with neutral items (e.g., “I experienced a change in the extent to which I am a confident person”) compared to the original SRGS (“I learned to be a more confident person”; Park et al., 1996) and displayed conceptually more sound

associations with convergent constructs, mental health outcomes, and coping (Boals & Schuler, 2018).

One of the central concerns not addressed by neutral items was the assumption that individuals could accurately report PTG when asked retrospectively. The instruction and items of retrospective self-report measures are highly complex, requiring individuals to 1) evaluate their current standing level of each item, 2) accurately remember their standing level of each item before their adverse experience, 3) quantify the degree of change between the pre- and post-adversity standing level for each item, and 4) decide how much of this change can be attributed to the adverse experience (Coyne & Tennen, 2010). Research showed that individuals tend to perceive improvement in constructs such as life satisfaction, self-confidence (Wilson & Ross, 2001) and relationship quality (Kirkpatrick & Hazan, 1994) regardless of actual changes. Individuals show the general tendency to derogate their perceptions of their past self to maintain a belief in personal improvement over time (McFarland & Alvaro, 2000), and the desire for improvement can lead to perceptions of growth even without genuine change over time (Sprecher, 1999). In addition to this, recent research suggests that participants do not engage with the complex process outlined above in the first place when completing retrospective self-report measures (Boals, Griffith, et al., 2022). Individuals prompted to engage with the four steps did not spend significantly more time compared to completing a simplified version of the measure which only requires the first step.

The conceptual separation between perceived and veridical PTG further fuelled the concern over the ability of retrospective self-report measures to assess PTG as veridical changes over time. Frazier and colleagues (2009) argued that measures such as the PTGI rather assess perceived PTG and examined whether these reported changes correspond with changes in convergent constructs over time. In addition to the inclusion of convergent constructs (such as positive relationships, gratitude, meaning in life, life satisfaction, and religious commitment), Frazier and

colleagues also developed a ‘current-standing’ version of the PTGI by rewording the measure’s instructions and items (see Section 2.2.2.1, p. 38). Instead of retrospective perceptions of PTG, the Current-Standing Post-Traumatic Growth Inventory (C-PTGI; Frazier et al., 2009) assesses each item based on the thoughts, feelings, and beliefs of the previous two weeks (e.g., “I have a greater sense of closeness with others”). Positive changes in the C-PTGI item scores when taken before and after an adverse event indicate that an individual experienced veridical PTG. A correlational analysis found no significant association between the PTGI dimensions and changes in most convergent constructs (except for religious commitment). Furthermore, the PTGI showed only small positive correlations with the changes in three of the five C-PTGI, and no significant correlation with two dimensions. The authors concluded that participants seemed not to recall changes as accurately as expected and that *“the PTGI, and perhaps other retrospective measures, does not appear to measure actual pre- to posttrauma change”* (Frazier et al., 2009, p. 912). Several follow-up studies replicated this finding (Corman et al., 2021; Gunty et al., 2011; Owenz & Fowers, 2018), establishing the C-PTGI as the first measure of veridical PTG.

1.1.3.3 Third wave of PTG assessment

In response to the concern about the validity of cross-sectional measures, the conceptual separation of perceived and veridical PTG, and the novel approach of Frazier and colleagues (2009) to measure changes over time, researchers started assessing veridical PTG using prospective longitudinal research designs. While this development is relatively recent and not many studies have so far been published, two different strategies to quantify veridical PTG have emerged: the use of current-standing PTG measures, and the use of established well-being measures as proxies for PTG.

Current-standing measures such as the C-PTGI use items designed to address PTG as originally conceptualized. With these, individuals are repeatedly

assessed for their present or recent level on items related to PTG at two or more time points, in contrast to assessing perceived changes once in a cross-sectional design. Conclusions on PTG are then drawn from changes between two time points or identified in longitudinal trajectories over time. A scoping review of existing current-standing PTG measures and the study characteristics of published research using these measures is conducted in Chapter 2. In addition to the C-PTGI, different measures were developed to cater to different populations or methodological requirements, such as experience sampling methodology (ESM; Blackie et al., 2017). Unfortunately, measures were often developed for single studies, so detailed information on psychometric properties and their empirical dimensionality are not always available.

Alternatively, some studies have operationalised veridical PTG as changes in conceptually related constructs over time. These constructs, such as life satisfaction, compassion, or spirituality, are usually assessed via psychometrically validated measures and in combination allow for a multidimensional assessment of changes over time (e.g., Infurna, Luthar, & Grimm, 2021). Yet, the use of proxy constructs comes with major challenges and limitations. First, proxy measures may not always measure PTG conceptually sound. Detecting significant changes in PTG-related constructs over time requires measures sensitive for these changes (Blackie et al., 2017). Many well-being measures assess well-being in a more general, trait-like way (e.g., “My life is going well”; Su et al., 2014) and may therefore be better suited for questions about an individual’s stability rather than detecting specific changes (Jayawickreme, Blackie, et al., 2021). Second, researchers have used different measures to capture the same constructs, limiting the comparability of findings across studies (Corman et al., 2021; Frazier et al., 2009; Infurna et al., 2022). Finally, while PTG should be measured multidimensionally (Taku & McLarnon, 2018)**,** the combination of different measures can result in lengthy questionnaires that are both

burdensome to complete and expensive to collect, particularly in repeated measure designs.

Summarising the three waves of PTG assessment, the focus of quantitative research on PTG has shifted from assessing perceived PTG with retrospective self-reported measures in cross-sectional study designs towards assessing veridical PTG over time by using prospective longitudinal study designs and proxy or current-standing PTG measures. The next section will discuss best practices for studies which aim to examine veridical PTG.

1.1.4 Best methodological practices to assess veridical PTG

In contrast to perceived PTG, which is usually measured in cross-sectional study designs, veridical PTG is measured using longitudinal study designs. While at least two assessment time points are required – ideally prospectively, with one assessment before and one after the adverse event – a larger number of assessment time points provides the opportunity to use more sophisticated analysis methods and examine the trajectories of each PTG dimension over time (Infurna & Jayawickreme, 2019). Having the ability to observe changes over time is very valuable, as the literature on the time frame over which veridical PTG develops is very limited. According to a comprehensive meta-analysis (Mangelsdorf et al., 2019), individuals may require at least 18 months in order to develop measurable changes when using proxy measures for PTG. Some studies have exceeded this time frame in their longitudinal designs (e.g., Infurna et al., 2022). Weststrate and colleagues (2022) have even suggested study durations of four years of more to explore the time course of PTG. Due to the ideally prospective nature of veridical PTG studies, participants should have the option to report if and when they experienced significant adversity at each assessment time point[2].

[2] As outlined in Section 1.1.1, adverse event may not necessarily need to qualify as clinically traumatic in order to lead to PTG. It is, however, recommended to assure that the experience is perceived as personally highly significant and considered as highly distressing. An example of how this can be implemented is given in Section 6.1.2.1.

As proxy measures have limited comparability, may assess PTG conceptually inaccurately, and may be not economical in comparison to multidimensional measures designed to assess PTG over time (see Section 1.1.3), veridical PTG may best be assessed using current-standing PTG measures. The available measures for this are reviewed in Chapter 2. In summary, all current-standing measures utilise adapted items based on the original PTGI (Tedeschi & Calhoun, 1996) and only a single measure has been used in more than one study. Most measures are not thoroughly validated and were only developed to address specific research questions. In response to the lack of a comprehensive, thoroughly validated, and economical current-standing PTG measure, a new measure was developed in Chapter 3 and validated in Chapter 4 and Chapter 5 to address the research question of the present thesis.

1.2 Resilience: conceptualization and assessment

The construct of resilience emerged in the field of developmental research in the 1970s. Early investigations focused on children growing up in disadvantaged circumstances – such as parental mental illness, poverty, or community violence – who displayed unexpectedly high levels of adaptation, psychological functioning, and developmental progression (Werner, 1993). The initial research centred on individual qualities of these 'invulnerable' children (Egeland & Farber, 1987) which may function as protective factors from adversity. Later, research expanded to include external resources rooted in their family or wider social environment. As research evolved, the concept of resilience as an absolute and unchanging quality (hence, 'invulnerable') gave way to the understanding of adaptation to adversity as a dynamic developmental progression which includes both the development of new strength as well as vulnerabilities (Luthar et al., 2000). Consequently, researchers increasingly examined the processes and underlying mechanisms associated with resilient outcomes, as well as intervention strategies for individuals facing adversity.

Notably, the research field of resilience has rapidly expanded in recent decades, resulting in a lack of consensus regarding the definition, conceptualization, and operationalisation of resilience. A review of resilience definitions (Fletcher & Sarkar, 2013) summarised that most definitions are centred on two fundamental concepts: adversity and positive adaptation. This raises the question of how distinct the constructs of resilience and PTG really are, and to what extent they conceptually and empirically overlap. Some researchers argue that PTG and resilience describe very similar or even synonymous processes (Hobfoll et al., 2007; Westphal & Bonanno, 2007). Others argue that the two constructs are conceptually distinct but research in either field can be strengthened by adapting methodological strengths from each other (Infurna & Jayawickreme, 2019). Ultimately, the answer to the question whether resilience and PTG are the same or distinct from each other depends on how each construct is conceptualised. The different perspectives on PTG are discussed in Section 1.1.2. In the resilience literature, resilience is mostly conceptualised as either a trait, a process, or an outcome (Fletcher & Sarkar, 2013).

Trait resilience refers to a constellation of characteristics (traits) which help an individual to maintain high levels of psychological functioning despite experiencing adverse circumstances and recover quickly to their pre-adversity level (e.g., Fletcher & Sarkar, 2013; Vieselmeyer et al., 2016; Windle, 2011). Considering that PTG is mostly considered an outcome (see Section 1.1.1), a trait perspective on resilience allows for a relatively distinct differentiation between the two constructs.

Researchers who conceptualize resilience as a process take on a more dynamic perspective and suggest that the effect of these protective factors vary between situations and time points in individual's lives (Fletcher & Sarkar, 2013). Although an individual may adapt well to adversity at one point in their life, they may show a different reaction at a different point in life or in response to a different stressor. Rather than examining which individual characteristics are involved in showing resilience, this perspective focuses more on how individual (e.g., coping

strategies, self-efficacy) and environmental (e.g., social support, socio-familial environment) resources and risk factors interact in the process of positive adaptation to stressors (Fontaine et al., 2016; Johnson et al., 2011; Luthar et al., 2000).

Finally, studies which examine resilience as an outcome or trajectory of successful adaptation to adversity often operationalize resilience as the absence of psychopathology (e.g., PTSD; Almedom & Glandon, 2007) or meeting developmental expectations such as academic achievement in children (Shaikh & Kauppi, 2010). However, the absence of psychopathology does not necessarily imply that an individual is thriving. Recent studies have therefore shifted towards a more salutogenic perspective (focusing on well-being rather than ill-being) and measured resilience in the form of stable positive functioning using well-being constructs such as life satisfaction (Infurna & Luthar, 2017). From this perspective, it is not surprising that resilience has been likened to PTG. Yet, the theoretical trajectories of resilience and PTG are distinct. While resilience is characterised by stable levels of adjustment (possibly following a slight temporary decrease in psychological functioning) following adversity (Laceulle et al., 2022), PTG is mainly characterised by initial struggle followed by an increase of psychological functioning beyond baseline levels over a longer period of time. Considering both constructs as different trajectories of adaptation following adversity implies that an individual can either show resilience or PTG as forms of positive adaptation, but not both (Infurna et al., 2022).

The present thesis uses a trait perspective on resilience. This allows for a clear distinction from PTG and is congruent with the main research question: whether and how resilience (independent variable) predicts posttraumatic growth over time (dependent variable). But even within the trait resilience literature, definitions and measures of resilience are diverse. The next section will expand on three different forms of resilience which may show different associations with PTG and introduce a measure which allows the assessment of each dimension through the lens of trait resilience.

1.2.1 Definition and operationalisation of trait resilience for the present thesis

Numerous researchers have reviewed the literature to cartograph and classify the different systems, theories and conceptualisations of resilience. Two studies will be highlighted in this and the following sections, as they synergise well in light of the research question in this thesis. Both studies identified three distinct dimensions of resilience using different methodological approaches. Yet, the identified dimensions closely resembled each other across the two papers. One study focuses on the role of PTG within the framework of the three dimensions, the other study provides a parsimonious measure for the traits associated with each dimension.

The first study (Lepore & Revenson, 2006) is a broad conceptual review of the term ‘resilience’ in the literature on stress and trauma, conducted to examine conceptual links to PTG. The authors identified three related but distinct dimensions of resilience, which they called Recovery, Resistance, and Reconfiguration. Notably, this review was not restricted to a specific trait, process, or outcome perspective but rather focused on different responses that could be considered resilient.

The second study (Maltby et al., 2015) followed a more empirical approach to consolidate the variety of theoretical and empirical approaches of assessing trait resilience. The authors pooled the items of the five most used trait resilience measures and examined their underlying structure using an exploratory factor analysis. They identified three dimensions – Engineering Resilience, Ecological Resilience, and Adaptive Capacity – which are not only subject to psychological research but can also be observed in different field of science, such as physics, biology, or sociology, respectively.

The dimensions described in each study map well on each other and of them will be briefly discussed in the following sections, including a conceptual outline using

the metaphor of a tree (individuum) blowing in the wind (stressors), their assessment, and their conceptual associations with veridical PTG.

1.2.1.1 Recovery and Engineering Resilience

The first resilience dimension is characterised by the ability to 'bounce back' and return (in terms of speed or status) to the level of functioning before the experience of an adverse event (Maltby et al., 2015). This is characterised through the sentiment expressed in the following metaphor:

> *"Ordinarily, when a strong wind blows a tree, the tree will bend to accommodate the wind or else it will break. When the wind stops, the tree resumes its original upright state. This elasticity is an important aspect of resilience: A stressor disrupts a person's normal state of functioning, but when the stressor passes, the person eventually resumes his or her normal pre-stressor level of functioning." (Lepore & Revenson, 2006, p. 25)*

Some researchers differentiate between recovery and resilience and claim that individuals need to show immediate recovery in order to be considered resilient (Bonanno, 2004), but others argue that even individuals who need longer to bounce back could be considered resilient in comparison to individuals who do not recover at all (Lepore & Revenson, 2006). In the EEA Resilience Scale developed by Maltby and colleagues (2015), traits associated with the Recovery dimension are assessed under the label 'Engineering Resilience'.

Recovery describes the return to baseline functioning, whereas PTG refers to positive change beyond pre-event levels (Tedeschi & Calhoun, 2004). While both constructs describe similar forms of positive adaptation, it is not clear whether the recovery to baseline levels of functioning is driven by the same resources and abilities as exceeding them. One option is that the processes are unrelated and facilitated by different resources and qualities. Individuals who recover quickly may

not experience a lengthy period of struggle and rumination and may not question their worldview to the degree that PTG would require (see Figure 1.1). Alternatively, traits associated with effective recovery may also facilitate the process of PTG and individuals with high levels of this dimension may not just recover to their baseline but also have a higher likelihood of developing veridical PTG.

1.2.1.2 Resistance and Ecological Resilience

The second resilience dimension is characterised by the ability to resist the impact of adversity and maintain stability in functioning and identity (Maltby et al., 2015). Revisiting the tree metaphor, this was described as follows:

> *"[Resistance] would be evident when a tree stands still, undisturbed, in the face of a howling wind. Bonanno (2004) captures this dimension of resilience in his conceptualization, which maintains that people who exhibit normal functioning before, during, and after a stressor – even long after a stressor – are exhibiting resilience." (Lepore & Revenson, 2006, p. 25)*

In a prospective study by Bonanno and colleagues (2002), the authors examined the trajectory of depression symptoms in bereaved individuals over the period of 18 months. Their study revealed that the most frequent pattern was not the experience of initially elevated but gradually subsiding depression (11.9%), but instead a stable trajectory of low depression (51.4%). In another study on a military sample, 83.1% of individuals showed a stable trajectory of low PTSD symptoms pre-post deployment (with three years between assessments), supporting their initial claim that more individuals show stability in the face of adversity than broadly assumed (Bonanno et al., 2012). The EEA Resilience scale (Maltby et al., 2015) assesses traits reflecting the Resistance dimension under the label 'Ecological Resilience'.

As outlined in Section 1.1.1, PTG is the result of an individual's struggle with experiences that pose a major challenge to their world view and identity. Tedeschi and Calhoun (1995) therefore suggest that individuals who resist the threat of adversity to their self- and world view may miss out on the opportunity to experience PTG and learn meaningful life lessons. At the same time, it would be unreasonable to expect individuals with major vulnerability and instability to experience positive rather than negative changes in response to adversity (Lepore & Revenson, 2006). Individuals with high levels of Resistance may therefore show neither negative nor positive changes in their outlook in life following adverse experiences.

1.2.1.3 Reconfiguration and Adaptive Capacity

The third resilience dimension is characterised by the ability to manage and accommodate change and adapt to adversity in a way that allows the individual to withstand future adversity better (Maltby et al., 2015). Lepore and Revenson (2006) explain this form of resilience as follows:

> *"[W]hen the wind blows, the tree does not simply make a temporary accommodation and then resumes its original shape; instead, it changes its shape. The reconfigured tree can accommodate prevailing winds, but it also may make the tree resistant to breaking in future wind storms." (Lepore & Revenson, 2006, p. 27).*

This dimension differs from Recovery and Resistance because it focuses on transformations resulting from adverse experiences. An individual who demonstrates high resilience in the Reconfiguration dimension would not display the same cognitions, beliefs, or behaviour as before their experience (Lepore & Revenson, 2006). This resilience dimension is captured in form of 'Adaptive Capacity' in the EEA Resilience scale, which describes an individual's *"general willingness to adapt across their lifetime"* (Maltby et al., 2016, p. 97).

The evolutionary element captured in the Reconfiguration dimension makes it similar to PTG, and Lepore and Revenson (2006) argue that PTG may describe a specific form of Reconfiguration, suggesting a positive association. The main difference between both constructs, however, is that some protective adaptations that would qualify as resilient may be overall perceived as negative, while PTG specifically focuses on beneficial improvements. For example, an individual may become less trusting following a divorce. In effect, this change may protect them from future heartbreak (a resilient reconfiguration), but at the same time may limit their ability to build intimate relationships (and hence would be described as posttraumatic depreciation).

1.3 The relationship between PTG and resilience

While the present thesis is the first empirical examination of the predictive effect of trait resilience on veridical PTG, some initial research on the relationship between resilience and perceived PTG already exists. However, the associations reported in these studies mainly depend on how resilience is operationalised. This section briefly outlines the existing research on the relationship between resilience and PTG.

Studies which have assessed resilience as a set of traits (Bensimon, 2012; Duan et al., 2015; Li et al., 2018; Nishi et al., 2010; Wan et al., 2022; Yuan et al., 2018) mostly reported positive associations with perceived PTG in cross-sectional designs. This means that individuals who reported a high level of trait resilience a few months after experiencing adversity also reported that they believed to have change positively due to their experience. In contrast, studies which assessed resilience as the lack of pathogenic outcomes (i.e., PTSD symptoms) have reported a negative correlation with perceived PTG (Levine et al., 2009; Zerach et al., 2013)[3].

[3] Notably, several studies have identified a positive association between PTSD symptoms and perceived PTG (Liu et al., 2016; Shakespeare-Finch & Lurie-Beck, 2014) but

The lack of studies examining the relationship between resilience and veridical PTG present a significant knowledge gap. This knowledge gap is particularly significant considering that both constructs describe possibly related forms of positive adaptation to adversity. Additionally, studies investigating the association between perceived PTG and trait resilience have not thoroughly differentiated between the different forms of resilience outlined in Section 1.2.1. This distinction is crucial, as traits associated with different forms of resilience may impact the development of veridical PTG in different ways.

As outlined in the previous three subsections, Resistance may play a greater role in the early stages in the process and specifically affect an individual's ability to manage emotional distress. Individuals with higher levels of Resistance may not struggle as much as others, ruminate less, but in consequence also show less PTG (Groleau et al., 2013). Reconfiguration may be more important at later stages of the PTG process when individuals integrate their experiences into a new outlook in life. Higher levels in this dimension may make it easier for individuals to change their perspective and be open to new possibilities and ideas, resulting in more PTG.

The Recovery dimension may affect the PTG process more broadly. While a better ability to overcome adversity quickly and effectively may also help to improve the levels of psychological functioning beyond pre-adversity baseline levels, the lesser extent of struggle and distress resulting from a quick recovery may also lower the likelihood of PTG (Tedeschi & Calhoun, 1995).

The present thesis presents a novel and nuanced perspective on the association between trait resilience and veridical PTG that extends beyond what has been reported in the currently existing literature.

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not between PTSD symptoms and veridical PTG (Owenz & Fowers, 2018). Findings for perceived PTG may therefore not necessarily apply to veridical PTG.

1.4 Structure of the thesis

This thesis explores whether and how trait resilience predicts veridical PTG over time. Both constructs will be assessed multidimensionally. While the EEA resilience scale, a validated multidimensional measure, will be utilised to assess the three resilience systems described in Section 1.2.1, selecting a suitable measure for multidimensional veridical PTG present more of a challenge. To explore the available measures of current-standing PTG and identify possible best-practices for longitudinal research designs, a scoping review is conducted in Chapter 2. As no existing current-standing measure of PTG was found to be sufficient for the purposes of this thesis, a new measure was developed in Chapter 3, psychometrically validated in Chapter 4, and compared to two comparable current-standing PTG measures in Chapter 5. After demonstrating adequate factor fit, convergent validity, test-retest reliability and predictive validity in the new measure, a longitudinal study was carried out to explore whether and how trait resilience is associated with veridical PTG in a sample with recent adversity experience in Chapter 6. A broad discussion of the overall findings is conducted in Chapter 7. A more detailed overview including the aim and summary of each empirical chapter can be found below.

Chapter 2 is a scoping review of current-standing measure of PTG. It is conducted to identify an adequate measure of PTG to examine the relationship between trait resilience and veridical PTG. The scoping review provides information on which current-standing PTG measures have been used in published research so far, which research questions and objectives they were used or, and the study designs and methodologies in which they were embedded. Six different measures were identified, and all are based on the retrospective PTGI. Only one measure has been used more than once, and that mostly for methodological questions. The psychometric validation was mostly limited and only one measure had a validated 5-

dimensional structure. None seem to be comprehensive enough to research multidimensional veridical PTG in a longitudinal study design.

As no existing current-standing measure of PTG seemed suitable to measure multidimensional PTG comprehensively, a new measure – the PRAISE scale – is developed in Chapter 3. The measure is designed to broadly capture the five conceptual dimensions proposed by the PTGI. However, items are selected from a diverse pool of items, sourced from eight different retrospective PTG measures, and appropriately adapted to enable the measurement of veridical PTG. The initial version of this theory-driven measure demonstrates a poor model fit in a confirmatory factor analysis (CFA; n = 569), leading to the exclusion of one item and adjustments of the instructions.

Chapter 4 described the psychometric validation process of the PRAISE scale, which includes analyses of the measure's factor structure and convergent validity (n_{t1} = 619), and the test-retest reliability and predictive validity after two weeks (n_{t2} = 94). Items slightly cross-loaded on different dimensions and a Bayesian CFA allowed to test the factor structure when allowing for small non-zero off-loadings, which resulted in adequate model fit. There is evidence for convergent validity, which was tested via seemingly unrelated regression analysis, and a first indication for predictive validity. The test-retest-reliability indicated overall stability but enough flexibility to allow for changes over time.

In Chapter 5, the factor structures of other current-standing measures of PTG were tested and compared to the PRAISE Scale, to find out whether cross-loading items are PRAISE-specific or more related to the assessment of current-standing PTG in general. A Bayesian CFA indicated that cross-loading items are not just observable in the PRAISE scale but seem to be generally rooted in the construct of multidimensional current-standing PTG. The PRAISE scale shows better fit indices than other comparable current-standing measures (n = 303).

Following the development of a new current-standing measure of veridical PTG, Chapter 6 reports on the examination of the main research question of the present thesis. The relationship of multidimensional trait resilience (see Section 1.2.1) and multidimensional veridical PTG in individuals with recent exposure to adversity is tested in a 3-wave longitudinal study (n = 285) using latent growth curve modelling (LGCM). The factor structure of the PRAISE holds in the adversity sample and demonstrates scalar measurement invariance. PTG shows stability over the 4-month period and no resilience dimension predicts changes in PTG dimensions. However, trait resilience shows associations with baseline levels of PTG, particularly Ecological Resilience (resistance) and Engineering Resilience (recovery).

Chapter 2 Scoping review of current-standing PTG measures

Multidimensional PTG has traditionally been assessed in cross-sectional research designs using the PTGI (Tedeschi et al., 2017; Tedeschi & Calhoun, 1996). While this assessment approach is relatively easy for researchers to carry out, it comes with significant drawbacks (see Section 1.1.3.2, p. 13). Most importantly, recent theoretical and empirical advancements (Boals, Jayawickreme, et al., 2022) suggest that cross-sectional retrospective measures assess perceived PTG (personal beliefs that could be a form of coping) rather than veridical PTG (actual changes that unfold over time). Some PTG researchers have thus started shifting their focus from perceived to veridical PTG. For the assessment of veridical PTG, longitudinal study designs are used which allow studies to detect and quantify changes between two or more time points (Mangelsdorf et al., 2019).

As described in Section 1.1.4, two assessment approaches have emerged to capture veridical PTG in longitudinal studies. Both approaches quantify PTG as changes in PTG-related dimensions between two time points or – if three or more datapoints exist – as trajectories over time. The first approach is to use established and validated measures of well-being constructs (e.g., life satisfaction, self-esteem, meaning in life), which in combination resemble the five dimensions of PTG (e.g., Corman et al., 2021). However, depending on the measures chosen, these questionnaires can become very lengthy and data collection can be expensive in administration effort and time. Furthermore, the measures are not always able to capture each PTG dimension as theorised (see Section 1.1.3.3), and the comparison of results across studies is limited due to the varying measures included.

A conceptually and economically more sound approach to assess veridical PTG in longitudinal studies is the use a current-standing measure of PTG. Current-standing measures have a stronger link to the theory and traditional measures of

PTG and are relatively concise. The first current-standing PTG measure (C-PTGI; Frazier et al., 2009) was developed to examine the relationship between perceived and veridical PTG. It includes adapted versions of the 21 PTGI items which assess each PTG dimension in terms of its current level, rather than perceived changes. Notably, the C-PTGI does not refer to just the very moment when assessing the 'current' level of well-being but prompts participants to evaluate each item in reference to the past two weeks.

To explore the multidimensional relationship between trait resilience and veridical PTG, a current-standing approach seems most promising. However, the exploration of veridical PTG within a longitudinal context is still very limited (Boals, Jayawickreme, et al., 2022; Jayawickreme et al., 2018) and the extent to which current-standing PTG measures have been used in published studies, the research designs they were embedded in, and whether questions beyond the comparison of perceived and actual PTG have been addressed, is poorly known. To assess the usability of available current-standing PTG measures for the longitudinal assessment of PTG, the following research questions are addressed in this scoping review:

1. Which current-standing PTG measures have been used in published longitudinal studies?
2. What were the research questions and objectives of studies using these current-standing PTG measures?
3. What research designs have current-standing PTG measures been used in?

2.1 Methods

Scoping reviews are an effective tool to examine broader questions, particularly when little prior research about the topic of interest exists (Peters et al., 2020). The methodology can be used to address questions on how research is conducted in a specific field (Munn et al., 2018) and on the breadth or extent of the

literature about a specific topic (Tricco et al., 2016). As minimal evidence on the amount or specific usage of current-standing measures in PTG research has been published so far, the research questions of the present study are well suited to be addressed by a scoping review.

To address the three research questions of this scoping review, relevant studies were identified and selected, and the available data were charted, collated, summarised, and reported. Review conduct and reporting was structured following the 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews' (PRISMA-ScR; Tricco et al., 2018) guidelines. These guidelines include 20 items in a checklist which provide an orientation for the conduct and report of the review to ensure good quality (e.g., to provide the number of sources of evidence screened / assessed for eligibility / included in the review; to list and define all variables for which data were sought).

2.1.1 Identifying relevant studies

Three strategies were used to identify relevant studies. First, forward citation tracking of studies citing the C-PTGI development study (Frazier et al., 2009) and the C-PTGI-SF development study (Kaur et al., 2017) was conducted using Scopus. Second, five electronic databases (Medline, Embase, PsycInfo, PsycArticles, and Journals@Ovid) were searched via Ovid. The search terms were: *("C-PTGI" or "C-PTGI-SF" or "CPTGI" or "Current Attributes Scale" or "Current-standing PT*").tw,kw*. The search was conducted on the 15 November 2021. Third, expert consultation was used, where the list of included studies was reviewed by an expert in the PTG field to identify any additional pertinent studies fitting the inclusion criteria.

2.1.2 Study selection

After initial scanning of the search results, the inclusion criteria were defined as follows: (1) Studies using a current-standing measure designed to assess

posttraumatic growth, and (2) Studies including at least two time points of assessment.

Studies using non-PTG-specific measures as proxies for PTG, such as measures for self-efficacy or spirituality, were excluded. Following deduplication of search results, titles and abstracts were screened and a full text review of eligible studies was conducted.

2.1.3 Data charting, summary, and synthesis

To address the first research question, the identified current-standing PTG measures were briefly described, and their psychometric properties summarised. For each measure this included number of items, their dimensionality, response scale (e.g., Likert scale with five response options), the instructions provided to participants, and their internal consistency.

As some studies examined a broad range of detailed questions, a clear summary of study aims was not possible. To address the second research question, each study was thus labelled as analytic, evaluative, or descriptive. Analytic studies are focusing on specific methodological questions around veridical PTG. In the evaluative studies, interventions fostering PTG are examined. Descriptive studies use more exploratory approaches to investigate PTG. Some examples are provided in Section 2.2.3.1.

To address the third research question, data on the research design and sample characteristics were charted. The data extracted on research design included the current-standing PTG measure used, the frequency and number of assessments, the data analysis approach used to derive PTG from the data, and, where relevant, which measure for perceived PTG was included in the study. The sample characteristics included the number of participants, age, sex, and target group (e.g., student sample). As studies on posttraumatic growth usually include a potentially

traumatic event (PTE) around which posttraumatic changes develop, it was also reported whether any specific adverse event or episode was examined.

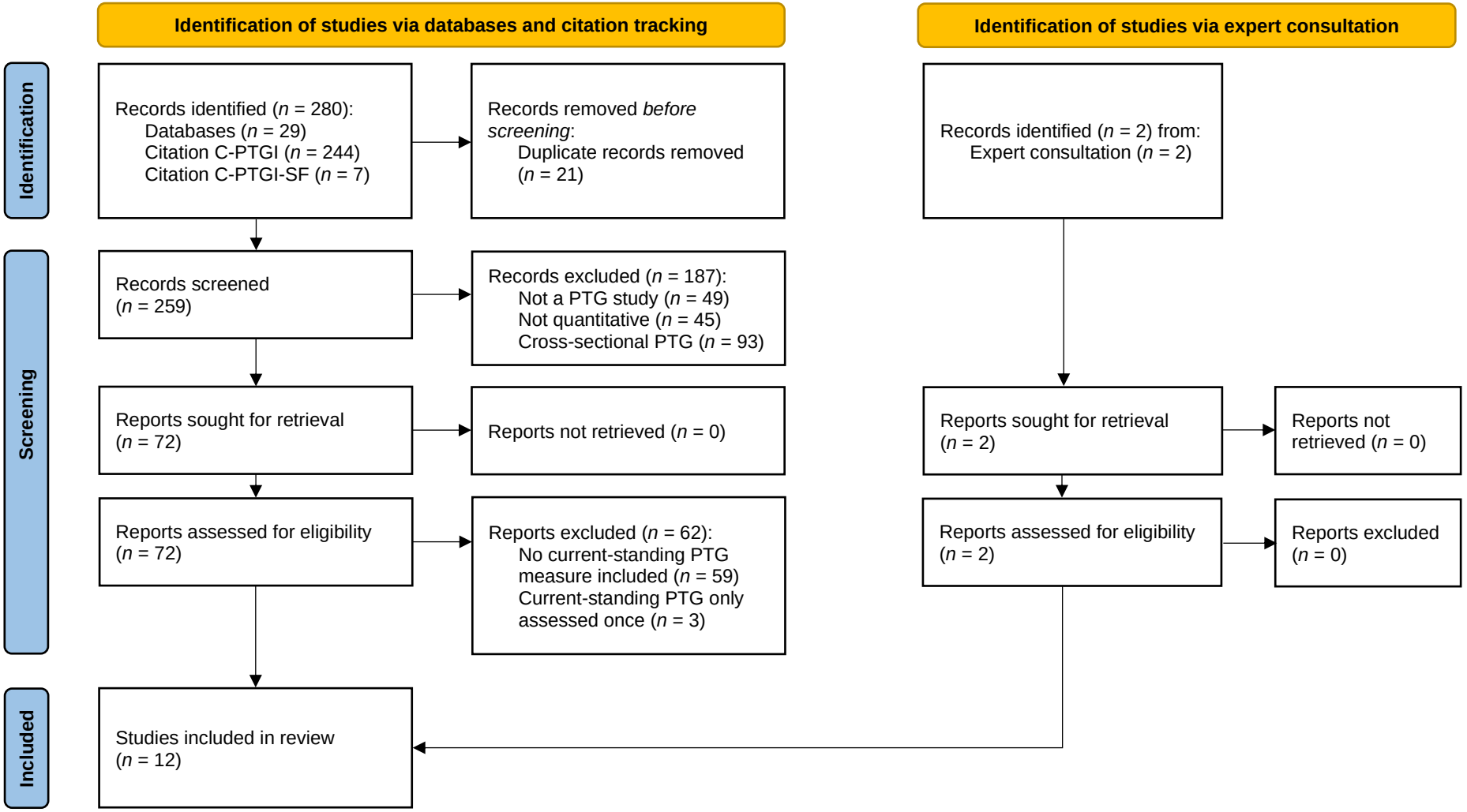
2.2 Results

2.2.1 Search results

The combined searches and citation tracking resulted in 280 identified citations. After de-duplication, the titles and abstracts of 259 records were screened. Full texts of 72 studies which could potentially include a current-standing measure of PTG were reviewed. This included longitudinal studies which included a PTG measure but did not clearly state in the abstract which one was used. Ten studies were found eligible for inclusion (Figure 2.1). Additionally, expert consultation identified a further two studies meeting the inclusion criteria. A complete list of the identified studies is provided in Appendix 1.

Figure 2.1

PRISMA Flow Diagram of Eligible Studies Using Current-Standing Measures of PTG



2.2.2 Current-standing PTG surveys identified

Six current-standing measures of PTG were identified. Each measure is briefly described in the following sections, including information on the psychometric properties, dimensionality, and application. An overview of the measures is given in Table 2.1.

Table 2.1

Current-Standing PTG Measures Identified in the Scoping Review

Measure	Development Paper (and papers using the measure)	Items	Dimensionality	Instructions	Response Scale	Internal Consistency
Current-Standing Post-Traumatic-Growth-Inventory	(Frazier et al., 2009) Included in #1-#7	21	5 conceptual dimensions (NP, RO, AL, PS, SC), empirically not validated	Past 2 weeks	1 (not at all) - 6 (very great degree)	"total & subscales <.77" (#1) α = .92-.96 (#2) α = .93-.95 (#3) α = .91 (#4) α = .90-.95 (#5) α = .84-.92 (#6) α = .89-.95 (#7)
Current-Standing Post-Traumatic-Growth-Inventory – Short Form	(Kaur et al., 2017) Included in #8	11	Unidimensional, empirically validated	Degree to which statements are true in your life	0 (not at all) - 5 (to a very great degree)	α = .90-.91 (#8)
Current-Standing Post-Traumatic-Growth-Inventory - Children	(Iimura & Taku, 2018) Included in #9	10	5 conceptual dimensions (NP, RO, AL, PS, SC), empirically not validated	Past 2 weeks	1 (not at all) - 4 (a very great deal)	α = .81-.85 (#9)
Current Attributes Scale	(Yanez et al., 2011) Included in #10	25	6 conceptual dimensions (NP, RO, AL, PS, SC, PH), empirically not validated	Degree to which statements apply to current experience	0 (not at all) - 5 (a great deal)	α = .90-.93 (#10)
State Post-Traumatic Growth for Experience Sampling Methodology	(Blackie et al., 2017) Included in #11	17	5-dimensional (NP, RO, AL, PS, SC), empirically validated	Past 30 minutes	1 (strongly disagree) - 5 (strongly agree)	Subscales: α = .72-.87 (#11)
Daily State Post-Traumatic Growth	(Jayawickreme, Blackie, et al., 2021) Included in #12	5	Unidimensional, empirically validated	Today	1 (strongly disagree) - 5 (strongly agree)	$\omega_{Between\text{-}person}$ = .89 (#12)

Note. Dimensions: NP = 'New Possibilities', RO = 'Relating to Others', AL = 'Appreciation of Life', PS = 'Personal Strength', SC = 'Spiritual Change', PH = 'Physical Health'. Internal consistencies were sourced from the studies identified in this review: #1 = (Frazier et al., 2009), #2 = (Gunty et al., 2011), #3 = (Johnson & Boals, 2015), #4 = (Roepke, Benson, et al., 2018) , #5 = (Roepke, Tsukayama, et al., 2018), #6 = (Owenz & Fowers, 2018), #7 = (Boals et al., 2019), #8 = (Jacobson et al., 2021), #9 = (Iimura & Taku, 2018), #10 = (Yanez et al., 2011), #11 = (Blackie et al., 2017), #12 = (Jayawickreme, Blackie, et al., 2021).

2.2.2.1 Current-Standing Post-Traumatic Growth Inventory (C-PTGI)

The C-PTGI (Frazier et al., 2009) is a current-standing version of the most widely used retrospective posttraumatic growth measure, the PTGI (Tedeschi & Calhoun, 1996). The PTGI aims to assess the perceived changes in five domains of psychological functioning: Relating to Others, Personal Strength, New Possibilities, Appreciation of Life, and Spiritual Change. Instead of asking how much change individuals experienced in each dimension, the 21 items of the C-PTGI are phrased to reflect the current-standing level of individuals over the past two weeks. Each C-PTGI dimension has correlated significantly with scales that reflect general domains of PTG. However, the factor structure of the C-PTGI has not been assessed.

To assess PTG in datasets with two assessment time points, the authors suggest to calculated change scores by subtracting T1 scores from T2 scores and further mentioned the use of residual scores and a regression of T2 scores controlling by T1 scores as alternatives (Frazier et al., 2009). The C-PTGI has originally been developed to examine the relationship between (retrospectively) perceived PTG and actual changes in PTG dimensions. Individuals are instructed to indicate their agreement with each item using a 6-point Likert scale, based on their feelings during the past two weeks. Across the observed studies, the C-PTGI showed an internal consistency between $\alpha = .77$ and $\alpha = .96$.

2.2.2.2 Current-Standing Post-Traumatic Growth Inventory – Short Form (C-PTGI-SF)

The C-PTGI-SF (Kaur et al., 2017) is a short form of the C-PTGI and consists of 11 items. The items are current-standing versions of the 10 items used in the PTGI-SF (short form of the retrospective PTGI; Cann et al., 2010) and one additional item assessing compassion for others. The measure was originally developed for the use in the longitudinal Millennium Cohort Study (US Military) and came first into use in the 2011-2013 cycle. Participants are provided with the following instructions: “Indicate the degree to which the following statements are true in your life…”. The

broad reference time frame sets this version apart from the other measures described, which refer to a shorter and more specific time frame. According to the development study (Kaur et al., 2017), individuals use a 7-point Likert scale from 0 (not at all) to 6 (to a very great deal). However, in included study #8, a scale from 0 to 5 was reported. The C-PTGI-SF showed an internal consistency between α = .90 and α = .91. Its unidimensional factor structure was empirically validated in development study (CFI = .910, TLI = .884, RMSEA = .090, SRMR = .048; Kaur et al., 2017) which did not meet inclusion criteria of this scoping review as it used a cross-sectional sample.

2.2.2.3 Current-Standing Post-Traumatic Growth Inventory – Children (C-PTGI-C)

The C-PTGI-C (Iimura & Taku, 2018) is a simplified version of the C-PTGI and is designed for the assessment of children. It comprises of 10 items, two per dimension. The items are current-standing versions of the children-oriented PTGI-C-R (Kilmer et al., 2009; Taku et al., 2012). So far, only a Japanese version has been used in a peer-reviewed publication. Across a 2-month period, the test-retest correlations were described as follows: total scale = .47; Relationships = .35, New Possibilities = .40, Personal Strength = .44, Spiritual Change = .41, Appreciation of Life = .37 (Iimura & Taku, 2018). The C-PTGI-C showed an internal consistency between α = .81 and α = .85.

2.2.2.4 Current Attributes Scale (CAS)

Similar to the C-PTGI, the CAS (Yanez et al., 2011) is a reworded version of the 21-item PTGI designed to capture participants' current status on each domain. The items and instructions are not clearly reported in the study. After requesting access to the measure via personal correspondence, the corresponding author provided a 25-item measure including four additional items on physical health. A major difference to the C-PTGI is that participants are asked to indicate the degree to which each item applies to their "current experience". Response options reported in

the study ranged from 0 (not at all) to 5 (a great deal). The CAS showed an internal consistency between α = .90 and α = .93.

2.2.2.5 State PTG for Experience Sampling Methodology (State PTG for ESM)

This measure was developed for the use in a study using experience sampling methodology (ESM) and captures daily manifestations of the five PTGI dimensions (Blackie et al., 2017). In ESM, participants describe their current behaviour, thoughts, and feelings several times per day for several days when prompted via mobile device. The purpose of this measure – which focuses on fluctuations in well-being and behaviour within a given day – differs from other current-standing measures, which can be more easily included in panel datasets or other longitudinal designs with less frequent assessments.

As the State PTG for ESM measure was designed to assess PTG in the moment participants were asked (here during the past 30 minutes), its 17 questions are not too global but capture the aspects that would be relevant in the moment. This requires a rather complex survey structure. To assess the relationship dimension, for example, participants are first asked whether they had a social interaction in the past 30 minutes. Only if individuals respond with ‘yes’, they received a battery of four questions (e.g., “I intentionally sought out this person for a meaningful interaction”). How exactly the content of each item was selected or created has not been documented in detail in the development study.

A psychometric validation (Blackie et al., 2017) has only been carried out on 57 individuals: 22 with recent adversity exposure, 35 without. A multigroup confirmatory factor analysis (MCFA) including all data points (up to 45 per person) collected from individuals with (CFI = .94; RMSEA = .061; SRMR = .082) and without (CFI = .91; RMSEA = .078; SRMR = .068) recent exposure to adversity indicated a moderate to good 5-dimensional factor fit. The internal consistencies ranged from .72 (personal strength) to .87 (appreciation of life). Intraclass correlation coefficients (ICC) ranged from .09 for personal strength to .88 for spirituality.

2.2.2.6 Daily State PTG

The brief Daily State PTG measure by Jayawickreme and colleagues (2021) includes one item for each of the five PTGI dimensions and was developed for a study assessing PTG weekly. The items were adapted from different non-PTG measures, and participants rated each one on a scale from 1 (strongly disagree) to 5 (strongly agree). The unidimensional factor structure has been validated using an MCFA, indicating excellent model fit (CFI = .99; RMSEA = .019; SRMR = .035). Except for the similar State PTG for ESM measure outlined above, the Daily State PTG measure has a much shorter reference time frame than the other current-standing measures reviewed (e.g., “Today the spiritual part of my life was very important to me”).

2.2.3 Study characteristics

Table 2.2 includes the charted data as outlined in Section 2.1.3, including a brief outline of the objectives of each study, details about how PTG was assessed and analysed (number of time points, assessment frequency, analytic approach, and whether a measure of perceived PTG was also included in the study), and sample characteristics (sample size, age, sex, population, and whether a specific adverse event was examined).

Table 2.2

Research Objectives, Design, and Sample Characteristics of Studies Using Current-Standing Measures of PTG

#	Publication	Measure	Research Objective	Ts	Freq.	Analysis	Perc. PTG	*n*	Age (SD)	F%	Sample	Adversity
1	(Frazier et al., 2009)*	C-PTGI	Analytic	2	8wks	Change scores; residual scores; regression controlling for t2 C-PTGI	PTGI	122	~18-21	85%	US UniUG	PTE (TLEQ) during study
2	(Gunty et al., 2011)*	C-PTGI	Analytic	2	8wks	Change scores	PTGI	122	~18-21	85%	US UniUG	PTE (TLEQ) during study
3	(Johnson & Boals, 2015)	C-PTGI	Analytic	2	8wks	Change scores	PTGI	1295	21.1 (3.7)	70%	US UniUG	Most stressful event during study
4	(Roepke, Benson, et al., 2018)	C-PTGI	Evaluative	5	1-4wks	Hierarchical Linear Modelling	PTGI	175	42.8 (12.7)	83%	US Adults 18+	PTE (LEC) during past 6 months
5	(Roepke, Tsukayama, et al., 2018)	C-PTGI	Evaluative	5	2wks	Hierarchical Linear Modelling	PTGI	112	31.5 (12.0)	64%	US Adults 18+	Bereavement (past 3m-5y)
6	(Owenz & Fowers, 2018)	C-PTGI	Analytic	2	5-10wks	Change scores	PTGI	100	20.5 (2.1)	71%	US UniUG	Romantic breakup during study
7	(Boals et al., 2019)	C-PTGI	Analytic	2	3mths	Change scores	PTGI	64	19.7 (3.5)	76%	US Uni	PTE (LEC-5) during study
8	(Jacobson et al., 2021)	C-PTGI-SF	Descriptive	2	3yrs	Change scores; groups (pos/no/neg)		8732		21%	US Military	Combat Deployment
9	(Iimura & Taku, 2018)	C-PTGI-C	Analytic	2	2mths	Latent difference scores	PTGI-C-R	262	14-16	50%	JP 9th grade pupils	School transition (MS to HS)
10	(Yanez et al., 2011)	CAS	Analytic	2	6wks	Change scores	PTGI	152	19.7 (1.8)	83%	US UniUG	Most stressful event during study
11	(Blackie et al., 2017)**	State PTG for ESM	Analytic	9x5	3hrs	Correlates of state PTG means; state PTG variance while controlling for means	PTGI-42	22	20.0 (1.2)	68%	US UniUG	PTE (LEC-5) during past 2mths
								35	18.6 (0.7)	49%	US UniUG	No PTEs (LEC-5) during past year
12	(Jayawickreme, Blackie, et al., 2021)	Daily State PTG	Analytic	45	~1wk	Latent Growth Curve Modelling		1247	46.2 (14.8)	51%	US Adults 18+	PTE (adapted MLEC) during study

Note. * Studies #1 and #2 used the same sample. ** Study #11 includes an adversity and a non-adversity sample, both subject to the same analyses. Ts = number of assessment time points; Freq. = time between assessments; Analysis = method used to derive PTG; Perc. PTG = measure of perceived PTG included in this study; *n* = sample size used for analysis; Age (SD) = age of sample, standard deviation in brackets if provided; F% = percentage of female participants; Adversity = potentially traumatic event (PTE) and used checklist if reported.

In the next sections, each study is referred to by its associated number provided in Table 2.2. Studies #1 and #2 used the same sample. The findings are discussed in greater detail to answer 1) which questions and objectives were addressed by studies which utilised current-standing PTG measures and 2) which study designs, analysis methods, and sample characteristics these studies employed.

2.2.3.1 Research questions and objectives

Studies including a current-standing measure have mostly been focusing on methodological discussions about the relationship between perceived PTG and actual PTG. In Table 2.2, study aims are differentiated between analytic (e.g., correlation between PTGI and C-PTGI), evaluative (e.g., evaluation of PTG intervention), and descriptive aims (e.g., exploration of who perceives PTG). Eight studies (#1, #2, #3, #6, #7, #9, #10, #11) explored the relationship between veridical and perceived PTG. This includes the association between veridical and perceived PTG in different conditions and their potential moderator variables. For example, study #11 focused on the variability of state (short term) well-being between and within individuals, and examined whether this construct is distinct from state affect and how it is associated with perceived PTG. The two Randomized Control Trials (RCTs; studies #4, #5) combined a traditional and current-standing measure of PTG to get a broader picture of the effectiveness of their examined PTG intervention by analysing its impact on both veridical and perceived PTG. In study #12, the Daily State PTG measure was used to analyse whether short-term changes in state PTG mediate the relationship between negative life events and changes in eudaimonic well-being.

2.2.3.2 Research design and analysis method

Seven studies (studies #1-7) used the C-PTGI. The other measures have been used once each. Notably, all but two studies (studies #8 and #12) also included a traditional measure of perceived PTG. Eight studies included only two assessment

time points, which allowed the calculation of change scores to quantify the changes in current-standing PTG from T1 to T2. In seven of them, simple pre-post change scores were calculated; one study (study #9) used Latent Difference Scores. In the two RCTs (studies #4 and #5) assessing the effectiveness of writing interventions to facilitate PTG, the C-PTGI was filled out five times in total, including a pre- and a post-test before and after the intervention and three assessments during the intervention.

The RCTs used Hierarchical Linear Modelling to assess changes in C-PTGI over time. The two studies using state PTG measures had a higher number and frequency of assessments and subsequently utilised different data analysis methods. Individuals were assessed up to five times a day for nine consecutive days in the ESM study (study #11), and both the mean of state PTG as well as the variance of state PTG (while controlling for its mean) were examined as correlates of perceived PTG. Assessments with the Daily State PTG (study #12) were taken once per week, up to 45 times over the course of a year. Trajectories of changes were then identified using latent growth curve modelling. The time between assessments varied across studies and mostly ranged between one week and three months. The time between assessments was exceptionally long for the C-PTGI-SF (study #8) with three years, and exceptionally short for the State PTG for ESM measure (study #11) with three hours.

2.2.3.3 Sample characteristics

Seven studies (#1, #2, #3, #6, #7, #10, and #11) have been conducted on undergraduate student samples from the US in their early 20s. Adults 18 years or older were recruited using an opportunity sampling approach (studies #4 and #5) and via a paid online recruitment service (study #12). Most samples were predominantly female (up to 85% in a student sample). The C-PTGI-C (study #9) was used to study Japanese middle-school students transitioning into high-school. Overall, the sample sizes were relatively small, and nine studies included only between 57 (combining

both sub samples of study #11) and 262 participants. The largest sample was described in study #8, which used the C-PTGI-SF to assesses PTG in mostly male individuals after military deployment (*n* = 8732, 79% male; no age information reported). The smallest sample was used in the ESM study (#11), which examined two sub samples of 22 and 35 individuals. However, the small sample size needs to be interpreted in the context that individuals in the ESM study responded to multiple prompts a day at specific time for 9 days and provided up to 45 data points each.

In contrast to measures of perceived PTG, current-standing PTG measures are not referring to a specific event which PTG is directly attributed to (note that the relationship items of the State PTG for ESM measure are only provided if the participant reported a recent social interaction, to which these items are then referencing). Nonetheless, different experiences may lead to different responses, and 'seismic events' are by definition required for posttraumatic growth to emerge (see Section 1.1.1, p. 2). Thus (and because most studies included a measure for perceived PTG), nine studies were designed to include a significant event during the study period (i.e., after the first and before the last assessment). The forms of events examined varied. Three studies (#6, #8, and #9) aimed at specific events or episodes (romantic breakup, combat deployment, school transfer). Four studies (#1, #2, #7, and #12) used event checklists during the study. In two studies (#3 and #10), individuals were asked for their "most stressful event" they experienced during the study. Three studies (#4, #5, and #11) assessed for significant life events in the months or years before the study.

2.3 Discussion

This scoping review was conducted to examine which current-standing PTG measures have been used in published studies, what research questions and objectives were investigated with them, and which research designs and sample characteristics were used in the process. The results inform the choice of measure

and research design for the examination of the relationship between trait resilience and veridical PTG (see Section 1.4). The reviewed current-standing measures, the objectives of studies using them, and the research designs in which they were used are now discussed.

2.3.1 Reviewed current-standing PTG measures

The review and comparison of measures was not trivial because their items, rating scales, instructions, and development or adaptation processes have not always been published. Overall, the available information indicates that the ways in which current-standing PTG measures are used vary and no clear best practice has so far emerged.

Six current-standing measures of PTG measures were identified in this review, but only the C-PTGI has been used in more than one published study. All measures reviewed were originally developed for specific purposes (e.g., for the comparison of perceived and veridical PTG, for the application in ESM, or extra short scales for the inclusion in panel datasets) and were developed by making methodological adaptions to existing measures, all tracing back to the PTGI and its five dimensions. The C-PTGI and CAS are simply reframing the PTGI items, the C-PTGI-C uses current-standing wordings for the items of the PTGI-C, and the C-PTGI-SF includes the C-PTGI (current-standing) items for each of the 10 items included in the PTGI-SF, plus one additional item. The two state-PTG measures were designed along the five PTGI dimensions, but their items were more freely selected. The Daily State PTG items were taken from different non-PTG measures; the origin of items of the State PTG for ESM measure was not further specified and may have been newly developed.

The two state PTG measures stood out as they were the only ones addressing a specified time frame of one day or less. The term ‘current-standing’ is used liberally overall, and the assessed time frames strongly vary across measures;

the two state-PTG measures may be the only ones really addressing how individuals 'currently' feel. However, this quality comes with unique challenges. The State PTG for ESM measure was developed for multiple assessments a day and requires a reference point for the items of the relationship domain (i.e., a social interaction during the past 30 minutes) to be fully utilised. As individuals vary in their experiences throughout a day, such brief momentary snapshots may miss relevant processes that happened in moments not directly addressed, for example whether a person pursues new possibilities. The same issue applies to the Daily State PTG measure, although arguably to a lesser extent. Considering that most studies include only two time points (see Section 2.2.3.2), confounding variables like daily mood or the day of the week (e.g., one assessment on a Saturday, one on a Monday) might influence the responses more than changes associated with PTG. The state-measures may thus rely on a high number and frequency of assessments to be meaningfully utilised. Notably, neither the State PTG for ESM nor the Daily State PTG measure are described as 'current-standing' measures in their respective development studies and might not be intended for use beyond this specific context.

Although the other measures reviewed arguably follow a less literal interpretation of the label 'current-standing', they may be better suited to capture PTG in more spaced out (i.e., less frequent) assessments over time. In the seven studies using the C-PTGI, individuals evaluated their well-being based on the past two weeks. This time frame gives rare experiences a more realistic chance to occur, such as the identification of new opportunities which could be pursued. Relating items to the past few weeks might most realistically capture the idea of changed perspective and values while at the same time being brief enough to not be too much affected by memory biases. In comparison, the time frame referenced in the CAS ("current experience") is ill-defined so may be interpreted differently by different participants. Furthermore, the time frame reference of the C-PTGI-SF ("generally in

life") assesses current-standing PTG as more trait-like, which may limit variability in responses.

While all measures showed good internal consistency, one major factor in the usability of PTG measures is their dimensionality, as recent research suggest that people might only experience growth in some areas while they experience decline in others (Taku & McLarnon, 2018; Zieba et al., 2019). A current-standing measure reflecting the five dimensions of the retrospective PTGI – which all measures link to – allows findings of longitudinal studies to be contextualized in the existing literature more easily. While all measures are conceptually linked to the five PTGI dimensions, only the factor structures of the C-PTGI-SF, the Daily State PTG, and the State PTG for ESM have so far been validated. The first two indicated a unidimensional factor structure. The State PTG for ESM measure shows a 5-dimensional factor structure, but its use is limited to a specific methodology and research design. Interpreting the C-PTGI, C-PTGI-C, or CAS multidimensionally is not advisable without a proper examination of their factor structure. Furthermore, the measures using reworded PTGI items have not been updated since new items on spiritual change have been added to the retrospective PTGI (Tedeschi et al., 2017). Consequently, they assess this dimension with only two items. Scales with less than three items per factor are usually not recommended as they can lead to identification issues when analysed via structural equation modelling (SEM; Kenny et al., 1998).

2.3.2 Research questions and objectives

Current-standing measures have mainly been used to explore the association between veridical and perceived PTG. The first study using a current-standing approach (Frazier et al., 2009) indicated little association between the two constructs, supporting the theoretical notion that perceived and veridical PTG should be interpreted separately (Zoellner & Maercker, 2006). Six follow-up studies included in the review examined this initial finding in more detail, replicated the initial findings

(e.g., Boals et al., 2019; Owenz & Fowers, 2018) and investigated potential moderators (e.g., Gunty et al., 2011; Iimura & Taku, 2018; Johnson & Boals, 2015) and mediators (e.g., Yanez et al., 2011) of perceived and veridical PTG. Ten of the twelve studies reviewed assess both perceived and actual PTG.

The continued inclusion of a measure of perceived PTG may certainly be rooted in the research questions, but it may also indicate that the research community is still hesitant to assess PTG solely with the available current-standing measures. Two recently published studies provide an exception as they use short forms of current-standing PTG – possibly for economic reasons – for the inclusion in 1) a panel datasets of military service members (Jacobson et al., 2021) and 2) a weekly assessment of paid participants over the duration if one year (Jayawickreme, Blackie, et al., 2021). The two RCTs (Roepke, Benson, et al., 2018; Roepke, Tsukayama, et al., 2018) included both assessment forms as separate indicators for the evaluation of PTG interventions, allowing them to examine veridical and perceived PTG. These and the ESM study displayed various alternative use case for current-standing assessments beyond just the direct comparison of perceived and veridical PTG.

2.3.3 Research design and study samples

The study duration greatly varies across the reviewed studies but is generally short. This becomes particularly evident in the two RCT studies with five time points, which – despite their conceptually sophisticated design – ran for less than three months each. The three-year study by Jacobson and colleagues (2021) includes only two assessment time points, making it impossible to identify nonlinear changes over time. Only one study examined the trajectory of PTG repeatedly over a longer period of time (Jayawickreme, Blackie, et al., 2021), but this study was also limited to only one year in duration. This is a major issue because veridical PTG might emerge only after years (Mangelsdorf et al., 2019), and individuals might show complex

trajectories of well-being over time, including episodes of struggle (Tedeschi & Calhoun, 2004). The timeline of PTG is one of the major unresolved issues in the field, but although in principle all current-standing measures could be used to examine how PTG unfolds over time, this potential has not yet been sufficiently utilised.

As most studies were limited to two assessments, actual PTG has mostly been operationalised as simple difference scores in current-standing PTG before and after an adverse experience. Iimura and Taku (2018) alternatively used latent difference scores (McArdle & Nesselroade, 1994) in their study. Studies with more than two assessments per person used a broader range of methods, including hierarchical linear modelling (Roepke, Benson, et al., 2018; Roepke, Tsukayama, et al., 2018), linear growth curve modelling (Jayawickreme, Blackie, et al., 2021), and correlations of means and variances (Blackie et al., 2017). Future study designs may therefore generally benefit from longer durations and more assessment time points.

Most studies were conducted on samples of less than 200 individuals. The samples comprised of mostly female undergraduate students or the general population in the US. Such WEIRD samples (i.e., drawn from western, educated, industrialised, rich and democratic populations; Henrich et al., 2010) provide limited generalisability across different populations. Only two studies were aimed at more specific samples: Japanese students and US military service members. Furthermore, most studies used trauma checklists or asked for '*the most stressful events*' to identify whether an individual experienced adversity, instead of exploring specific events. The use of easily accessible student samples and broad interpretation of adversity reflects that research with current-standing measures is still at an early stage. It also highlights the difficulties of identifying and accessing samples in which PTG may occur within a specific time frame, so prospective studies will require major resources.

2.3.4 Strength and limitations of the review

The first strength of this study is that it is the first to provide an overview of the available current-standing PTG measures, including the purpose for which each measure has been developed and the empirical literature which examined veridical PTG longitudinally using these measures. The second strength is the inclusion of expert consultation, which enhanced the sensitivity of the review. The third strength is that this review identified a clear knowledge gap in the field, specifically the lack of a well-validated multidimensional measure which can be used in a general longitudinal context.

Limitations include that studies using proxy constructs for the assessment of PTG, such as self-efficacy or satisfaction of life (Mangelsdorf et al., 2019), were not included. Thus, only a few studies were included in this review, and methodological implications and findings in other studies which explore PTG longitudinally were not considered. While this was in line with the research aim to identify dedicated current-standing PTG measures, a future systematic review could expand to also include alternative constructs and measures used to examine veridical PTG (e.g., Mangelsdorf et al., 2019). Furthermore, most measures and articles were identified via forward citation tracking of two studies. Two measures were identified through expert consultation after the database and citation tracking searches were completed. While the expert consultation made the review more robust, this also indicated that the search terms were not sufficiently sensitive. Consequently, other current-standing measures might have been overlooked and the search terms did not include all identified current-standing PTG measures. Considering the novelty of the trait-state differentiation in PTG assessment (Blackie et al., 2017; Infurna & Jayawickreme, 2019), it is unlikely that adding the search term “state PTG” would have identified more studies at the time this review was conducted. Regardless, a systematic review could be expanded in this direction.

2.3.5 Conclusions

Despite calls for more longitudinal research on PTG (Boals, Jayawickreme, et al., 2022; Infurna & Jayawickreme, 2019), current-standing measures have not frequently been used. The reviewed measures have mostly been designed to examine the relationship between perceptions and actual pre-post changes in PTG dimensions, and research has yet to be extended to examine PTG trajectories (and their predictors) thoroughly. One reason for this could be the lack of awareness about the differences between perceived and veridical PTG in the wider research community. For although these differences are empirically supported – as the studies discussed in this review showed repeatedly – PTG is still often understood as synonymous with perceptions of PTG. According to a recent systematic review (Boals, Jayawickreme, et al., 2022), the term 'perceived' was used in less than one third of their analysed PTG studies, and 82% of PTG studies made no mention of the differentiation at all.

This review identified conceptual and psychometric issues in existing current-standing measures which are another likely reason for their little use. State PTG measures shows limited useability in monthly or less frequent longitudinal assessments, which makes sufficiently long studies very expensive. Few measures were made publicly available or were thoroughly validated. Unidimensional measures (such as the C-PTGI-SF) are not the best choice for many research questions, as PTG is conceptualized as a multidimensional construct. Most importantly, none of the reviewed measures made use of the wealth of existing PTG items beyond the original 21 items included in the PTGI. The PTGI is not all-comprehensive, even if recently additions (Tedeschi et al., 2017) were added to existing current-standing measures (which they are not). The limitation to the original 21 PTGI items may be justified in the case of the C-PTGI, which was initially only developed to compare veridical and perceived PTG down to item level. To assess multidimensional veridical

PTG for other research questions – such as the relationship between trait resilience and veridical PTG – the comprehensive coverage of each dimension is more important, and current-standing items should ideally be sourced from a more diverse range of options. Other retrospective PTG measures such as the SRGS (Park et al., 1996) assess PTG with different items identified in qualitative research. Adapting items from a broader range of PTG items may provide a more comprehensive coverage of some dimensions.

In conclusion, none of the identified current-standing measures allows for a thoroughly validated comprehensive multidimensional assessment of PTG as required for the assessment of the relationship between trait resilience and veridical PTG. While smaller issues could possibly be addressed (e.g., validating the C-PTGI factor structure), greater shortcomings like the limited range of items leave reasonable doubt that any of the reviewed measures could be easily improved to suffice as a broad and universally applicable measure of current-standing PTG. To satisfy the need for such a measure, the development of a new current-standing measure will be described in Chapter 3 and its validation in Chapter 4.

Chapter 3 Development of the PRAISE Scale

The present study describes the development process for a new comprehensive and multidimensional current-standing measure of PTG. Instead of retrospective perceptions of PTG, a current-standing measure assesses current levels of characteristics that are subject to change in individuals who experience PTG. The Possibilities, Relationships, Appreciation of Life, Strength, and Existence (PRAISE) scale aims to incorporate the methodological advancements learned from research using the C-PTGI (Frazier et al., 2009) and ensure that the multidimensionality of PTG is maintained. To ensure compatibility with the existing retrospective PTG literature, the PRAISE scale is designed to reflect the same dimensions as the PTGI (Tedeschi & Calhoun, 1996). However, the PRAISE scale includes adapted items sourced from a broad range of validated PTG measures to allow for a more comprehensive coverage of each dimension. This approach utilises the extensive work of researchers who identified suitable but retrospectively worded PTG items and ensures that the concept of items across measures was maintained in the PRAISE scale. The development process of the PRAISE scale reported in Chapter 3 is followed by a psychometric validation described in Chapter 4.

3.1 Initial development of the PRAISE alpha

The PRAISE scale was designed to comprehensively assess the current-standing level of the five most commonly described dimensions of PTG (Tedeschi et al., 2017; Tedeschi & Calhoun, 2004). As the PRAISE scale does not intend to challenge the theory of PTG but rather aims to broaden its assessment within the existing theory, a deductive theory-driven approach to the selection of items was used when developing the initial version – the PRAISE alpha – by selecting items from different existing PTG measures to capture the theoretical breadth of each dimension (Section 3.1.1). This approach makes use of the extensive qualitative and quantitative research used to create existing items and their subsequent

psychometric and conceptual examination. After the items were selected, they were reworded (Section 3.1.2) from a retrospective focus (assessing perceived changes since the event) to capturing each construct in a more recent time frame (assessing their current-standing level within the recent weeks). After finalising the PRAISE alpha, a confirmatory factor analysis (CFA) on a cross-sectional dataset was conducted to examine whether the factor structure holds empirically (Section 3.2). Informed by the findings, small changes were made to the measure (Section 3.3). The final PRAISE scale was then subjected to a more thorough validation analysis, described in Chapter 4.

3.1.1 Item selection process

First, an item bank was created by drawing from the existing retrospective self-report PTG measures. A literature search for self-report measures of posttraumatic growth and synonymous concepts like stress-related and adversarial growth was conducted in November 2019. Of 24 identified measures, 16 measures were fully, and two measures were partially excluded (Table 3.1). Measures were excluded if PTG was measured in children and adolescents, in response to specific experiences (e.g., cancer), assessed negative changes (i.e., posttraumatic depreciation), or mechanisms that facilitate PTG (e.g., deliberate rumination). Furthermore, revised short-form versions of measures and revisions which used only reworded items (i.e., most current-standing versions of the PTGI) were excluded as they did not contain any new items.

Table 3.1

Excluded Posttraumatic Growth Measures

Criteria	Excluded Measure	Development Study	Items
Children, Adolescents	Benefit Finding Scale – Child Version	(Phipps et al., 2007)	10
	Stress-Related Growth Scale – Adolescents	(Vaughn et al., 2009)	19
	Post-Traumatic Growth Inventory – Child Version Revisited	(Kilmer et al., 2009)	10
Specific Population	Benefit Finding Scale #1 – Multiple Sclerosis	(Mohr et al., 1999)	19
	Benefit Finding Scale #2 – Breast Cancer	(Antoni et al., 2001)	17
	Benefit Finding Scale #3 – Breast Cancer	(Tomich & Helgeson, 2004)	20
Negative Change	Changes in Outlook Questionnaire – Negative Change dimension*	(Joseph et al., 1993)	15 of 26
	Perceived Benefits Scale – distractor items*	(McMillen & Fisher, 1998)	8 of 38
	Posttraumatic Depreciation	(Baker et al., 2008)	21
Process	Doors Opening Questionnaire	(Roepke & Seligman, 2015)	6
	State PTG for Experience Sampling Methodology	(Blackie et al., 2017)	17
Short Forms	Changes in Outlook Questionnaire – Short	(Joseph, 2009)	10
	Post-Traumatic Growth Inventory – Short Form	(Cann et al., 2010)	10
	Stress-Related Growth Scale – Short Form	(Cohen et al., 1998)	15
Reworded	Current Attributes Scale	(Yanez et al., 2011)	25
	Current-Standing Post-Traumatic Growth Inventory	(Frazier et al., 2009)	21
	Current-Standing Post-Traumatic Growth Inventory – Children	(Iimura & Taku, 2018)	10
	Current-Standing Post-Traumatic Growth Inventory – Short Form	(Kaur et al., 2017)	11

Note. * Items on positive changes were still included.

This leaves 190 items of eight different PTG measures to be included in the pool of items, as shown in Table 3.2. Two of the eight measures were only partially included, as some of their items focused on negative changes.

Table 3.2

Included Posttraumatic Growth Measures

Included Posttraumatic Growth Measures	Development Study	Items
Changes in Outlook Questionnaire – Positive Change *	(Joseph et al., 1993)	11 of 26
Perceived Benefits Scale – without distractor items *	(McMillen & Fisher, 1998)	30 of 38
Post-Traumatic Growth Inventory	(Tedeschi & Calhoun, 1996)	21
Post-Traumatic Growth Inventory – Revised	(Tedeschi et al., 2017)	25
Psychological Well-Being – Post-Traumatic Change Questionnaire	(Joseph et al., 2012)	18
Stress-Related Growth Scale	(Park et al., 1996)	50
Stress-Related Growth Scale – Revised	(Boals & Schuler, 2018)	15
Thriving Scale	(Abraído-Lanza et al., 1998)	20

Note. * Items on negative changes were excluded.

After creating the initial pool of 190 items, the author allocated the items to one of the five PTG dimensions outlined by Tedeschi and Calhoun (2004), using the definitions described in Table 1.1 (p.11). Although the dimensions captured by each measure differed both in theory and practice – some captured unidimensional PTG, others differed between up to seven dimensions – most items across measures could be conceptually allocated to one of these five dimensions. Notably, some measures used the same or very similar items (e.g., SRGS: “I learned that I was stronger than I thought I was”, TS: “I learned that I am stronger than I thought I was”). These duplicates were removed from the item pool at this stage, resulting in 145 unique items (Appendix 2) to be included in the item bank. Table 3.3 shows how many items of each measure were associated with which PRAISE dimension.

Table 3.3

PTGI Dimensions Addressed by the Items of Included PTG Measures

Scale	Possibilities	Relationships	Appreciation of Life	Strength	Existence	None / Unclear	Total
CIOQ*	1	4	4	1	1	0	11
PBS*	0	15	4	6	3	2	30
PTGI	5	7	3	4	2	0	21
PTGI-X	0 (5)	0 (7)	0 (4)	0 (3)	4 (6)	0	4 (25)
PWB-PTCQ	2	3	4	5	3	1	18
SRGS	6	13	12	8	4 (5)	6	49 (50)
SRGS-R	0 (3)	2 (6)	0 (1)	0 (4)	0 (1)	0	2 (15)
TS	0	4 (6)	1 (5)	3 (5)	2 (3)	0 (1)	10 (20)
Total	14 (22)	48 (61)	28 (37)	27 (36)	19 (24)	9 (10)	145 (190)

Note. Some items are used in multiple measures. Items used in multiple scales are only listed in the first scale which used it. Numbers in brackets show the total numbers of items, including those used in other PTG measures. *Excluding negative and distractor items.

It became apparent that measures differ in the extent to which they address some dimensions. For example, the Possibilities dimension received much less attention across all measures compared to the relationships dimension. In case of the PBS, not a single item is dedicated to the Possibilities dimension but 15 of its 30 items address perceived changes associated with relationships. Such an imbalance in conceptual coverage could exaggerate or undermine domain-specific PTG and introduces significant methodological limitations to studies.

The next step of the item selection process was carried out collaboratively by the author and a second researcher who conducts research into PTG as their primary area of expertise. For each PTG dimension, each researcher selected up to six items to represent Tedeschi and Calhoun's theoretical definitions of the five PTG dimensions (Table 1.1) broadly and comprehensively. Efforts were made to ensure that each item added new conceptual content, was meaningfully related to the broader PTG dimension and other items, and at the same time represented a unique expression of that PTG dimension. While there were some disagreements in the selection process, the final list was based on discussions about these items. The limit of six items per dimension was chosen to balance comprehensiveness and parsimony: The number of 30 items was not to be exceeded in total, and including more than the minimum recommended number of three indicators per construct (Kenny et al., 1998) allows items to be excluded during the scale development process if needed. Twenty-nine items were selected, with the Existence domain consisting of only five items due to the high similarity of items across measures (Appendix 2).

3.1.2 Rewording to current-standing items

After the selection process, the items were reframed (Appendix 3) to a current-standing wording following the example of the C-PTGI scale to reduce the influence of retrospective bias (Frazier et al., 2009). Current-standing items ask

individuals to report how much they “enact each domain of PTG in their daily lives” (Blackie et al., 2017, p. 31). As discussed in Section 2.3.1, the term ‘current-standing’ has been used rather liberally in the PTG assessment literature and also includes measures which assess the thoughts and feelings of the past few weeks. This allows participants to respond to items which assess experiences that may happen less frequently, such as rethinking priorities, following new paths in life, or embracing new opportunities. In the PRAISE alpha, participants were thus asked to think about the past four weeks when responding to the items, using the instruction: “Think about how you have felt in the past four weeks. Please indicate the degree to which each of the following statements applies to you”. Following the empirical examination of the PRAISE alpha factor structure (Section 3.2), this time period was changed to two weeks in the final PRAISE scale. As for most current-standing measures, the PRAISE items are therefore still retrospective. However, the reference time frame of each item corresponds to the brief time before the measurement point, decreasing the cognitive work that traditional retrospective measures such as the PTGI require when asking for perceived changes since the event happened (see Section 1.1.3.2).

To preserve the construct of each selected item, some items were slightly altered. This mostly affected the Possibilities dimension, particularly items 7 (“New opportunities are available which wouldn’t have been otherwise” was changed into “I have made the most of new opportunities”) and 12 (“I established a new path for my life” was changed into “I have followed new paths in my life”). These items addressed dynamic circumstances, while most items rather assess the improvement of already existing qualities. Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores are created by summing up the response values of each item in one dimension.

3.2 Empirical Factor Structure of the PRAISE alpha

Following its initial development, the factor structure of the PRAISE alpha was assessed empirically. As the development of the measure was driven by theory with a 5-factor model in mind, a confirmatory factor analysis (CFA) was used. The results were used to adjust the initial measure, taking modification indices and other psychometric information such as the internal consistency into account. The final version of the PRAISE scale will be psychometrically validated on a new sample in Chapter 4.

3.2.1 Methods

Current-standing measures assess PTG by comparing changes in psychological functioning over time. The items do not intend to reflect qualities that only emerge in times of adversity, but base levels of these qualities may be enhanced in some individuals following highly stressful experiences. In contrast to retrospective measures of PTG, this baseline assessment does not require a highly stressful event as reference. Considering that Blackie and colleagues (2017) identified the same factor structure of their state PTG measure in an adversity and a non-adversity group, the factor structure of the PRAISE alpha was assessed on a cross-sectional sample of non-traumatized individuals, as it should hold regardless of adversity status.

3.2.1.1 Ethics

At the beginning of the survey, participants were provided with an information sheet which reminded them of the voluntary nature of this study, their ability to withdraw from the study, and the use of their data for research purposes only. Furthermore, they were informed that they “will be asked to complete a brief questionnaire on how [their] experiences in life have shaped how [they] feel and view the world and some demographical questions”. Participants provided informed consent before being forwarded to the measures included in the study. For the

unexpected case that participants felt distress after completing the survey, participants were provided with the contact information of various UK-based mental health organisations and helplines at the end of the survey. This study received ethical approval from the research ethics board of the University of Nottingham (REF: S1252).

3.2.1.2 Participants and procedure

The validation sample of the PRAISE alpha included 569 individuals (49.9% female) between 18 and 60 years old (M = 38.56, SD = 12.02), with a UK nationality and residing in the UK. The sample mainly identified as White British (85.2%) or White European (3.5%), Black (3%, including Black Caribbean, Black African, and Other Black), and Indian (2.5%). The sample was collected on the 25.03.2020 through the online service Prolific (https://prolific.co), which enables researchers to post online studies and collect data from people that are signed up to do research studies in return for payment (Palan & Schitter, 2018). Participants were paid an average hourly wage above £7.50 after survey completion.

3.2.1.3 Measures

PRAISE alpha. The 29-item PRAISE alpha is a self-report measure which assesses the current state of five dimensions of positive functioning across the past four weeks: Possibilities, Relationships, Appreciation of Life, Strength, and Existence. Each item is rated on a scale from 1 (strongly disagree) to 5 (strongly agree).

3.2.1.4 Analytical approach

The data analysis was conducted using STATA 17 (StataCorp, 2021). The aims of this analysis were to identify whether the theoretical multidimensionality holds in an empirical sample and to detect any psychometric issues caused by specific items which could be excluded. First, a CFA using maximum likelihood estimation (Distefano, 2002) was used to test the factor structure of the PRAISE alpha. To account for non-normality, Satorra–Bentler scaled chi-squared statistics (Satorra & Bentler, 1994) were used to calculate related fit indices and the robust comparative fit

index (CFI), robust Tucker-Lewis index (TLI), and robust root mean square error of approximation (RMSEA) are reported. To assess the factor structure, CFI and TLI values > .90 (Bentler, 1990), RMSEA values < .08 (Browne & Cudeck, 1993), and standardized root mean square residual (SRMR) values < .06 (Hu & Bentler, 1998) were used to indicate adequate fit; an improved model is characterised by a change in CFI greater than .01 (Cheung & Rensvold, 2002). As it is important to demonstrate the incremental value of proposed CFA models (Barrett, 2007), three different models that could be expected based on the findings in other PTG measures were compared: 1) a unidimensional model, 2) an uncorrelated 5-factor model as originally described for the PTGI (Tedeschi & Calhoun, 1996), and 3) a correlated 5-factor model as found in the PTGI in a more recent study (Taku et al., 2008). Furthermore, modification indices were analysed to detect sources of potential misfit in the model. Any adjustments to the measure would be further informed by the internal consistency of each dimension, the item-rest correlation of each item (the correlation between an item and the total score of its dimension excluding itself), and the conceptual importance of each item.

3.2.2 Results

Both the Bartlett's test of sphericity ($\chi^2(406) = 6211.141$, $p<.001$) and Kaiser-Meyer-Olkin test (KMO = .906) demonstrated adequacy of the data for factor analysis. Significant skewness and kurtosis were found in each item but were not a problem due to the use of robust (Satorra–Bentler adjusted) error terms.

The CFA showed the best fit indices for the correlated five-factor structure (Table 3.4). However, the CFI and TLI were low and indicated poor fit. Thus, the factor loadings of the 29 items along with their modification indices were reviewed. Three items were problematic in the PRAISE alpha, as they showed factor loadings below .30: the Possibilities item "I have rethought how I want to live my life" and the two Appreciation of Life items "I have changed my priorities about what is important

in life" and "I have placed low emphasis on material things". The first two items were conceptually very similar, and their error terms were highly correlated (modification indices of > 100) despite being sorted in different dimensions. The item on changed priorities also showed the lowest item-rest correlation of r = .17 and its exclusion would lead to an improved internal consistency of the Appreciation of Life dimension, which was the lowest with α = .63 (ω = .65).

Table 3.4

Confirmatory Factor Analysis and Psychometric Properties of the PRAISE alpha (n = 569)

Model		SBχ²	df	CFI	TLI	RMSEA	SRMR
A:	Unidimensional [a]	1949	377	.678	.654	.086	.083
B:	5 uncorrelated dimensions [b]	2658	377	.533	.498	.103	.234
C:	5 correlated dimensions [c]	1526	367	.763	.738	.075	.075
#	Item	*M*	*SD*	Factor Loading	Item-rest cor.	α (if deleted)	ω (if deleted)
Factor 1: Possibilities		**19.56**	**3.91**			**.71**	**.72**
26	Motivated to accomplish a lot	3.31	1.02	.71	.50	(.66)	(.67)
7	Made most of new opportunities	3.37	0.99	.72	.47	(.67)	(.68)
12	Followed new paths in my life	2.82	1.05	.47	.53	(.65)	(.67)
17	Open to new information / ideas	3.98	0.76	.56	.42	(.69)	(.70)
2	Developed new interests	2.98	1.11	.43	.51	(.66)	(.67)
21	Rethought how to live my life	3.08	1.11	.24	.29	(.73)	(.73)
Factor 2: Relationships		**23.69**	**3.60**			**.79**	**.80**
6	Compassionate towards others	4.06	0.77	.73	.61	(.74)	(.75)
25	Been nice to others	4.20	0.70	.67	.56	(.75)	(.76)
20	Great sense of closeness	3.45	1.10	.57	.50	(.77)	(.79)
11	Valued other people highly	3.94	0.82	.65	.57	(.75)	(.76)
16	People care about me	4.03	0.94	.57	.54	(.75)	(.78)
1	Understanding and tolerant	4.01	0.77	.63	.50	(.76)	(.77)
Factor 3: Appreciation of Life		**20.87**	**3.56**			**.63**	**.65**
5	Appreciate each day	3.50	1.01	.73	.52	(.52)	(.53)
24	Approach life calmly	3.55	0.94	.58	.35	(.59)	(.60)
15	Live for the moment	3.17	1.04	.64	.50	(.52)	(.54)
10	Not taken things for granted	3.65	0.91	.41	.38	(.58)	(.61)
28	Low emphasis on material things	3.52	1.01	.26	.27	(.62)	(.65)

	Changed priorities about life	3.48	1.10	.23	.17	(.66)	(.67)
Factor 4: Strength		**21.54**	**4.21**			**.81**	**.81**
8	Confident in myself	3.29	1.12	.77	.66	(.76)	(.76)
27	Thought of myself as strong	3.54	1.04	.74	.66	(.76)	(.76)
18	Worked / did not just give up	3.94	0.81	.62	.53	(.79)	(.79)
13	Able to deal with uncertainty	3.60	1.00	.62	.57	(.78)	(.79)
3	Accept the way things work out	3.71	0.90	.61	.55	(.79)	(.79)
22	Feeling of self-reliance	3.47	0.98	.53	.46	(.81)	(.81)
Factor 5: Existence		**14.91**	**3.77**			**.69**	**.69**
4	My life has meaning	3.35	1.10	.68	.45	(.63)	(.64)
14	Sense of harmony with the world	2.71	1.10	.58	.45	(.63)	(.64)
19	There is a reason for everything	3.22	1.19	.56	.53	(.59)	(.60)
9	Face questions about life / death	3.48	1.04	.47	.34	(.68)	(.68)
23	Spiritual / connected to higher	2.14	1.24	.41	.43	(.64)	(.64)

Note. Items are abbreviated. For better comparison, the item numbers (#) are provided in the order used in the final PRAISE scale. Factor loadings are displayed for model C. The item-rest correlations, Cronbach α if item deleted, and McDonald's ω if item deleted are displayed in reference to the item's dimension. SBχ^2 = Satorra-Bentler chi-squared test; CFI = robust comparative fit index; TLI = robust Tucker-Lewis index; RMSEA = robust root-mean-square error of approximation; SRMR = standardized root mean square residual. [a] Each item loaded on a general PTG factor. [b] Each item loaded on one of the five uncorrelated dimensions. [c] The five dimensions were allowed to correlate with each other.

3.3 Discussion

This study described the development process of a new current-standing measure of PTG which comprehensively assesses the five conceptual dimensions of PTG described by Tedeschi and Calhoun (2004). Twenty-nine items were sourced from different validated retrospective PTG measures to capture each dimension broadly and comprehensively. Although the dimensionality of each measure varied, most items conceptually mapped on one of the five proposed dimensions. Each item was then reworded into a current-standing version as described by Frazier and colleagues (2009). Finally, the psychometric properties and factor structure of the 29 items were assessed in a general population of UK citizens to inform necessary

adjustments to the measure before its final version will be thoroughly psychometrically validated in Chapter 4.

3.3.1 Adjustments following the first empirical analysis

The PRAISE alpha showed the best factor fit for the hypothesized correlated 5-factor structure, although the fit indices (especially the TLI and CFI) indicated poor model fit. Further inspection on item level revealed that three items showed particularly low item loadings and correlations with other items in their dimension, which could explain the low model fit. The Appreciation of Life item “I have changed my priorities about what is important in life” showed the lowest factor loading of .23 and correlated so little with its dimension that it decreased its internal consistency. The item also was conceptually very similar to the Possibilities item “I have rethought how I want to live my life”, with highly correlated error terms. Revisiting the definition of each dimension, the item “I have changed my priorities about what is important in life” did not fit optimally to the Appreciation of Life dimension. As the construct of re-negotiating one’s direction was considered to be sufficiently covered in the Possibilities domain, this item was subsequently excluded from the survey. The other two low performing items were not excluded as they were conceptually sound and provided a unique expression of their associated PTG dimension.

In addition to excluding one item, the time frame addressed in the instruction text was changed to two weeks: “Think about how you have felt in the past two weeks. Please indicate the degree to which each of the following statements applies to you”. The excluded item was one of the main reasons for the large time window of four weeks and considering that a substantial number of individuals have indicated high agreement with items describing experiences which might happen less often, a two-week window like in the C-PTGI was adapted to further lower the cognitive load to answer each item and allow for shorter assessment intervals. The final measure which includes the changes described above is referred to as the PRAISE scale.

3.3.2 General discussion of the PRAISE Scale

A significant improvement over existing current-standing PTG measures is the PRAISE scale's ability to assess PTG multidimensionally. The measure was designed along a widely accepted five-dimensional model which has been used in most empirical PTG studies. This allows an easy integration of findings within the existing literature and a longitudinal assessment of veridical PTG with the PRAISE scale could be easily combined with a cross-sectional assessment of perceived PTG using a multidimensional traditional measure such as the PTGI. As discussed in Chapter 2, the multidimensional interpretation of available current-standing PTG measures is limited, either due to their unidimensional factor structure or limited validation. In recent years, researchers interested in specific dimensions have thus used non-PTG measures and subscales (e.g., Infurna et al., 2021; Lee et al., 2022) that rarely assess PTG as it was initially theorised. The PRAISE scale was developed to address this problem.

It is worth noting that, like the C-PTGI (Frazier et al., 2009), the PRAISE scale also still uses a retrospective timeframe, albeit much shorter. The PRAISE scale is therefore still a retrospective self-report measure of well-being, as participants have to respond in reference to the prior two weeks. PTG measures which focus on just the day or hour – referred to as state-PTG measures in Chapter 2 – may reduce retrospective bias better. However, these come with different challenge and study design requirements, such as high assessment frequencies and the use of specific methodologies (Section 2.2.3.2; Blackie et al., 2017). Some PTG dimensions may not be suitable to such frequent and repeated daily measurement. For example, individuals who have identified new possibilities in their lives are not necessarily going to be considering or pursuing these at such regular intervals during the day. Thus, assessing PTG with a longer timeframe over two weeks might be more suitable to capture this dimension, while staying true to the original conceptualisation

of this dimension. The PRAISE scale's assessment focus on two weeks may therefore be a good compromise between easiness of use, participant burden, conceptual accuracy and vulnerability to retrospective bias. However, its self-report character may still leave space for influences by cultural expectations and personal motivations to score high or low on well-being.

Traditional measures usually refer to perceived changes associated with a specific event. For example, the PTGI instructs individuals to "Indicate for each of the statements below the degree to which this change occurred in your life as a result of your crisis" (Tedeschi & Calhoun, 1996). The PRAISE Scale – in line with other current-standing measures - assesses overall well-being in each dimension without asking individuals to attribute the fluctuations they may experience. While an individual's ability to attribute changes might not be accurate in the first place (Boals, Griffith, et al., 2022), this means that the PRAISE scale technically measures general changes in each PTG dimension which may have occurred due to non-adversity related experiences and processes.

Finally, ceiling effects might be observed in individuals who scored extremely high or low levels on the PRAISE scale, and positive changes may not be identifiable in individuals with extremely high baseline well-being. Due to this design choice, PTG as pre-post-adversity change will thus likely only show in individuals with particularly low post-adversity scores. Individuals with very high baseline well-being – who might be overall better equipped with coping strategies – might show stability at best.

3.3.3 Strengths and limitations

The development process of the PRAISE scale has several strengths. First, the process was motivated by the knowledge gap identified in Chapter 2. This helped to make design decisions such as the item framing and dimensionality. Second, the PRAISE items were sourced and adapted from published measures which were developed using rigorous qualitative and quantitative research. The selection of items

to create brief but comprehensive subscales was further strengthened by the involvement of a second researcher. Third, the development process was conceptually rather than psychometrically guided. While adjustments to the PRAISE alpha were made following the initial analysis of the factor structure, these adjustments were conceptually justifiable and not solely made to produce favourable psychometric results. A purely psychometrically informed item selection processes would likely have led to the inclusion of items more similar to each other within dimensions, limiting the conceptual breadth.

A few limitations of this development study can be identified. First, the development process was finished before the brief Daily State PTG measure (Section 2.2.2.6; Jayawickreme et al., 2021) was published and could be considered for inclusion. This measure assesses veridical PTG using conceptually relevant items from non-PTG measures, demonstrating that suitable items do not necessarily have to originate from perceived PTG measures. Other items might be similarly or even better suited to assess veridical PTG than items from perceived PTG measures. This is reflected in the difficulty to reframe some of the items, for example whether someone pursues new pathways in life or rethinks their world view. Second, the items of most existing current-standing measures were only published in abbreviated form and could therefore not be used as references in the rewording process. The rewording process was thus conducted following a brief description and few examples provided in the C-PTGI development paper (Frazier et al., 2009). Third, all items included in the PRAISE scale were originally developed based on research conducted in the USA. PTG measures – including the PRAISE scale – may thus have limited cross-cultural validity.

3.3.4 Conclusions

Chapter 3 described the development of the PRAISE scale, a current-standing measure designed to measure multidimensional veridical PTG. Participants

rate their current-standing levels of five PTG dimensions and respond to each of the 28 items in reference to their thoughts, feelings, and observations of the past two weeks. This approach is much less complex for participants compared to traditional assessments of perceived PTG and can be used to measure trajectories of PTG over time. Following the development and revision of the PRAISE scale in this chapter, a thorough validation process covering a range of psychometric properties including the factor structure, convergent validity, predictive validity, and test-retest-reliability will be carried out in Chapter 4 to assure that the new measure assesses multidimensional veridical PTG as intended. The low factor fit of the PRAISE alpha will be further considered in the evaluation process. Furthermore, model fit indices will be compared to those of other current-standing measures in Chapter 5.

Chapter 4 Validation of the PRAISE Scale

The 28-item PRAISE scale was developed to comprehensively measure the current-standing level of the five PTG dimensions described by Tedeschi and Calhoun (2004). Following the development process described in Chapter 3, this chapter reports the validation process of the PRAISE scale, including the assessment of its factor structure, the convergent validity of each dimension, the test-retest reliability after two weeks, and the predictive validity of the Relationships dimension.

4.1 Methods

The method and data analytic strategy was pre-registered on Open Science Framework (OSF) before data collection (https://osf.io/gkqba). The survey was hosted by Qualtrics, and data were stored in compliance with GDPR regulations.

4.1.1 Ethics

At the start of each survey, participants were provided with an information and debrief sheet (in case any participants felt distress after completing the survey) similar to the one described in Section 3.2.1.1 (p. 61). At time point one (T1), participants were informed that the survey "includes questions about your perspective and beliefs about the world, personal relationships, and general appreciation of life". It was further noted that a randomly selected group of participants will be invited for a follow-up survey two weeks later, for which they will be compensated separately. At time point two (T2), participants were informed that the survey includes questions "about your well-being, resilience, how you deal with stress, recent social behaviour and some questions aiming at recent stressful experiences". For each survey, participants provided informed consent before they could access any items. This study received ethical approval from the University of Nottingham School of Psychology research ethics board (REF: S1288).

4.1.2 Participants and procedure

Participants were recruited via the online service Prolific (https://prolific.co) in January 2021 and were surveyed at two time points (T1 and T2) two weeks apart. The sample consisted of a general population residing in the UK with a UK nationality.

At T1, 619 individuals between 18 and 60 years old took part. This subsample was used to examine the factor structure and convergent validity of the PRAISE scale. To investigate the test-retest reliability of the PRAISE scale and predictive validity of the Relationships dimension, 107 participants were re-invited at T2. Participants were paid an average hourly wage above £7.50 after each survey completion.

The T2 survey included an item asking whether participants had experienced significant adversity between T1 and T2 which may have affected their well-being (and with that, the test-retest reliability of the PRAISE scale). Thirteen individuals who indicated such an event were excluded, resulting in a sample size of 94 individuals for T2. An a-priori power analysis as outlined in the OSF registration (https://osf.io/gkqba) indicated that at least 92 participants were needed to identify a medium effect size for the predictive validity when using the five dimensions of PTG as predictors. After further consideration it was decided that it was not necessary to control for all the PTG dimensions because only the predictive validity within the *Relationships* domain was examined. A post-hoc power analysis using G*Power (Erdfelder et al., 2009) indicated that a small-to-medium effect size (f^2>.09) could be detected under these circumstances (α = .05; β = .80).

Detailed demographic characteristics of the two subsamples are shown in Table 4.1.

Table 4.1

Demographic characteristics of T1 and T2 PRAISE validation participants

Demographics	T1		T2	
	n	%	*n*	%
Sample size	619		94	
Sex				
Female	312	50.4%	55	58.5%
Male	307	49.6%	39	41.5%
Prefer not to say / NA	0	0.0%	0	0.0%
Ethnicity				
White British	517	83.5%	81	86.2%
White European	12	1.9%	4	4.3%
Black African	13	2.1%	2	2.1%
Black Caribbean	12	1.9%	1	1.1%
Other Black	0	0.0%	0	0.0%
Indian	11	1.8%	1	1.1%
Pakistani	8	1.3%	1	1.1%
Bangladeshi	7	1.1%	0	0.0%
Chinese	7	1.1%	1	1.1%
Other Asian	4	0.6%	0	0.0%
Arab	0	0.0%	0	0.0%
Other	21	3.4%	3	3.2%
Prefer not to say / NA	7	1.1%	0	0.0%
Employment				
Undergraduate Student	68	11.0%	6	6.4%
Postgraduate Student	11	1.8%	4	4.3%
PhD Student	10	1.6%	3	3.2%
Employed	397	64.1%	59	62.8%
Not employed	65	10.5%	8	8.5%
Retired	20	3.2%	5	5.3%
Other	41	6.6%	9	9.6%
Prefer not to say / NA	7	1.1%	0	0.0%
	M	*SD*	*M*	*SD*
Age	38.7	12.2	40.1	11.72

4.1.3 Measures

For the validation analysis of the PRAISE scale, participants filled out the PRAISE scale and a variety of additional measures, depending on whether they participated at both time points. An overview of the measures used is provided in Table 4.2. The rationale for each measure is detailed.

Table 4.2

Measures Used in the PRAISE Validation Process

Measure	Items	T1	T2
PRAISE Scale	28 [a]	x	x
Possibilities			
Short Big Five Inventory - Openness	3 [b]	x	
Relationships			
Psychological Wellbeing Scale - Positive Relations with Others	9 [b]	x	
Friendship Maintenance Scale - Supportiveness	5 [c]		x
Appreciation of Life			
Gratitude Questionnaire	6 [b]	x	
Strength			
New General Self-Efficacy Scale	8 [a]	x	
Existence			
Spiritual Transcendence Scale - Universality	9 [a]	x	

Note. [a] Ranging from 1 (strongly disagree) to 5 (strongly agree). [b] Ranging from 1 (strongly disagree) to 7 (strongly agree). [c] Ranging from 1 (never) to 11 (frequently).

The 28-item PRAISE scale was included in both surveys. The CFA was calculated using the larger sample assessed at T1. For the assessment of the convergent validity of the PRAISE scale, five measures that conceptually resembled each PRAISE domain without using the same items (PRAISE scale items listed in Table 3.4, p. 64) were selected. The three items of the Openness for Experiences dimension of the Short Big Five Inventory (BFI-S; Lang et al., 2011) were selected for the Possibilities dimension, which aims to assess whether an individual has recently picked up new interests and rethought their direction in life. The reason for this selection was that creativity and openness (e.g., “I see myself as someone original, comes up with new ideas”) should be associated with this domain. The Positive Relations With Others subscale of the Psychological Wellbeing Scale (PWB; Ryff & Keyes, 1995) was selected for the Relationships dimension, as it includes nine items on one’s contribution to positive relationships and the perceived quality of one’s relationships (e.g., “I know that I can trust my friends, and they know that they can trust me”). The Gratitude Questionnaire (GQ6; McCullough et al., 2002) includes six items (e.g., “I have so much in life to be thankful for”) and was selected for the

Appreciation of Life dimension, which aims at the general appreciation of what one has, and being content. The New General Self-Efficacy Scale (NGSE; Chen et al., 2001) includes eight items (e.g., “I will be able to achieve most of the goals that I have set for myself”) and was selected for the Strength dimension, which addresses the belief in one’s capability to overcome hurdles and succeed in personal goals. Finally, the Universality subscale of the Spiritual Transcend Scale (STS; Piedmont, 1999) was chosen for the Existence dimension as its nine items do not aim at any religion or specific rituals (e.g., prayer, church) but still address thoughts and feelings shared across different belief systems (e.g., “There is an order to the universe that transcends human thinking”).

To assess the predictive validity of the Relationships dimension of the PRAISE scale, participants were asked to complete the Supportiveness subscale of the Friendship Maintenance Scale (FMS; Oswald et al., 2004) at T2 in sample 1, which assesses behavioural anchors associated with relationship maintenance behaviour. The instructions were adapted to aim at the time between the two assessments (e.g., “Think about the past two weeks. How often did you and your friends… provide each other with emotional support?”). This construct is included to assess the predictive validity of the Relationships dimension, as lower social well-being and perceived connectedness can lead to behaviours of social retreat (Hawkley & Cacioppo, 2010). Individuals with a higher score on the Relationships dimension should thus demonstrate more friendship pursuing behaviour in the weeks after their assessment.

4.1.4 Analytical approach

The CFAs used maximum likelihood estimation and were carried out in MPLUS 8.8 (Muthén & Muthén, 2017). Satorra-Bentler scaled chi-squared statistics were used to calculate fit indices robust to nonnormality (CFI, TLI, RMSEA). The same fit heuristics as described in Section 3.2.1.4 were used to indicate adequate

model fit: CFI and TLI > .90, RMSEA < .08, SRMR < .06 (Hu & Bentler, 1998). Due to the relatively low factor fit of the three models tested for the PRAISE alpha in the previous chapter (unidimensional, five uncorrelated factors, five correlated factors), two additional models were included in the CFA of the PRAISE scale to examine whether they improve the model of the PRAISE scale: Model D describes a correlated 5-factor structure allowing for correlated error terms, as done in other validation studies of PTG measures (e.g., Tedeschi et al., 2017). Correlated error terms were allowed for three item pairs (each within one PRAISE dimension), which were identified by examining the modification indices (MI > 50) of error covariances in the PRAISE alpha. Model E tests for a correlated 5-dimensional factor structure and allows for non-zero off-loadings using a Bayesian CFA (Asparouhov et al., 2015). This model is run because items are rarely perfectly pure construct indicators. As Asparouhov, Muthén and Morin (2015, p. 1563) pointed out, *"even completely reliable ratings of insomnia or physiological measures of sleep patterns are likely to present significant levels of true score (i.e., valid) associations with multiple constructs, such as burnout, depression, stress, drug abuse, and so on"*. Bayesian Structural Equation Modelling (BSEM) allows to set informative priors to allow small cross-loadings for each item, implying that cross-loading are close to but not necessarily exactly zero. In the present analysis, items and factors were standardized and a prior distribution of $\lambda \sim N(0, 0.01)$ was used, so that 95% of the off-loading variation is between ±0.20 (Muthén & Asparouhov, 2012).

All other analyses were conducted using STATA 17 (StataCorp, 2021). The test-retest reliability of the PRAISE scale was determined by calculating the intraclass correlation coefficient (ICC) across two weeks of time, using a single-measurement, absolute-agreement, 2-way mixed-effects model. To evaluate the test-retest reliability, ICC cut-offs as described by Koo and Li (2016) were used: Poor reliability is indicated by an ICC below .50, moderate by an ICC between .50 and .75, good by an ICC between .75 and .90 and excellent by an ICC higher than .90.

To examine the convergent validity of the PRAISE scale, a seemingly unrelated regression analysis (SUR; Zellner, 1962) was carried out using STATA's 'sureg' command, which uses Ordinary Least Squares (OLS) estimation. In an SUR, the error terms of each regression equation are assumed to be correlated, which leads to more efficient coefficients than estimation with separate regressions (Tien, 2011). The five convergent scales (i.e., BFI-S Openness, PWB Positive Relations, GQ6 Gratitude, NGSE Self-Efficacy, STS Universality) were used as predictor variables for each of the PRAISE dimensions (Possibilities, Relationships, Appreciation of Life, Strength, Existence), which were entered separately as the outcome variable. In a previous study, Frazier and colleagues (2009) found that current-standing posttraumatic growth dimensions correlated similarly strong with different convergent measures. It was thus expected that each PRAISE dimension may be significantly predicted by multiple convergent constructs. However, the following associations are expected to be the strongest, due to the conceptual similarity of the constructs: Possibilities and Openness, Relationships and Positive Relations, Appreciation of Life and Gratitude, Strength and Self-Efficacy, and Existence and Universality.

The predictive validity of the PRAISE scale was tested on the example of the *Relationships* domain. A simple linear regression was carried out to test the predictive validity of the *Relationships* domain assessed at time point one for supportive friendship maintenance behaviour assessed at time point two. Individuals who rank higher in the *Relationships* domain are expected to display more friendship maintenance behaviour in the near future.

4.2 Results

Descriptive information for each measure and time point of the present study is provided in Table 4.3.

Table 4.3

Descriptive Scale Information of the PRAISE Validation Measures Assessed at T1 and T2

Scale	*M*	*SD*	Minimum	Maximum	Skewness	Kurtosis	α	ω	*ICC* (95% CI)
				T1 (*n* = 619)					
PRAISE Scale	94.75	14.39	36	137	-0.26	0.45	.91	.91	
Possibilities	19.19	3.96	6	30	-0.02	-0.15	.74	.75	
Relationships	23.10	3.56	8	30	-0.69	0.78	.80	.81	
Appreciation of Life	16.97	3.10	7	25	-0.28	-0.17	.66	.67	
Strength	20.87	3.96	7	30	-0.39	0.09	.80	.80	
Existence	14.63	3.67	5	25	0.14	-0.15	.71	.71	
Openness (BFI-S)	15.10	3.18	3	21	-0.52	0.18	.72	.72	
Positive Relations (PWB)	41.11	9.39	12	63	0.01	-0.65	.84	.84	
Gratitude (GQ6)	31.35	6.36	9	42	-0.77	0.55	.85	.86	
Self-Efficacy (NGSE)	29.47	5.78	8	40	-0.75	0.56	.92	.92	
Universality (STS)	26.62	8.46	9	45	-0.12	-0.71	.92	.92	
				T2 (*n* = 94)					
PRAISE Scale	95.10	14.42	65	128	-0.25	-0.43	.91	.91	.69 (.56-.78)
Possibilities	19.05	4.06	9	29	0.06	-0.33	.74	.75	.61 (.46-.72)
Relationships	23.10	3.17	15	29	-0.52	0.10	.76	.76	.55 (.40-.68)
Appreciation of Life	17.17	2.92	9	24	-0.35	-0.27	.64	.66	.61 (.47-.72)
Strength	21.01	4.19	7	28	-0.76	0.14	.83	.83	.68 (.55-.77)
Existence	14.77	3.55	7	24	0.11	-0.30	.71	.72	.73 (.62-.81)
Supportiveness (FMS)	35.15	13.26	5	55	-0.64	-0.38	.94	.94	

4.2.1 Factor structure of the PRAISE Scale

The T1 sample (*n* = 619) was large enough for structural equation modelling (Wolf et al., 2013) and demonstrated adequacy for factor analysis (Bartlett's Test of Sphericity (BS): $\chi^2(378) = 6466$, $p < .001$; KMO = .925). Nonnormality was accounted for by using robust error terms (Satorra & Bentler, 1994) for models A, B, C, and D.

The CFA results of the 28-item PRAISE scale are reported in Table 4.4. The fit indices of the PRAISE scale indicate better fit compared with the PRAISE alpha (Table 3.4, p. 64). Comparing the three standard models (A, B, C), a correlated 5-factor structure showed the best factor fit in a general population (means, standard deviations and factor loadings for each item using model C are shown in Appendix 4). When allowing for correlated error terms in model D, the factor fit improved slightly. Allowing for small non-zero cross-loadings (ranging between ±0.20) resulted in the best factor fit (model E). The RMSEA indicated good model fit, the CFI exceeded the desired threshold of .90 indicating adequate model fit, and the TLI was very close to this score.

Table 4.4

Confirmatory Factor Analysis Results of the PRAISE Scale (n = 619)

Model		SBχ²	df	CFI	TLI	RMSEA [90% CI]	SRMR
A:	Unidimensional	1844	350	.722	.699	.083 [.079 - .087]	.074
B:	5 uncorrelated	2609	350	.579	.545	.102 [.098 - .016]	.234
C:	5 correlated	1257	340	.829	.810	.066 [.062 - .070]	.062
D:	5 correlated, error terms [a]	1075	337	.863	.846	.059 [.056 - .063]	.059
E:	5 correlated, xloadings ±0.20 [b]			.909	.896	.053 [.051 - .054]	

Note. SBχ² = Satorra-Bentler chi-squared test; CFI = robust comparative fit index; TLI = robust Tucker-Lewis index; RMSEA = robust root-mean-square error of approximation; SRMR = standardized root mean squared residual. [a] In model D, three covariances were set between error terms based on modification indices > 50 in the PRAISE alpha (Section 3.2.2, p. 63). Each pair (items 2-12, 16-20, 19-23) belongs to the same factor. [b] Model E uses Bayesian CFA estimation. SBχ², *df,* and SRMR are not provided for this approach. Posterior Predictive P-values (*PPP*) = 0.000. 30.000 Markov Chain Iterations were processed.

4.2.2 Test-retest reliabilities of the PRAISE Scale and its five dimensions

The test-retest reliability of the PRAISE scale was tested on participants who filled out the survey twice across a period of two weeks (*n* = 94). The intraclass correlation coefficient was considered moderate at ICC = .69 (95% CI, .56 - .78). Moderate test-retest validity was also found for each PRAISE dimension (ranging between .55 and .73; Table 4.3). The Strength and Existence dimensions of the PRAISE scale were on the upper end of this threshold, whereas test-retest reliability was slightly lower for the Possibilities and Appreciation of Life dimensions and lowest for the Relationships dimension.

4.2.3 Convergent validity of the five PRAISE Scale dimensions

Before conducting the SUR, the data were first examined for whether it met the assumptions required for regression analyses. Assumption tests were carried out for each of the five equations separately, as the STATA 17 command 'sureg', which was used to carry out the analysis, did not allow to use robust error terms. Outliers were identified using Mahalanobis distance, leverage, and Cook's distance. Forty-six outliers exceeded the cut-off values in two or more of these statistics in at least one of the equations and were subsequently removed, leaving a sample of *n* = 573 for the analysis. This strategy is less sensitive than using each individual indicator for outliers, balancing the removal of data points against undue influence from discrepant data points. Due to the high sample size, the assumption of normally distributed residuals (residuals were not normally distributed in every equation) could be relaxed. The residuals were homoscedastic (Appendix 5) in all equations except for Relationships. Multicollinearity was not detected, as VIF values were in the acceptable range (*M* = 1.41, range = 1.08-1.84).

Table 4.5

Convergent Validity of the PRAISE Scale – Results of the Seemingly Unrelated Regression Analysis

Scale	*B*	*SE B*	95% CI		*p*	*β*
			LL	*UL*		
Possibilities						
Openness (BFI-S)	.237	.048	.143	.331	<.001	.180
Positive Relations (PWB)	.021	.019	-.016	.058	.273	.049
Gratitude (GQ6)	.013	.032	-.050	.076	.688	.019
Self-Efficacy (NGSE)	.255	.030	.196	.315	<.001	.349
Universality (STS)	.087	.017	.053	.121	<.001	.187
Relationships						
Openness (BFI-S)	.098	.039	.021	.175	.012	.086
Positive Relations (PWB)	.144	.016	.113	.174	<.001	.387
Gratitude (GQ6)	.118	.026	.067	.170	<.001	.201
Self-Efficacy (NGSE)	.072	.025	.023	.120	.004	.113
Universality (STS)	.004	.014	-.024	.032	.788	.009
Appreciation of Life						
Openness (BFI-S)	.062	.037	-.010	.134	.091	.060
Positive Relations (PWB)	.049	.015	.021	.078	.001	.146
Gratitude (GQ6)	.090	.025	.042	.138	<.001	.169
Self-Efficacy (NGSE)	.193	.023	.147	.238	<.001	.333
Universality (STS)	.030	.013	.004	.057	.023	.082
Strength						
Openness (BFI-S)	.093	.040	.015	.171	.019	.072
Positive Relations (PWB)	.047	.016	.016	.078	.003	.112
Gratitude (GQ6)	.041	.027	-.012	.093	.127	.061
Self-Efficacy (NGSE)	.432	.025	.383	.481	<.001	.600
Universality (STS)	.000	.014	-.029	.028	.987	-.001
Existence						
Openness (BFI-S)	-.065	.036	-.136	.006	.073	-.054
Positive Relations (PWB)	.053	.014	.025	.082	<.001	.137
Gratitude (GQ6)	.041	.024	-.006	.088	.090	.066
Self-Efficacy (NGSE)	.220	.023	.176	.265	<.001	.328
Universality (STS)	.205	.013	.179	.231	<.001	.477

Note. Total n = 573 after outlier exclusion. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

As shown in Table 4.5, the convergent scales were significantly associated with each PRAISE dimension – Possibilities: $F(5, 567) = 47.00$, $R^2 = .29$, $R^2_{adj} = .29$, $p < .001$; Relationships: $F(5, 567) = 69.45$, $R^2 = .38$, $R^2_{adj} = .37$, $p < .001$; Appreciation of Life: $F(5, 567) = 57.63$, $R^2 = .34$, $R^2_{adj} = .33$, $p < .001$; Strength: F(5,

567) = 113.65, R^2 = .50, R^2_{adj} = .50, p < .001, Existence: F(5, 567) = 125.94, R^2 = .53, R^2_{adj} = .52, p < .001. Each PRAISE dimension was significantly predicted by their associated convergent construct, indicating convergent validity. Each PRAISE dimension had at least two significant predictors. Most notably, self-efficacy was a significant predictor in all five equations and was the strongest predictor of the Possibilities and Appreciation of Life dimension (Openness and Gratitude were significant predictors, respectively). The other three PRAISE dimensions (Relationships, Strength, and Existence) were most strongly predicted by their associated convergent scale.

4.2.4 Predictive validity of the Relationships dimension of the PRAISE Scale

A simple linear regression was carried out to test the predictive validity of the Relationships dimension, using supportive friendship maintenance behaviour as the criterion variable. Of the 94 individuals who participated at T1 and T2, three outliers were identified and excluded using the strategy described in Section 4.2.3, lowering the sample size to n = 91. Residuals were not normally distributed (Shapiro-Wilk: W(91) = .94, p < .001) and therefore, robust (HC2) error terms were used.

The regression found that Relationships explained a significant amount of the variance in supportive friendship maintenance behaviour two weeks later, F(1, 89) = 8.63, R^2 = .07, R^2_{adj} = .06, p = .005. The regression coefficient was significant and indicated individuals who reported more fulfilling relationships at T1 engaged in greater maintenance behaviour in the two weeks after, reported at T2 (B = 1.08 and standardized β = .26).

4.3 Discussion

Across the last two chapters, the development, refinement, and validation of the PRAISE scale was presented. The PRAISE scale was developed to comprehensively measure current-standing levels of five PTG dimensions. As a

measure designed for the assessment of veridical PTG, it is less complex for participants to complete compared to measures of perceived PTG. Participants only need to report on their thoughts, feelings and observations over the past two weeks instead of having to quantify the changes before and after an adverse event occurred (Boals, Griffith, et al., 2022). This allows its use in prospective longitudinal studies and track trajectories of PTG rather than mere retrospective perceptions of PTG (Corman et al., 2021).

This study was conducted to examine whether the exclusion of one item and the adjustment of the instructions in Section 3.3.1 led to acceptable factor fit and whether the PRAISE scale demonstrated overall good psychometric properties, including its convergent validity, internal consistency, test-retest reliability, and predictive validity. Overall, this analysis provides information whether the PRAISE scale can assess current-standing PTG multidimensionally and whether each dimension reliably captures the constructs they were designed to measure.

4.3.1 Psychometric validation of the PRAISE Scale

The confirmatory factor analyses suggested a correlated 5-dimensional factor structure (Taku et al., 2008; Tedeschi & Calhoun, 2004) for the PRAISE scale. When cross-loadings were strictly constrained to zero – indicating that each item purely indicates their associated construct – the model fit indices suggested a less than acceptable fit. The retrospective 25-items PTGI-X showed slightly better model fit indices for the same correlated 5-factor model (RMSEA = .086, TLI of .876, and a CFI of .890 for model C and RMSEA = .076, TLI = .902, CFI = .915 for model D in its validation study (Tedeschi et al., 2017). However, the assumption that items solely reflect their associated dimension and do not at all present some degree of systematic association with other constructs does not reflect the complexity of well-being. The five dimensions are strongly correlated, and it is likely that some items slightly overlap with other dimensions. For example, social relationships could be a

source of meaning in life (Stavrova & Luhmann, 2016), and individuals with more self-reliance may feel more courageous to try out new pathways. When the strict assumption of zero-off-loadings were eased by allowing small cross-loadings of ±.20 for each item (model E), the factor fit indices significantly improved and suggested an adequate model fit. The chosen range of ±.20 suggests that cross-loadings *"are hypothesized to be close to zero, although perhaps not exactly zero"* (Muthén & Asparouhov, 2012, p. 316). In summary, the CFA results indicate that the PRAISE scale reflects the theoretical 5-factor structure overall sufficiently but may suffer from cross-loading items. Whether this issue is specific to the PRAISE scale or rooted in the current-standing assessment approach of PTG in general will be examined further in Chapter 5.

At the item level, items 21 ("I have rethought how I want to live my life") and 28 ("I have placed low emphasis on material things") showed relatively low factor loadings (.26 and .22, respectively), although they are conceptually sound and seem sufficiently unique. The difference between populations may suggest that the importance of each indicator depends to some extent on the population, and despite the less-than-ideal factor loadings, items 21 and 28 should not be discounted in their value to detect PTG.

Overall, the PRAISE scale demonstrated good internal and external reliability, construct validity, and predictive validity. The internal consistencies were above .70 and high enough for the intended application in non-clinical research (Tavakol & Dennick, 2011). It is not surprising that the scores are not higher, considering that each dimension consist of relatively few items which were included to cover a broad variety of manifestations of each dimension. Test-retest reliabilities over two weeks were good and similar to other measures of PTG (Tedeschi & Calhoun, 1996). The test-retest reliabilities of PRAISE dimensions are lower than measures for constructs less subject to change, such as personality traits (Gnambs, 2014). No information

about the test-retest reliabilities for the current-standing measures C-PTGI and C-PTGI-SF that would allow for comparison have been published yet.

Evidence of convergent validity was observed as each PRAISE dimension was significantly predicted by their allocated conceptually similar construct. All PRAISE dimensions were significantly predicted by more than one convergent measure, which is unsurprising given the empirical and conceptual correlation between PTG dimensions. Similar observations have been made by Frazier and colleagues (2009), who found that each of their selected convergent constructs (including the PWB and GQ6 included in this study) significantly correlated with almost every dimensions of the C-PTGI. Surprisingly, self-efficacy significantly predicted all five PRAISE dimensions and was the strongest predictor for three of them. An association between self-efficacy and general PTG has been reported in several retrospective cross-sectional designs (Lotfi-Kashani et al., 2014; Mystakidou et al., 2015), and the present results underline that individuals' belief in their abilities and confidence in achieving their goals may play a special role in the context of PTG. The strong association of self-efficacy across dimensions could indicate that a certain degree of self-regulatory capacity is central to experiencing positive functioning in the aftermath of the crisis. Indeed, self-efficacy was found to promote recovery from posttraumatic stress symptoms over time (Nygaard et al., 2017), making longitudinal research on how individual differences in self-efficacy predict trajectories of PTG over time a worthwhile topic for future research. The convergent scales were the second strongest predictors after self-efficacy in two cases, and openness was the third strongest predictor of Possibilities after self-efficacy and universal spirituality. The relatively low association between the PRAISE dimension Possibilities and the personality trait Openness may indicate that the Possibilities items are more varied and not as related to openness as a personality trait as expected. Finding new pathways and solutions in response to adversity might not necessarily reflect an individual's general personal tendency to be open.

4.3.2 Strength, limitations and future research

The first major strength of this study is that a combination of different psychometric analyses was used to extensively validate the reliability and validity of the PRAISE scale. In addition to the test-retest reliability and internal consistency, the analysis also examined whether the measure can be interpreted multidimensionally by testing whether its conceptual five dimension hold empirically and whether each dimension captures the construct it was designed for. Second, this study includes advanced methodological considerations such as the use of a Bayesian CFA to work around unrealistic assumptions imposed by standard CFA analyses. Third, the range of psychometric properties provided in the present analysis exceeds the information reported in previous validation studies of current-standing PTG measures such as the C-PTGI. As outlined in Chapter 2, most current-standing measures were validated on small sample sizes and were often not examined in their factor structure, test-retest reliability, convergent validity, or predictive validity. While the validation process is not fully exhausted with the present study, the analyses run in this study allow for more insight into the validity of the PRAISE scale compared with the analyses other current-standing PTG measures were subjected to. These were often developed for a single study and validation efforts were subsequently just minor subsections included in the publication.

This study includes four limitations which should be considered in future studies. First, only the predictive validity of the Relationships dimension using a behavioural construct as the dependent variable was assessed. While this approach is novel in the validation of current-standing PTG measures, it is recommended to expand this analysis in future studies to also include the Possibilities, Appreciation of Life, Strength, and Existence domains, incorporating control measures of predictive validity outcomes at T1. Second, the present study did not examine the divergent validity of the PRAISE dimensions. Assessing this psychometric property in future

studies would add valuable insight to the convergent information provided in this study. For example, Kaur and colleagues (2017) used one item on hypertension to assess the divergent validity of the C-PTGI-SF. Third, the validation process has so far been limited to a general population which might respond differently to the PRAISE scale than individuals with recent exposure to adversity. Chapter 6 will address this sample issue partially but does not include all analyses of the present study. Finally, the PRAISE scale, its five conceptual dimensions, and the measures which informed the item selection process were designed and validated using predominantly WEIRD samples (i.e., drawn from western, educated, industrialised, rich and democratic populations; Henrich et al., 2010). The validation samples only included individuals from the UK and it is not clear whether the psychometric properties of the PRAISE scale hold in cultures where beliefs about growth might differ (Splevins et al., 2010). The less performant items 21 and 28 were originally developed in the USA and might show higher factor loadings in a USA sample. Future validation efforts across diverse samples are thus explicitly encouraged.

4.3.3 Conclusion

Summarising the results of this study, the new PRAISE scale offers improvements compared to traditional retrospective and existing current-standing scales of PTG. It allows researchers to assess veridical PTG in terms of actual change from pre-to-post trauma with a validated and multidimensional measure capturing growth-related constructs. With 28 items, the PRAISE scale is a conceptually broad yet brief scale, making it more viable than selecting different subscales of other measures to capture growth-related constructs. While the measure demonstrated overall good psychometric properties, the factor model fit was less than ideal. Chapter 5 examines this finding by comparing the model fit of the PRAISE scale and other current-standing measures in the same sample. In Chapter 6, the PRAISE scale will then be used to explore the association between trait

resilience and veridical PTG in individuals with prior exposure to adversity, generating additional psychometric validity data. Finally, researchers are invited to evaluate and validate the PRAISE scale in various populations and use the new measure to explore PTG in prospective longitudinal study designs. For this purpose, a brief overview of the PRAISE scale – including items, instructions and scoring – has been published on OSF (https://osf.io/njd3e; see also Appendix 6). For general samples in the UK – including individuals exposed to significant adversities – the measure can be considered ready for use.

Chapter 5 Factor structure of current-standing PTG measures

The PRAISE Scale was developed to assess PTG in the five dimensions proposed by Tedeschi and Calhoun (Tedeschi & Calhoun, 2004). In Chapter 4, the measure's factor structure was validated based on these five conceptual dimensions. The model fit of the PRAISE scale was not as high as desirable for conventional standards and lower than the fit of the PTGI-X (Tedeschi et al., 2017) and the State PTG for ESM measure (Blackie et al., 2017), which follow the same five dimensions. However, the comparability with these measures is limited, as the PTGI-X measures perceived and not veridical PTG, and the state-PTG measure was developed for a very specific research method which requires multiple assessments per day (see Section 2.2.2.5). The study reported in this chapter aims to add context to the factor fit indices of the PRAISE scale by comparing it to the fit of two similar current-standing PTG measures – the multidimensional C-PTGI (Frazier et al., 2009) and its revised short form C-PTGI-SF (Kaur et al., 2017). Both measures were identified and described in Chapter 2 and were used on adult populations in longitudinal studies. Three research objectives are pursued in this study.

The first objective of the present study is to assess the factor structure of the C-PTGI, the most used current-standing PTG measure. The C-PTGI (see Section 2.2.2.1) is based on the same five conceptual dimensions and assesses current-standing PTG in the same time frame of two weeks, but no data on its empirical factor structure have been published (Frazier et al., 2009). Comparing the model fit of the PRAISE Scale to that of the C-PTGI helps to determine whether the low fit indices of the PRAISE Scale is an issue of this specific measure or whether it is a more conceptual issue which may affect similar current-standing measures of PTG as well.

The second objective of the present study is to explore whether allowing for small cross-loadings leads to strong improvements of the C-PTGI model fit. When small cross-loadings were allowed for the PRAISE items, the model fit indices greatly improved compared to when cross-loadings were restricted to zero (see Section 4.3.1). This observation implies that items are not uniquely measuring one dimension but also cross-load onto other factors to some degree. If the same effect was found for the C-PTGI, it would further support the idea that the observed factor structure issues are rooted in the measurement approach of current-standing PTG assessment itself, rather than solely in the PRAISE Scale.

Finally, the model fit of the C-PTGI-SF will be examined in this study. It is the only current-standing PTG measure (apart from the state-PTG measure; see Table 2.1) for which empirical data on the factor structure have been published (Kaur et al., 2017). While the development of the C-PTGI-SF has been based on the C-PTGI, the measures differ in terms of instructions, number of items included, and dimensionality. The C-PTGI-SF provides a unidimensional comparison for the evaluation of the model fit of the multidimensional C-PTGI and PRAISE scale.

5.1 Methods

5.1.1 Ethics

The survey included an information sheet which informed individuals that they will be asked to answer questions regarding their “well-being and the potential psychological impact of recent negative life events” at the beginning of the study and a debrief sheet including the contact details of various UK based mental health services and helplines, as described in Section 3.2.1.1 (p. 61). Each participant provided informed consent before they could access any items.

This study was covered by the ethical approval granted by the University of Nottingham School of Psychology research ethics board (REF: S12333) for the study described in Chapter 6 (Ethics outlined in Section 6.1.4, p. 110). The changes

introduced by including the additional (very similar and positively worded) measures did not introduce new additional risks that would have required additional approval, as outlined by the University's ethics guidelines (School of Psychology, 2023).

5.1.2 Participants and procedure

Participants were recruited in February 2022 via the online service Prolific (https://prolific.co). The inclusion criteria for this sample were the same as in Chapter 4, apart from allowing individuals older than 60 to participate. A general population sample of 303 individuals (50.2% female) between 18 and 84 years old (M = 40.02, SD = 15.18) was surveyed. All participants had a UK nationality and resided in the UK. Most participants identified as White British (86.8%) or White European (4.0%), 11 individuals (3.6%) identified as Black African, Black Caribbean, or Other Black, and 17 individuals (5.6%) reported a different ethnicity. Most individuals were employed (59.1%), followed by students (17.6%, including undergraduate, postgraduate, and PhD students), retired (10.2%), and unemployed individuals (8.3%). Five percent of the participants indicated other or unspecified employment. Participants were paid an average hourly wage above £7.50 after survey completion.

5.1.3 Measures

PRAISE Scale. This current-standing PTG measure was developed in Chapter 3 and validated in a general UK population in Chapter 4. It assesses five dimensions of PTG (*Possibilities*, *Relationships*, *Appreciation of Life*, *Strength*, *Existence*). Participants are asked to rate how they felt in the previous two weeks by responding to 28 items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

C-PTGI. This current-standing PTG measure has been used in multiple longitudinal studies and was the first such measure to be developed (Frazier et al., 2009). It includes 21 items which mirror the 21 items of the PTGI conceptually, but with a slightly adapted wording. Individuals report their current-standing PTG levels in

reference to the past two weeks by responding to each item on a 6-point Likert scale ranging from 0 (not at all) to 5 (very great degree). Its empirical factor structure has not been published. Due to its strong link with the PTGI, a correlated 5-dimensional factor structure is assumed. More information about the C-PTGI is available in Section 2.2.2.1.

C-PTGI-SF. This current-standing PTG measure is a short version of the C-PTGI (Kaur et al., 2017). It includes 11 items which were selected from all five PTG dimensions. Empirically, the C-PTGI-SF shows a unidimensional factor structure (Kaur et al., 2017). To assess current-standing PTG, individuals are instructed to "Indicate the degree to which the following statements are true in your life…" using a 7-point Likert scale ranging from 0 (not at all) to 6 (very great degree), as described in the development study (Kaur et al., 2017). More information about the C-PTGI-SF is available in Section 2.2.2.2.

5.1.4 Analytical approach

Descriptive information were examined using STATA 17 (StataCorp, 2021). Internal consistencies of each measure and their dimensions were determined by calculating McDonald's Omega (McNeish, 2018). As the Existence dimension of the C-PTGI includes only two items, which leads to identification issues in the calculation of omega, Cronbach's alpha was also calculated as an alternative indicator (but may underestimate the reliability of the two-item scale; Eisinga et al., 2013).

The confirmatory factor analyses of the PRAISE scale, C-PTGI and C-PTGI-SF were carried out using MPLUS 8.8 (Muthén & Muthén, 2017) and followed a similar procedure as outlined in Section 4.1.4 (p. 75). Maximum likelihood estimation was used and Satorra-Bentler scaled chi-squared statistics were calculated to derive fit indices robust to nonnormality (CFI, TLI, RMSEA). Adequate model fit was indicated by a CFI and TLI > .90, RMSEA < .08, and SRMR < .06 (Hu & Bentler, 1998).

Three different factor models were tested. Model A tests for a unidimensional factor structure in which all items load on one general PTG factor. This factor structure was previously identified in the C-PTGI-SF (Kaur et al., 2017) and is tested in all three measures. Model B tests for a correlated five-dimensional factor structure. This is the assumed factor structure of the C-PTGI. Model C proposes a correlated 5-dimensional factor structure but allows small cross-loadings for each item. This model uses a Bayesian CFA approach and was first introduced in Section 4.1.4, where the PRAISE scale showed much better model fit in comparison to a correlated 5-dimensional model where off-loadings were constrained to zero. To test whether the model fit of the C-PTGI improves to a similar degree, model C is tested for the PRAISE scale and C-PTGI in the present study. Items and factors were standardized and a prior distribution of $\lambda \sim N(0, 0.01)$ was used, assuming that 95% of the off-loading variation is between ±0.20 (Muthén & Asparouhov, 2012).

5.2 Results

Descriptive information about the three current-standing measures and their dimensions are provided in Table 5.1 below. All three measures indicated high internal consistency. For both the PRAISE Scale and the C-PTGI, the Existence dimension showed the lowest and the Relationships dimension the highest internal consistency.

Table 5.1

Descriptive Scale Information for the PRAISE Scale, C-PTGI, and C-PTGI-SF

Scale	*M*	*SD*	Min	Max	Skew.	Kurt.	ω	α
PRAISE Scale	98.20	16.61	49	140	-0.11	0.28	.94	.93
Possibilities	20.16	4.40	8	30	-0.11	-0.16	.79	.79
Relationships	23.48	3.84	11	30	-0.59	0.14	.85	.84
Appreciation of Life	17.40	3.64	6	25	-0.19	-0.03	.79	.77
Strength	21.52	4.12	7	30	-0.41	0.37	.82	.82
Existence	15.65	3.97	6	25	0.20	-0.27	.75	.73
C-PTGI	67.56	16.43	12	104	-0.50	0.30	.93	.92
Possibilities	16.21	4.70	0	25	-0.42	0.13	.84	.84
Relationships	23.76	6.45	1	35	-0.61	0.25	.87	.87
Appreciation of Life	10.89	2.90	1	15	-0.78	0.45	.80	.79
Strength	13.33	3.68	0	20	-0.53	0.34	.81	.80
Existence	3.38	2.77	0	10	0.53	-0.76	-	.70
C-PTGI-SF	41.33	11.11	5	65	-0.47	0.28	.90	.88

Note. McDonald's ω could not be calculated for the C-PTGI Existence dimension, as at least three items are required for identification.

The sample (n = 303) was considered large enough for structural equation modelling (Wolf et al., 2013) and demonstrated adequacy for factor analysis (Bartlett's Test of Sphericity $(BS)_{PRAISE}$: $\chi^2(378) = 4144$, $p < .001$; $KMO_{PRAISE} = .931$; $BS_{C\text{-}PTGI}$: $\chi^2(201) = 3550$, $p < .001$; $KMO_{C\text{-}PTGI} = .914$; $BS_{C\text{-}PTGI\text{-}SF}$: $\chi^2(300) = 6873$, $p < .001$; $KMO_{C\text{-}PTGI\text{-}SF} = .955$). Robust error terms (Satorra & Bentler, 1994) were used for models A and B to account for nonnormality.

The factor structure of the PRAISE scale, C-PTGI, and C-PTGI were examined in the same general population (Table 5.2). The PRAISE scale and C-PTGI showed the best model fit for the correlated 5-dimensional model with small cross-loadings (model C). The C-PTGI showed a CFI above .90 and an RMSEA of .08 (indicating good model fit) and a TLI slightly below the desired value of .90. The PRAISE scale showed a CFI and TLI slightly below .90, but the RMSEA indicated good model fit. For model B, the PRAISE scale showed consistently better fit indices than then C-PTGI. Both scored TLIs and CFIs below .90 but the RMSEA of the PRAISE Scale showed a good model fit. As expected, the C-PTGI-SF showed the highest fit indices for a unidimensional factor structure (model A) of all examined

measures. However, fit indices were still poor and the PRAISE scale and C-PTGI showed a better fit for model B than the C-PTGI-SF showed for model A.

Table 5.2

Confirmatory Factor Analysis of the PRAISE Scale, C-PTGI, and C-PTGI-SF

Model		SBχ²	df	CFI	TLI	RMSEA [90% CI]	SRMR
PRAISE Scale							
A:	Unidimensional	1079	350	.780	.762	.083 [.077 - .089]	.070
B:	5 correlated	816	340	.856	.840	.068 [.062 - .074]	.064
C:	5 correlated, xloadings ±0.20 [a]			.895	.892	.061 [.058 - .063]	
C-PTGI							
A:	Unidimensional	884	189	.748	.720	.110 [.103 - .118]	.081
B:	5 correlated	602	179	.843	.816	.089 [.082 - .097]	.068
C:	5 correlated, xloadings ±0.20 [a]			.916	.882	.080 [.076 - .084]	
C-PTGI-SF							
A:	Unidimensional	270	44	.842	.802	.130 [.116 - .145]	.084

Note. *n* = 303. SBχ² = Satorra-Bentler chi-squared test; CFI = robust comparative fit index; TLI = robust Tucker-Lewis index; RMSEA = robust root-mean-square error of approximation; SRMR = standardized root-mean squared residual. [a] Model C uses Bayesian CFA estimation. SBχ², *df*, and SRMR are not provided for this approach. Posterior Predictive P-values (*PPP*) = 0.000 in both equations. 30.000 Markov Chain Iterations were processed.

5.3 Discussion

The aim of this study was to examine whether some psychometric issues of the PRAISE scale identified in Chapter 4 can be found in other measures as well. Specifically, the PRAISE showed cross-loading items which led to a less than ideal factor model fit despite otherwise good psychometric properties. It is not clear whether this issue only affects the PRAISE scale or whether small cross-loadings can also be identified in other current-standing measures. Due to the high similarity in framing and dimensionality, the C-PTGI was included as a reference measure. Additionally, the C-PTGI-SF was included as a unidimensional reference for the model fit.

5.3.1 Factor model fit of current-standing PTG measures

The first objective of the present study was to assess the factor structure of the C-PTGI. The C-PTGI showed a much better model fit for a correlated 5-dimensional factor structure (model B) compared to a unidimensional model (model A). This is not surprising, as it includes conceptually the same items as the PTGI. However, the model fit was still poor and the indices lower than the published data for the traditional PTGI (Taku et al., 2008) it was based on. The PRAISE scale also showed the best model fit indices for a correlated 5-dimensional factor structure (model B), which were better in the present sample compared to the PRAISE validation study (see Section 4.2.1, p. 79). The RMSEA indicated adequate fit, but the TLI and CFI still indicated a poor model fit. Comparing the standard model B (with off-loadings restricted to zero), the PRAISE scale showed better model fit than the C-PTGI. These results indicate that a poor model fit may not just be an issue of the PRAISE scale.

The C-PTGI is based on the PTGI, for which items were selected via a principal component analysis (Tedeschi & Calhoun, 1996). The PTGI performed quite well in a CFA (Taku et al., 2008), demonstrating excellent fit. Finding that a current-standing version of the same items performs much worse than the original perceived-PTG-wording suggests that the current-standing assessment of PTG may come with additional challenges which measures of perceived PTG do not have.

The second objective examined whether the factor fit improved in the C-PTGI and PRAISE scale when small cross-loadings were allowed. In the previous Chapter 4, cross-loadings of single items were freed from their constraint to zero, suggesting that single items are not just associated with one dimension but could be slightly associated with other dimensions as well. Allowing for small cross-loadings without penalising the overall model fit is a much more realistic assumption for empirical measures (Asparouhov et al., 2015). This may particularly apply in the context of

psychological functioning, as salutogenic constructs often correlate with more than just one PTG dimension (see Section 4.2.3; Frazier et al., 2009; Tedeschi & Calhoun, 1996) and PTG dimensions are strongly correlated with each other.

When allowing for small cross-loadings in model C, the fit indices of the C-PTGI and PRAISE scale increased. Both multidimensional measures improved to a similar extent when allowing for small item cross-loadings. This supports the idea that current-standing PTG items are not purely associated to only one dimension but also slightly cross-load on other dimensions. Considering all fit indices, the PRAISE scale showed quite good model fit and performed slightly better than the C-PTGI.

The third objective of this study was to examine the factor fit of the unidimensional C-PTGI-SF in a general UK sample. Comparing the unidimensional model fit across all three measures, the C-PTGI-SF showed the best fit indices. However, the model fit was poor and particularly the RMSEA quite high. These results support the multidimensional structure of PTG and suggest that the C-PTGI and particularly the PRAISE scale not only capture PTG more comprehensively but also map the empirical structure better than the unidimensional C-PTGI-SF.

Notably, the fit indices of the C-PTGI-SF are much worse than reported in the original validation sample (Kaur et al., 2017). The discrepancies may be explained by the different samples (the validation was carried out on a US military population), but the comparability might also be adversely affected by the vague wording of the instructions of the C-PTGI-SF. Individuals are prompted to evaluate each item in reference to their life instead of the past two weeks. This issue has been earlier addressed in Section 2.3.1 (p. 46) and may lead to confusion, as the time frame may be differently interpreted by different participants and does not necessarily capture the current or recent experience of participants.

Finally, it is important to note that not all current-standing PTG measures require the relaxation of the assumption of non-zero off-loadings to demonstrate good model fit. The State PTG for ESM measure (Section 2.2.2.5; Blackie et al.,

2017) showed good factor fit in both a US student sample with (CFI = .94; RMSEA = .061; SRMR = .082) and without recent exposure to adversity (CFI = .91; RMSEA = .078; SRMR = .068). However, this measure was designed for an experience sampling methodology and therefore has limited comparability with other current-standing PTG measures.

5.3.2 Strength and limitations

The present study has several strengths which make it an important contribution to the field of PTG. It is the first to examine whether the conceptual factor structure of the C-PTGI holds empirically, providing new insights into its psychometric properties. Furthermore, it is the first to compare the psychometric properties of different current-standing measures in the same sample, including the C-PTGI-SF which so far has only been used in a military population. Finally, a Bayesian CFA allowing for cross-loadings has been used in addition to the standard CFA of assuming zero-off-loadings, which proposes more realistic assumptions for the analysis.

Limitations include that the study was conducted on a general population of UK citizens and very similar to the sample used in Chapter 4. While the present study confirmed the factor structure of the PRAISE scale and provided valuable comparison data of alternative measures, it did not provide any additional insight into cross-cultural generalizability or whether the PRAISE scale's factor fit holds in an adversity sample. While it is likely that the results are similar for an adversity sample, the much worse fit indices of the C-PTGI-SF compared to a military sample suggest that an assessment of the PRAISE factor structure in more diverse samples may prove beneficial.

5.3.3 Conclusions

The PRAISE scale demonstrated a good but not excellent model fit for a correlated 5-dimensional factor model when allowing for small cross-loadings. The fit

indices were superior when compared to the other two measures examined, indicating that the PRAISE scale captures the empirical structure of current-standing PTG most appropriately. The data suggest that the issue of cross-loading items have affected both multidimensional measures similarly and that the use of more narrow items with minimal cross-loadings may lead to an improved model fit. However, the usefulness of a measure should not solely be determined by whether model fit indices meet conventional cut-off values. Selecting items only to improve psychometric values comes to a cost in other qualities like comprehensiveness and conceptual accuracy. Considering the available options, the PRAISE scale can be considered the best option for a 5-dimensional current-standing assessment of PTG, due to its greater comprehensiveness and overall good psychometric properties (see Section 4.3.1). It will subsequently be used in Chapter 6 to examine how trait resilience affects the development of PTG over time in a sample with recent exposure to adversity. This also provides an opportunity to assess the PRAISE scale's factor structure in a sample with recent exposure to adversity.

Chapter 6 Longitudinal examination of trait resilience and PTG

In this chapter, the relationship between trait resilience and veridical PTG in individuals who have recently experienced significant negative life events will be examined. As outlined in Section 1.2, trait resilience refers to a set of individual characteristics and abilities which help individuals to adapt and recover from adversity. PTG refers to positive psychological changes which can result from struggling with adverse experiences. These changes can express in the form of new identified possibilities, improved relationships, a greater sense of appreciation for life, awareness of one's strength and capabilities, and a stronger spiritual or existential connection with the world.

Trait resilience may play a role in facilitating PTG, but the exact nature of this relationship is not well understood. While some researchers have conducted initial research on the relationship between trait resilience and PTG, their studies only looked into single dimensions of trait resilience and solely focused on perceived PTG rather than veridical PTG (Bensimon, 2012; Nishi et al., 2010; Yuan et al., 2018). The results of these studies have been mixed and contradictory, as described in Section 1.3, leaving the question of how trait resilience affects PTG over time unanswered. The present study will take a more exploratory approach and examine whether and how different forms of trait resilience predict the longitudinal trajectory of the five PTG dimensions stated above over the course of three assessments within a 4-month period. The resilience dimensions explored in this study are Resistance, Recovery, and Reconfiguration (Lepore & Revenson, 2006), which were chosen as each of them addresses a different mechanism of resilience which may affect the development of PTG in different ways. Traits associated with each of these resilience dimensions are captured by the EEA resilience scale in form of Ecological

Resilience, Engineering Resilience, and Adaptive Capacity as outlined in Section 1.2.1.

Resistance (Ecological Resilience) refers to an individual's ability to absorb or resist adversity and maintain stability in psychological functioning over time. In Tedeschi and Calhoun's model of PTG (Figure 1.1), this ability seems to be more relevant early in the process, as it may contribute to an individual's "management of emotional distress". Individuals lacking this ability might be overwhelmed by their experiences and develop negative rather than positive changes (Lepore & Revenson, 2006). Conversely, high levels of Resistance may decrease an individual's sensitivity to adverse experiences and their transformative potential, resulting in less (positive) changes (Tedeschi & Calhoun, 1995). Individuals with high levels of Resistance may therefore mostly show stability around baseline levels of their psychological functioning rather than developing negative or positive changes over time.

Recovery (Engineering Resilience) refers to an individual's ability to bounce back quickly from adversity. The research debate surrounding this construct focuses on the speed of return to pre-stressor levels of functioning; individuals who recover quickly are considered more resilient (Lepore & Revenson, 2006). However, it is not clear whether and how this quality affects the development of PTG. Three scenarios could apply. One possibility is that individuals scoring high in this dimension might not just recover to their baseline level of psychological functioning but also develop positive changes beyond pre-trauma levels. Another possibility is that individuals who recover quickly do not struggle long or intensely enough with their experience and therefore are less likely to change their values, perspectives, and priorities. Finally, recovery to baseline levels of psychological functioning and positive changes beyond this level (i.e., PTG) may not necessarily be affected by the same abilities and resources. The effectiveness of an individual to speedily recover from their adverse experience and whether they develop PTG or not may therefore not be associated.

Reconfiguration (Adaptive Capacity) describes an individual's ability to adjust themselves and adapt to changes. It can be compared to an evolutionary perspective on resilience, where resilience is depicted as successful adaptation to a changing environment, which possibly even allows individuals to withstand future adversity better (Cicchetti & Cohen, 1995). Conceptually, this resilience dimension has been most closely associated with PTG (Lepore & Revenson, 2006), and the ability to withstand future adversity is a recurring theme in PTG measures such as the SRGS (e.g., "I learned to work through problems and not just give up"; Park et al., 1996) and PTGI ("I discovered that I'm stronger than I thought I was"; Tedeschi & Calhoun, 1996). One major conceptual difference between Reconfiguration and PTG is noteworthy. While PTG describes changes that are overall beneficial to an individual's psychological functioning, Reconfiguration may include changes that have positive and negative effects (Lepore & Revenson, 2006). Measures of perceived PTG may not detect these negative changes (Zieba et al., 2019). Conceptually, this resilience dimension may be more relevant in the later stage of the PTG model when integrating changes (Figure 1.1, p. 5), and should show the strongest association with PTG (particularly the Possibilities dimension, which addresses an individual's openness for changes). Individuals with high levels of Reconfiguration may therefore show more veridical PTG over time.

The objective of this study is to examine the relationship between trait resilience and the trajectory of PTG over time. However, the analysis also includes an examination of the association between trait resilience and baseline levels of current-standing PTG, as both constructs describe adaptive responses to adversity. In a prior analysis (Maltby et al., 2015), all three resilience dimensions demonstrated a positive association with subjective and psychological well-being. For the Resistance (Ecological Resilience) dimension, this association held when controlling for personality traits and different coping approaches. It is thus to be expected that

trait resilience – particularly the Resistance dimension – broadly predicts higher baseline levels of current-standing PTG.

This study is exploratory, aiming to refine hypotheses for future research. It explores the linear relationships between three dimensions of trait resilience and five dimensions of veridical PTG using a latent growth curve modelling approach. Associations may vary depending on the specific dimension of PTG and form of resilience involved, and different forms of resilience may be more important for the development of certain manifestations of PTG. This research responds to the call for more longitudinal studies in PTG research (Infurna & Jayawickreme, 2019) and is the first to examine the relationship between trait resilience and PTG multidimensionally. In addition, this dataset will be used to examine the factor structure of the PRAISE scale in individuals with recent exposure to adversity (as discussed in Section 5.3), and its measurement invariance over time.

6.1 Methods

In this study, a longitudinal design is used to examine whether and how different dimensions of trait resilience predict the trajectory of multidimensional PTG over time in individuals with recent experiences of adversity. The study design comprises a pre-screening survey and three surveys (referred to as the main surveys) collecting data to inform the research questions.

The data were collected as part of a larger longitudinal research project that investigated questions relating to PTG from individuals who had recently experienced adversity. The project involved three authors, each with their own sub-studies and pre-registered research questions. The three sub-studies comprised questions about eating behaviour, perceived PTG, rumination, the perceived impact of trauma, and, as reported here, trait resilience and current-standing PTG. Only the data relevant to the present study are described in this section. The research questions, method and

data analytic strategy were pre-registered on Open Science Framework (OSF) before data collection (https://osf.io/ksj3t).

6.1.1 Participants

Participants were recruited through the online recruitment platform Prolific (https://prolific.co). Each participant was paid above the recommended hourly wage of £7.50 after each survey completion.

The inclusion criteria specified that participants 1) must live in the UK, 2) are between 18 and 64 years old, 3) have a minimum approval rate on Prolific of at least 95% and 4) have participated in at least 50 studies on Prolific. Furthermore, participants must have experienced an adverse life event during the six months prior to study begin which they 5) perceived as unpredictable and 6) personally significant. Of these participants who were considered eligible for the main surveys, only those who 7) participate in all three main surveys formed the analysis sample.

A total of 999 individuals who met the first four inclusion criteria were invited to the pre-screening stage, where 395 individuals (39.5%) were found to meet inclusion criteria five and six. Of these 395 participants, 285 (72.2% of eligible and 28.5% of total participants) completed all three trajectory surveys. Demographic characteristics at each of these stages are provided in Table 6.1.

Table 6.1

Demographics of the Longitudinal Study of Resilience and PTG

Demographics	Completed pre-screening		Eligible after pre-screening		Completed all surveys	
	n	%	*n*	%	*n*	%
Sample size	999		395		285	
Sex						
Female	632	63%	258	65%	189	66%
Male	353	35%	131	33%	93	33%
Prefer not to say / NA	14	1%	6	2%	3	1%
Ethnicity						
White British	714	71%	290	73%	213	75%
White European	104	10%	35	9%	23	8%
Black African	26	3%	12	3%	9	3%
Black Caribbean	9	1%	2	1%	2	1%
Other Black	2	0%	2	1%	1	0%
Indian	27	3%	11	3%	8	3%
Pakistani	17	2%	8	2%	6	2%
Bangladeshi	8	1%	2	1%	2	1%
Chinese	20	2%	5	1%	2	1%
Other Asian	15	2%	5	1%	2	1%
Arab	5	1%	3	1%	2	1%
Other	40	4%	16	4%	12	4%
Prefer not to say / NA	12	1%	4	1%	3	1%
Employment						
Undergraduate Student	118	12%	47	12%	31	11%
Postgraduate Student	58	6%	20	5%	9	3%
PhD Student	25	3%	8	2%	5	2%
Employed	579	58%	242	61%	177	62%
Not employed	128	13%	52	13%	41	14%
Retired	29	3%	7	2%	5	2%
Other	50	5%	15	4%	14	5%
Prefer not to say / NA	10	1%	2	1%	2	1%
	M	*SD*	*M*	*SD*	*M*	*SD*
Age	36.32	12.43	36.40	11.95	38.35	12.05

6.1.2 Procedure

The study comprised of two stages: the pre-screening stage and the main study stage. All data were collected across a total time span of four months. The pre-screening survey (T0) was conducted in the first week of August 2021. The three main surveys were conducted in the second week of August (T1), October (T2, two months after T1) and December (T3, four months after T1).

All surveys were administered online using Qualtrics. To invite participants to subsequent surveys and to link the data of each individual across waves, an anonymised Prolific ID was automatically recorded and associated with each participant once they opened the survey.

6.1.2.1 Pre-screening stage to determine study eligibility

Prolific.co allows researchers to filter participants for a limited range of individual characteristics. In order to receive an invitation to the pre-screening survey, inclusion criteria specified that participants had to live in the UK, were between 18 and 64 years old, had a minimum approval rate on Prolific of at least 95% and participated in at least 50 studies on Prolific.

In the pre-screening survey, participants were screened for having experienced an adverse event during the 6 months prior to study begin which they perceived as 1) unpredictable and 2) personally significant. An adverse event with these characteristics has a higher potential to provoke a PTG response than if it solely meets clinical criteria for traumatic stressors (Boals et al., 2010; Gold et al., 2005; Johnson & Boals, 2015). Using adapted instructions from Luhmann et al. (2021), participants were first asked to recall a personally significant negative life event “from any life domain, including education and work, love and partnership, family, friendship or health” which they may have experienced between the 1st of January and the 30th of June 2021. They were asked to briefly describe the event in an open text field and indicate the month during which the event happened. Participants then evaluated their experience using the Event Characteristic Questionnaire (ECQ; Luhmann et al., 2021).

Participants were considered eligible for the main surveys if they scored 1) an average of 3 or lower on the ECQ’s Predictability scale, indicating the event was not expected or anticipated, 2) an average of 3 or higher on the ECQ’s Impact scale, indicating the event was psychologically significant and impactful on the individual’s life, and 3) a score of 3 or higher on the extra item “I need time and space to work

through and process what happened to me", indicating the individual was trying to work through the impact of the event (all scales range from 1-5). Finally, the event descriptions of individuals who met the inclusion criteria were screened by the author and one other PTG researcher involved in the data collection and participants were excluded if they described positive or vague events (e.g., "Christmas and covid", "family event")[4]. The survey also included two attention check items (e.g., "please select 'Applies completely'") to exclude individuals who only skimmed through items.

In addition to event related questions, the pre-screening survey included demographic questions about the ethnicity and employment of participants. Information on age and sex were collected automatically via Prolific. Individuals who met inclusion criteria were invited to the first of three main surveys one week after the pre-screening survey. The invitations were sent out via prolific.co by using the anonymised Prolific ID of eligible individuals as filter criteria.

6.1.2.2 Main study stage

The main study stage comprises three surveys, with two months between each survey. While only little research on the time frame of PTG existed when this study was conducted (Mangelsdorf et al., 2019), the 2-month interval was chosen to not leave too much time between the surveys and retain participants. At T1, participants provided information on their trait resilience levels by completing the EEA Resilience scale and on their current-standing PTG levels by completing the PRAISE scale. Only individuals who completed the T1 survey were subsequently invited to surveys T2 and T3, where they completed the PRAISE scale.

6.1.3 Measures

This section outlines the measures used in the present study. Table 6.2 provides an overview of the measures and time points they were administered at.

[4] This step was carried out because another research project for which the dataset was collected required a detailed description of the event. As individuals who provided positive or vague descriptions were not invited to the follow-up studies, this decision also affected the present study.

Table 6.2

Assessments Conducted in the Longitudinal Examination of Trait Resilience and PTG

Measure	Items	Range (low – high)	Pre-screening (*n* = 999)	T1 (*n* = 377)	T2 (*n* = 321)	T3 (*n* = 301)
Demographics	4		x			
Attention Check	2		x			
Event Description	1		x			
Event Month	1	January – July	x			
Event Characteristics Questionnaire	38		x			
Predictability	4	1 – 5	x			
Impact	4	1 – 5	x			
I need time and space	1	1 – 5	x			
EEA Resilience Scale	12	12 – 60		x		
Ecological Resilience	4	4 – 20		x		
Engineering Resilience	4	4 – 20		x		
Adaptive Capacity	4	4 – 20		x		
PRAISE Scale	28	28 – 140		x	x	x
Possibilities	6	6 – 30		x	x	x
Relationships	6	6 – 30		x	x	x
Appreciation of Life	5	5 – 25		x	x	x
Strength	6	6 – 30		x	x	x
Existence	5	5 – 25		x	x	x

Note. Only two dimensions of the ECQ were used to screen for participants. Measures not used in the present study can be found in the OSF preregistration (https://osf.io/dh4k6).

Event Characteristic Questionnaire (ECQ). This measure comprises 38 items which allow individuals to evaluate nine different characteristics that may differ across major life events (Luhmann et al., 2021). These dimensions are: Challenge, Emotional Significance, External Control, Extraordinariness, Impact, Predictability, Social Status Change, Valence and Change in World Views. Each item is rated on a 5-point Likert scale ranging from 1 ("Does not apply at all") to 5 ("Applies completely"). Scores were created for each dimension by calculating the mean of their associated items. The scores for each dimension therefore range between 1 (low) and 5 (high).

Only the Impact (4 items, e.g., "The event had multiple effects on my daily life.") and Predictability (4 items, e.g., "I knew in advance that the event would be happening") dimensions were used to pre-screen individuals in the present study. They were used in addition to an extra un-standardised item which measured the perceived impact of the event ("I need time and space to work through and process what happened to me"), which used the same instructions and scoring criteria as the ECQ. This item was included to detect whether the event was still relevant to the participant at the time of assessment.

EEA Resilience Scale. This measure comprises 12 items which assess three dimensions of trait resilience (Maltby et al., 2015). The Ecological Resilience dimension (4 items, e.g., "I believe I can achieve my goals, even if there are obstacles") captures an individual's ability to absorb or resist adversity and maintain stability (Resistance). Engineering Resilience (4 items, e.g., "It does not take me long to recover from a stressful event") captures the ability to bounce back quickly from adverse experiences and recover quickly (Recovery). Adaptive Capacity (4 items, e.g., "I enjoy dealing with new and unusual situations") captures an individual's ability to adjust themselves and adapt to changes (Reconfiguration). Participants rated the 12 items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores of each dimension were calculated by using the sum of their

associated items. Two items included in the Engineering Resilience dimension are negative and were reversed. The score of each dimension can range between 4 (low resilience) and 20 (high resilience) points.

PRAISE Scale. The PRAISE Scale (Chapter 4) is a multidimensional current-standing PTG measure which assesses recent levels of positive psychological functioning in five dimensions: Possibilities, Relationships, Appreciation of Life, Strength and Existence. Participants indicate their agreement to each of the 28 items considering how they felt in the previous two weeks on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores of each dimension were calculated using the sum of their items and range between 6 (low) and 30 (high) for those dimensions with six items and 5 (low) and 25 (high) for those with five items.

6.1.4 Ethics

At the start of each survey, participants were presented with an information sheet (Appendix 7) and asked to provide informed consent (Appendix 8) to participate. In case any participants felt distress after completing the surveys, the debrief sheet provided at the end of each survey included contact information of various UK-based mental health organisations and helplines (Appendix 9). The consent form was the same for each survey. The information and debrief sheet were mostly the same and only varied in small details (e.g., expected duration of the survey). For one of the other studies for which the present dataset was collected, descriptions of adverse events participants reported in the pre-screening survey were displayed again at later surveys to remind participants of the nature of their experience. However, as participants completed the measures used in this study before the event details were displayed, priming effects by other measures included in the surveys or the displayed event description is unlikely. Ethical approval for this study was granted by the University of Nottingham School of Psychology research ethics board (REF: S12333).

6.1.5 Data analysis plan

To investigate if and how different dimensions of trait resilience predict the trajectories of each PTG dimension over time in individuals with recent exposure to adversity, latent growth curve modelling (LGCM) was used. LGCM offers a more comprehensive understanding of changes over time (Burant, 2016) compared to using simple change scores (see Section 2.3.3). For example, it not only allows examination of the magnitude of change (how much current-standing PTG levels change) but also the rate of change (how quickly the change happens). LGCM also allows researchers to examine the association between trait resilience and the intercept of the current-standing PTG dimensions. As the present study includes three assessment points for current-standing PTG, only linear rather than curvilinear trajectories can be analysed. Under these conditions, latent growth curve models are also referred to as linear growth curve models (Duncan & Duncan, 2009). All analyses were carried out using STATA 17 (StataCorp, 2021).

Prior to the LGCM analysis, demographic differences between individuals who were and were not found eligible in the pre-screening survey were examined. Differences in ethnicity and employment were tested by using Pearson's Chi-Square Test for independence (McHugh, 2013). Mean differences in age were examined using a two-sample t-test. Additionally, demographic differences and differences in EEA Resilience and PRAISE dimensions reported at T1 were examined between participants who completed all three main surveys and participants who completed T1 but not the T2 or T3 survey. Demographic differences were examined as outlined above, mean differences in trait resilience and current-standing PTG dimensions were examined using two-sample t-tests.

Furthermore, the factor structures of the EEA Resilience Scale and PRAISE scale were tested to make sure that each measure could be interpreted multidimensionally in the present sample. For the EEA Resilience scale, a correlated

3-dimensional model as suggested by Maltby et al. (2015) was tested. For the PRAISE scale, a correlated 5-dimensional model was tested[5]. The CFAs used maximum likelihood estimation and robust (Satorra-Bentler adjusted) standard errors (Satorra & Bentler, 1994) to account for nonnormality; the model fit was evaluated based on the robust Chi-Square, robust CFI, robust RMSEA, and SRMR indices. Adequate model fit was indicated by a CFI and TLI > .90, RMSEA < .08, and SRMR < .06 (Hu & Bentler, 1998). Additionally, the PRAISE scale was tested for longitudinal measurement invariance across the three assessments. As STATA 17 does not support measurement invariance testing with Satorra-Bentler adjusted X^2 statistics, unadjusted error terms were used for this analysis. Measurement invariance was examined by comparing the following four models: 1) configural invariance (equal form), 2) metric invariance (equal form and loadings), 3) scalar invariance (equal form, loadings, and intercept), 4) residual invariance (equal form, loadings, intercepts, and error terms).

To interpret latent mean differences, at least scalar invariance should be achieved. This would mean that across the three assessment time points, the same items load on the same dimensions, their factor loadings are similar, and that the item intercepts are similar (Putnick & Bornstein, 2016). If scalar invariance is not achieved, differences between time points may be attributed to measurement issues rather than actual changes. For example, non-invariance of an item intercept would mean that individuals rate this item much higher in one survey, but this increase does not relate to increased levels of this dimension (Putnick & Bornstein, 2016).

[5] The PRAISE scale has demonstrated significantly better model fit indices when additionally allowing for small item cross-loadings using a Bayesian CFA. This mostly reflects that standard CFA assumptions are too restrictive and that the PRAISE scale can be interpreted multidimensionally despite not meeting conventional cut-off values for good model fit in a standard CFA. This finding therefore does not affect how scores are created and interpreted. While taking the methodological limitations into account for the interpretation of the results, a standard model is assumed for the purpose of the present analyses. For comparison of the Bayesian CFA model across chapters, results for the present sample using model specifications outlined in Section 4.1.4 are provided in Appendix 12.

Invariance of items residuals (residual invariance) is not required to interpret latent mean differences.

The LGCM analysis was carried out using maximum likelihood estimation and robust (Satorra-Bentler adjusted) standard errors to account for non-normality. Due to the exploratory nature of the LGCM analysis in this study, Bonferroni correction was applied to evaluate the significance of the results. To reflect the change per month, the time variable used in the LGCM was set to the value 0 for T1, 2 for T2 and 4 for T3. In the first set of latent growth curve models, the general pattern of change over time was examined without including trait resilience dimensions or other predictors to determine if there was significant mean-level change over time for each PRAISE dimension. The second set of latent growth curve models included the three resilience dimensions (each centred) as predictors and the month in which the event occurred (January = 0 to June = 5) as a control variable[6]. The control variable was included because changes over time might be different when the event was experienced more recently compared to being experienced several months ago. For PRAISE dimensions which showed changes over time (i.e., a significant slope) in the first set, predictors were examined in their effect on both the intercept and slope. For PRAISE dimensions which showed no significant change over time, only the predictor's effect on the intercept was examined.

For additional information about the general test-retest reliability of each PRAISE scale, intraclass correlation coefficients (ICC) were calculated using a single-measurement, absolute-agreement, 2-way mixed-effects model using all three time points.

[6] Controlling for the month has the same effect as controlling for the time since the event occurred. Setting January to 0 has the benefit that the intercept in Table 6.7 can be interpreted as the expected value for individuals with average trait resilience levels who had their experience in January.

6.2 Results

The results are presented in five sub-sections – 1) differences in demographics, trait-resilience and PRAISE between individuals with complete and incomplete participation, 2) confirmatory factor analysis of the EEA resilience scale, 3) measurement invariance of the PRAISE Scale across the three follow-up studies, 4) analysis of mean-level changes of the five PRAISE scale dimensions across the three follow-up studies, and 5) the association between trait resilience and veridical PTG.

The month in which participants experienced their adverse event is reported in Table 6.3. Descriptive information of each measure and sub-scale is provided in Table 6.4. Descriptive information for each item of the PRAISE scale is provided in Appendix 10.

Table 6.3

Month Distribution of Reported Adverse Event

	Completed pre-screening		Eligible after pre-screening		Completed all surveys	
	n	%	*n*	%	*n*	%
January	213	21.3%	85	21.5%	61	21.4%
February	136	13.6%	52	13.2%	40	14.0%
March	165	16.5%	68	17.2%	47	16.5%
April	112	11.2%	48	12.2%	33	11.6%
May	125	12.5%	52	13.2%	41	14.4%
June	248	24.8%	90	22.8%	63	22.1%
Total *n*	999	100%	395	100%	285	100%

Note. Answers to the question “When did this event happen?” included in the pre-screening survey T0. The responses were converted into numeric values (0 = January to 5 = June) for the present analysis.

Table 6.4

Descriptive Scale Information for the PRAISE and EEA Resilience Scales (n = 285)

Scale	*M*	*SD*	Minimum	Maximum	Skewness	Kurtosis	α	ω
			T1					
EEA Resilience Scale	38.37	7.42	18	60	0.05	-0.84	.87	.86
Ecological Resilience	15.31	2.78	7	20	-0.66	0.34	.82	.82
Engineering Resilience	10.60	3.56	4	20	0.39	-0.46	.86	.86
Adaptive Capacity	12.46	3.12	4	20	-0.06	-0.60	.81	.81
PRAISE Scale	97.64	16.29	60	140	-0.24	-0.86	.93	.93
Possibilities	20.29	4.16	11	30	-0.13	-0.58	.77	.78
Relationships	23.52	3.80	10	30	-0.80	0.57	.82	.83
Appreciation of Life	17.39	3.44	8	25	-0.39	-0.79	.74	.75
Strength	20.82	4.41	9	30	-0.55	-0.67	.84	.84
Existence	15.63	4.05	6	25	-0.10	-0.50	.72	.73
			T2					
PRAISE Scale	96.53	16.43	35	135	-0.50	0.34	.93	.93
Possibilities	19.81	4.28	9	30	-0.08	-0.63	.79	.79
Relationships	23.25	3.67	6	30	-1.02	1.82	.83	.84
Appreciation of Life	17.27	3.49	5	25	-0.66	0.46	.76	.77
Strength	20.77	4.39	6	30	-0.57	0.09	.85	.85
Existence	15.42	4.06	5	25	-0.24	-0.53	.75	.76
			T3					
PRAISE Scale	95.68	17.82	30	140	-0.42	0.66	.94	.94
Possibilities	19.38	4.40	7	30	-0.17	0.03	.78	.78
Relationships	22.96	4.05	6	30	-0.86	1.38	.83	.84
Appreciation of Life	17.23	3.63	5	25	-0.40	0.32	.77	.79
Strength	20.80	4.80	7	30	-0.55	0.01	.86	.87
Existence	15.32	4.22	5	25	-0.11	-0.67	.78	.79

6.2.1 Differences between complete and incomplete participation

Demographic differences were tested between individuals who were found eligible (n = 395) vs not eligible (n = 604) in the pre-screening survey (Table 6.1). Of the non-eligible participants, 588 were excluded due to their responses to the ECQ and 16 were excluded based on their event descriptions. No significant differences at an $\alpha < .05$ level were found for sex ($\chi^2(3) = 4.56$, $p = .21$), ethnicity ($\chi^2(12) = 10.72$, $p = .55$) or employment ($\chi^2(7) = 8.90$, $p = .26$). Furthermore, no significant mean age differences were found between individuals who were eligible (M = 36.40, SD = 11.95) vs not eligible (M = 36.27, SD = 12.74), $t(997) = -0.16$, $p = .87$.

Differences in ethnicity, employment, mean age, the EEA Resilience dimensions reported at T1 and the five PRAISE dimensions reported at T1 were examined between individuals who participated in all follow-up surveys (n = 285) and individuals who completed the T1 survey but not T2 or T3 (n = 92). Participants who did not complete all surveys were significantly younger (M = 31.39, SD = 10.14) than participants who completed all follow-up measures (M = 38.35, SD = 12.05), $t(393) = -5.40$, $p < .001$. However, there were no significant differences in sex ($\chi^2(3) = 0.90$, $p = .83$), ethnicity ($\chi^2(12) = 10.24$, $p = .60$) or employment ($\chi^2(7) = 12.36$, $p = .09$) at $\alpha < .05$ level. Mean levels of the EEA Resilience and PRAISE dimensions assessed at T1 did not significantly differ between the two groups either.

6.2.2 Factor structure of the EEA Resilience Scale

The sample was considered large enough for structural equation modelling (Wolf et al., 2013) and demonstrated adequacy for factor analysis (Bartlett's Test of Sphericity $(BS)_{EEA}$: $\chi^2(66) = 1540$, $p<.001$; $KMO_{EEA} = .859$).

A correlated 3-dimensional model was tested for the EEA Resilience Scale at T1. The model provided good fit indices ($SB\chi^2 = 106$, df = 51, robust CFI = .960, robust TLI = .948, SRMR = .056, robust RSMEA = .061 [90% CI .045 - .078]), supporting a multidimensional interpretation of trait resilience (Hu & Bentler, 1999).

6.2.3 Measurement invariance of the PRAISE Scale

The sample demonstrated adequacy for factor analysis (BS_{PRAISE}: $\chi^2(378) = 11445$, $p<.001$; $KMO_{PRAISE} = .946$). Model fit indices and the results for the measurement invariance analysis of the PRAISE scale are reported in Table 6.5. The measurement invariance test indicated scalar invariance, as the model fit did not become significantly worse until the same item residuals at each time point was assumed. The PRAISE scale was thus interpreted multidimensionally.

Table 6.5

Measurement Invariance Results for the PRAISE Scale (n = 285)

Model	χ^2	*df*	CFI	SRMR	RMSEA	comparison	$\Delta\chi^2$	Δdf	*p*	ΔCFI
T1 5 correlated dimensions*	792	340	.847	.070	.068					
T2 5 correlated dimensions*	769	340	.866	.066	.067					
T3 5 correlated dimensions*	760	340	.876	.065	.066					
1. Configural Invariance	2728	1020	.849	.067	.077	–	–	–	–	–
2. Metric Invariance	2783	1066	.848	.074	.075	2v1	54	46	.184	.001
3. Scalar Invariance	2844	1122	.848	.074	.073	3v2	62	56	.279	.000
4. Residual Invariance	2931	1178	.845	.075	.072	4v3	86	56	.006	.003

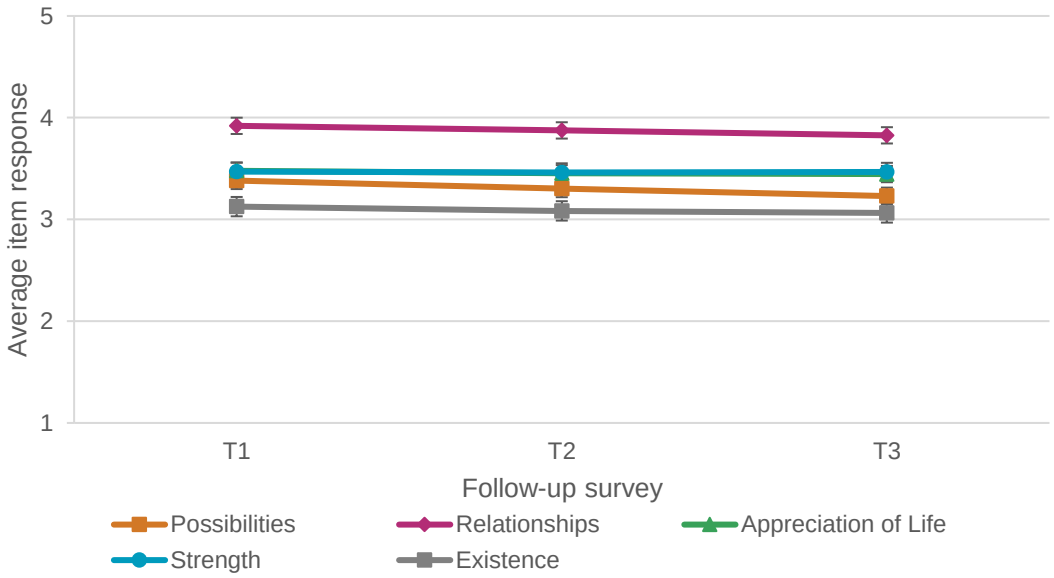
Notes. χ^2 = chi-squared goodness of fit; *df* = degrees of freedom; CFI = comparative fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation, vs = models compared. *Satorra-Bentler corrected χ^2, CFI, and RMSEA.

6.2.4 Mean-level change of the five PRAISE dimensions

The means and standard deviations of each PRAISE dimension at each time point are listed in Table 6.4. As the number of items differ across dimensions and hence the range of possible outcome values differ, the trajectory of each PRAISE dimension is visualised in Figure 6.1, using the average response per item which range from 1 (strongly disagree) to 5 (strongly agree). The intraclass correlation coefficients (ICC) indicated moderate test-retest reliability (Koo & Li, 2016), with an ICC = .53 for the Possibilities dimension, ICC = .64 for Relationships, ICC = .65 for Appreciation of Life, ICC = .63 for Strength, and ICC = .68 for the dimension Existence. The total PRAISE scale showed an ICC of .67.

Figure 6.1

Trajectories of each PRAISE Dimension Using Average Item Responses



Note. Means were used instead of scores for comparison reasons, as the range of possible scores differs across dimensions due to the different number of items in them. Item response options range from 1 (strongly disagree) to 5 (strongly agree). Error bars represent the 95% confidence intervals.

Latent growth curve models were conducted for each PRAISE dimension separately to test whether each dimension shows significant mean level change over time (Table 6.6). When using the Bonferroni-corrected significance threshold, only

the Possibilities (-0.23, $p < .001$) dimension showed a significant negative slope, indicating decline over time. The slope for the dimensions Relationships, Appreciation of Life, Strength, and Existence were not significant, suggesting stability over time. Each PRAISE dimension showed significant variance in their intercept. However, no PRAISE dimension showed significant variance in the slope. Furthermore, no significant covariances between the intercept and variance were found for any dimension.

Table 6.6

Latent Growth Curve Model for Each PRAISE Dimension Without Predictors and Covariates (n = 285)

	Mean			Variance		
	Estimate	*SE*	*p*	Estimate	*SE*	*p*
Possibilities						
Intercept	20.280	0.238	**<.001*** **	9.869	2.010	**<.001*** **
Slope	-0.228	0.060	**<.001*** **	0.008	0.272	.976
Relationships						
Intercept	23.521	0.218	**<.001*** **	9.549	1.655	**<.001*** **
Slope	-0.139	0.051	.006*	0.037	0.155	.809
Appreciation of Life						
Intercept	17.382	0.202	**<.001*** **	9.391	1.353	**<.001*** **
Slope	-0.042	0.047	.379	0.242	0.128	.060
Strength						
Intercept	20.805	0.252	**<.001*** **	11.648	1.850	**<.001*** **
Slope	-0.006	0.061	.925	0.015	0.249	.953
Existence						
Intercept	15.610	0.234	**<.001*** **	11.374	1.587	**<.001*** **
Slope	-0.077	0.050	.128	0.074	0.195	.704

Note. Unstandardized estimates were provided. *SE* = standard error. * $p < .05$; ** $p < .01$; *** $p < .001$. Covariances between the Intercept and Slope were all not significant ($p > .05$). **Bold** *p*-values were significant after Bonferroni correction. The Bonferroni-corrected significance threshold was calculated by dividing the standard significance threshold of $\alpha = .05$ by the number of significance tests in the present table (20 p-values included), resulting in a Bonferroni-corrected significance threshold of $\alpha_{Bonferroni} = .0025$).

As insignificant variance suggests that the individual trajectories in the dataset follow the same pattern (Burant, 2016), the effect of trait resilience on the

change over time (slope) will be analysed only for the Possibilities dimension, for which significant changes were observed. The effect of trait resilience on the intercept will be examined for all five dimensions.

6.2.5 Examining the association with trait resilience

Following the analysis of significant slopes in the PRAISE dimensions, five additional LGCM analyses were conducted. These LGCMs included each trait resilience dimension (Engineering Resilience, Ecological Resilience, Adaptive Capacity) as predictors. Furthermore, the analyses included the month in which the individual experienced their adverse event (Table 6.3) as a covariate to control for the time that passed since the reported event. The analysis examined the association between the trait resilience dimensions and the slope of the Possibilities dimension, as the latter showed significant mean level change in the previous section. The LGCMs also analysed the association between the three trait resilience dimensions and the intercept of each PRAISE dimension. The LGCM results are summarised in Table 6.7. Bonferroni-corrected significance thresholds were used to determine the significance of findings.

Table 6.7

Latent Growth Curve Model for Each PRAISE Dimension Including Predictors & Covariates (n = 285)

	Coeff.	95% CI		SE	*p*
		LL	*UL*		
Possibilities					
Intercept (R^2 = .418)	19.916	19.268	20.565	0.331	**<.001*** **
Ecological Resilience	0.481	0.307	0.654	0.089	**<.001*** **
Engineering Resilience	0.124	-0.007	0.255	0.067	.064
Adaptive Capacity	0.272	0.108	0.437	0.084	**.001** **
Month of Event	0.146	-0.060	0.352	0.105	.165
Slope (R^2 = .265)	-0.200	-0.374	-0.027	0.089	.024*
Ecological Resilience	-0.054	-0.100	-0.007	0.024	.024*
Engineering Resilience	-0.005	-0.043	0.033	0.019	.792
Adaptive Capacity	-0.006	-0.045	0.032	0.020	.752
Month of Event	-0.011	-0.071	0.049	0.031	.719
Relationships					
Intercept (R^2 = .184)	23.247	22.600	23.895	0.330	**<.001*** **
Ecological Resilience	0.388	0.207	0.568	0.092	**<.001*** **
Engineering Resilience	0.182	0.067	0.297	0.059	.002**
Adaptive Capacity	-0.082	-0.234	0.070	0.078	.289
Month of Event	0.109	-0.081	0.300	0.097	.261
Appreciation of Life					
Intercept (R^2 = .356)	17.403	16.928	17.878	0.242	**<.001*** **
Ecological Resilience	0.324	0.186	0.462	0.070	**<.001*** **
Engineering Resilience	0.312	0.222	0.403	0.046	**<.001*** **
Adaptive Capacity	-0.005	-0.129	0.119	0.063	.933
Month of Event	-0.039	-0.186	0.109	0.075	.608
Strength					
Intercept (R^2 = .628)	20.854	20.353	21.355	0.256	**<.001*** **
Ecological Resilience	0.481	0.333	0.628	0.075	**<.001*** **
Engineering Resilience	0.517	0.422	0.612	0.049	**<.001*** **
Adaptive Capacity	0.090	-0.042	0.221	0.067	.181
Month of Event	-0.022	-0.175	0.131	0.078	.778
Existence					
Intercept (R^2 = .368)	15.705	15.100	16.310	0.309	**<.001*** **
Ecological Resilience	0.440	0.301	0.580	0.071	**<.001*** **
Engineering Resilience	0.337	0.227	0.447	0.056	**<.001*** **
Adaptive Capacity	-0.004	-0.153	0.146	0.076	.963
Month of Event	-0.094	-0.288	0.100	0.099	.342

Predictor / Covariate	*M*	*SD*	Min	Max	2.	3.	4.
1. Ecological Resilience	0.00	2.78	-8.31	4.69	.42***	.42***	-.04
2. Engineering Resilience	0.00	3.12	-8.46	7.54		.42***	-.06
3. Adaptive Capacity	0.00	3.56	-6.60	9.40			-.12*
4. Month of Event	2.50	1.85	0	5			

Note. Satorra-Bentler adjusted error terms were used. Ecological Resilience, Engineering Resilience, and Adaptive Capacity are centred. Month of event: 0 = January; 5 = June. The Intercept thus corresponds to an individual with average levels on each resilience dimension in January. * $p < .05$; ** $p < .01$; *** $p < .001$. **Bold** LGCM *p*-values were significant after Bonferroni correction. The Bonferroni-corrected significance threshold $\alpha_{Bonferroni} = .0017$ was calculated by dividing the standard $\alpha = .05$ by the number of significance tests in the LGCM (35 p-values included).

The variance of slope of the Possibilities dimension (27%) was much less explained than the variance of intercepts across dimensions. The negative slope of the Possibilities dimension was predicted by Ecological Resilience (p = .024) but not significantly when using Bonferroni-corrected significance thresholds. Thus, none of the trait resilience dimension predicted changes in current-standing PTG levels over time, nor did the month in which participants experienced adversity.

Trait resilience predicted between 18% (Relationships) and 63% (Strength) of the variance in PRAISE intercepts. The Possibilities intercept (R^2 = .418) was mostly predicted by Ecological Resilience and significantly by Adaptive Capacity. The Relationships intercept (R^2 = .184) was only significantly predicted by Ecological Resilience. The intercepts of the Appreciation of Life (R^2 = .356) and Existence (R^2 = .368) dimensions were similarly predicted by trait resilience, specifically by the Ecological and Engineering Resilience dimensions (both with similar coefficients). Strength stood out as the PRAISE dimensions with the highest explained variance by trait resilience (R^2 = .628) and was significantly predicted by Engineering Resilience, closely followed by Ecological Resilience.

Ecological Resilience (Resistance) was the strongest and most consistent predictor of PRAISE intercepts. It showed the strongest positive association with four PRAISE dimensions and predicted all five significantly. Engineering Resilience (Recovery) was the strongest predictor of the Strength dimension and predicted the intercept of the Appreciation of Life and Existence dimensions significantly. Adaptive Capacity (Reconfiguration) was only positively associated with the intercept of the Possibilities dimension. The time passed since the adverse event, which was included as a possible confounding variable, did not significantly predict any of the PRAISE intercepts.

Variances and covariances of the LGCM are shown in Table 6.8. Significant variance in the intercept of each PRAISE dimension was observed, but not for the slopes. This means that individuals showed different baseline levels of PRAISE

dimensions but developed in very similar trajectories over time (the insignificant slope indicating stability). The covariance between the intercept and slope was also not significant. In other words, individuals showed the same (stability) trajectory over time regardless of their baseline PRAISE levels.

Table 6.8

Variances and Covariances of the LGCM with Predictors and Covariates.

	Estimate	*SE*	*z*	*p*
Variance of the Intercept				
Possibilities	6.148	1.671	3.679	<.001***
Relationships	8.332	1.542	5.405	<.001***
Appreciation of Life	5.209	0.669	7.782	<.001***
Strength	4.779	0.749	6.384	<.001***
Existence	7.251	0.739	9.811	<.001***
Variance of the Slope				
Possibilities	0.077	0.243	0.316	.752
Covariance between the Intercept and Slope				
Possibilities	0.165	0.488	0.337	.736

Note. n = 285. * p < .05; ** p < .01; *** p < .001.

6.3 Discussion

This study investigated whether and how trait resilience predicts veridical PTG in adults living in the UK, who had experienced significant adversity in the six months prior to study conduct. Trait resilience was measured in relation to Resistance (Ecological Resilience), Recovery (Engineering Resilience), and Reconfiguration (Adaptive Capacity). PTG was assessed in the five dimensions of Possibilities, Relationships, Appreciation of Life, Strength, and Existence.

Close to 40% of the participants invited to the pre-screening survey reported an event that qualified as significantly adverse following this study's working definition (Table 6.3). This equates to an incidence ratio of 5-9% per month. The overall attrition over three follow-up measures across four months was 27.8%. This

information may be useful for the sample size calculation of future prospective studies.

6.3.1 Psychometric assessment of the PRAISE Scale

The PRAISE Scale demonstrated similar fit indices as observed in previous studies (see Section 4.2.1 and 5.2), indicating that its correlated 5-dimensional factor structure is consistent in both general UK populations and UK populations with recent exposure to adversity. The achievement of scalar invariance (assuming five correlated dimensions) across three time points in the present study further supports the reliability of the PRAISE scale, as it demonstrates the measure's ability to produce consistent results across different time points (Putnick & Bornstein, 2016). Test-retest reliabilities were moderate for each dimension, although slightly lower compared to a previous assessment conducted with a two-week interval (see Section 4.2.2). The decrease in test-retest reliability over a longer period of time is expected for a measure designed to assess changes longitudinally (McCrae et al., 2011).

6.3.2 Changes in current-standing PTG over time

The first analysis examined whether participants showed significant changes in current-standing PTG dimensions (veridical PTG) over time. Despite exposure to adverse life events shortly before the study, individuals displayed mostly stable trajectories of current-standing PTG over a four-month period, with only the Possibilities dimension demonstrating small but significant negative changes over time. These findings suggest that, on average, individual experienced slight posttraumatic depreciation in this area during the study; no general patterns of veridical PTG were identified in the sample. As a result, the study’s ability to examine predictors of veridical PTG was limited by the lack of positive changes observed. However, this does not necessarily indicate that individuals will not experience PTG at a later stage of working through their experiences, as further discussed in Section 6.3.4.

The use of LGCM analysis in this study additionally allowed for the meaningful interpretation of baseline current-standing PTG and its association with trait resilience. Each PRAISE dimension showed significant variability in the intercept across individuals. In the next section, the predictive effect of each trait resilience dimension on the slope of Possibilities and the intercept of each PRAISE dimension will be discussed.

6.3.3 Trait resilience as a predictor of veridical PTG

The main aim of this study was to explore the association between trait resilience and veridical PTG – changes in current-standing PTG levels over time. Trait resilience explained little to none of the already small changes observed in current-standing PTG over time. The Possibilities slope was negatively predicted by Ecological Resilience (Resistance), which means that individuals with high Ecological Resilience showed decreases in the Possibilities dimension over time. However, this effect was not robust, and became insignificant when using a Bonferroni-corrected significance threshold due to the exploratory nature of the analysis. Thus, no predictive association between trait resilience and veridical PTG (i.e., changes in current-standing PTG levels) could be identified in this sample and time window.

While no veridical PTG was observed in this study, the LGCM analysis suggested a significant association between some dimensions of trait-resilience and baseline current-standing PTG. Individuals with higher levels of trait resilience showed higher levels of baseline current-standing PTG across dimensions. The following paragraphs discuss which trait-resilience and baseline current-standing PTG levels showed a significant association.

Ecological Resilience (Resistance) and Engineering Resilience (Recovery) showed significant and similarly high prediction coefficients for the baseline levels (intercepts) of the PRAISE dimensions Appreciation of Life, Strength, and Existence. The coefficients of Ecological Resilience (Resistance) were slightly higher (although

confidence intervals were overlapping) and also predicted the baseline levels of the Possibilities and Relationships dimensions significantly, making it the most important predictor of baseline current-standing levels of PTG. Adaptive Capacity (Reconfiguration) only predicted baseline levels of the Possibilities dimension significantly.

The important role of Ecological Resilience (Resistance) in predicting baseline PTG levels is in line with previous research (Maltby et al., 2015), where this dimension demonstrated a robust association with subjective and psychological well-being even after controlling for personality traits and coping behaviour. The insignificant association between Engineering Resilience (Recovery) and baseline levels of the Relationships dimension was a surprise, as social support has been a consistent predictor of post-adversity recovery (Birkeland et al., 2017; Prati & Pietrantoni, 2009). Here, it is advisable to take the greater context of the analysis into consideration, as the confidence intervals of prediction coefficients were relatively large, and the association would be significant at $p = .002$ if Bonferroni correction was not applied. One possible explanation for the smaller than expected association are the quite narrow focused items on recovering from adverse events (including two reversed items) included in the Engineering Resilience subscale, which may limit how comprehensive the construct is captured.

The small role of Adaptive Capacity (Reconfiguration) was also surprising, as this dimension is conceptually the closest to PTG due to its focus on transformative change (Lepore & Revenson, 2006). At the item level, the dimension assesses openness for experiences and participants are asked whether they like uncertainty and are interested in changing their routine. Openness for experiences (albeit assessed with a different measure) demonstrated little associations with the dimensions of the PRAISE scale in the analysis of its convergent validity (see Section 4.2.3, p. 80), which supports the observed findings of this study. The strongest association was found for the Possibilities dimension, which captures

whether individuals put changes into action. The small observed association in this study may suggest that the ability to follow new opportunities may not necessarily rely on whether a person generally looks favourably towards changes, and it is more important that an individual is determined to improve their life experience (Ecological Resilience). However, caution should be taken not to extrapolate the relationship between trait resilience and baseline PTG to changes over time. While Adaptive Capacity may not be a good predictor of baseline well-being in PTG-related dimensions, it may still facilitate changes over time at later stages in the process.

In terms of PRAISE dimensions, the variance of the Strength intercept was particularly well explained, with nearly 63% of the variance accounted for, mostly by Ecological Resilience (Resistance) and Engineering Resilience (Recovery). The association with the Relationships intercept was the weakest, with only 18% of variance in the intercept explained. These findings suggest that external resources, such as social support, may be less strongly associated with trait resilience than internal resources such as self-efficacy. Indeed, research found a medium to strong association between perceived self-efficacy and a range of different resilient qualities such as adaptability, engagement, and competence (Sagone et al., 2020). In the validation study of the PRAISE scale, self-efficacy showed the strongest association with the Strength dimension and the lowest with the Relationships dimension as well (see Section 4.2.3, p. 80). These results highlight the importance of examining different dimensions of both constructs and the potential role of self-efficacy in linking the constructs together.

6.3.4 Possible explanations for the stability of current-standing PTG

One reason for the lack of significant changes may be the short duration of this study. In a meta-analysis of longitudinal PTG studies, changes in constructs that act as proxy measures for PTG have only been identified in studies which lasted for more than a year (Mangelsdorf et al., 2019). The authors of the meta-analysis

therefore recommended a minimum study duration of 18 months after event exposure. Participants of the present study responded to the first survey between two and seven months after event exposure, and changes in their responses were only observed over a period of four months. They may therefore simply not have had enough time to integrate their experiences and develop veridical PTG.

Conceptually, individuals are likely to experience a temporary decrease of well-being in the weeks or months after exposure to adversity before ultimately experiencing a significant increase (Infurna et al., 2022). However, individuals did not report much difference in values for any dimension at any time point when compared with the PRAISE scores of general populations reported in Chapter 4 and Chapter 5 (see Appendix 11). One possible explanation could be that the adverse events individuals reported were not severe enough to affect their well-being. While all individuals reported an event they evaluated as personally significant, impactful, and unexpected, the cut-off values used on the screening measures may have been too low and individuals may not have experienced an event that was ‘seismic’ enough to affect their PRAISE levels. However, other prospective longitudinal studies also found mostly stable trajectories in PTG-related characteristics such as wisdom (Dorfman et al., 2022) or life satisfaction (Infurna et al., 2022) in time periods up to two years after the experience of a PTE. This suggests that individuals may show much more stability in their psychological functioning than theoretically assumed. Trajectories of veridical PTG might be far less common than perceptions of PTG. Considering that retrospective perceptions of PTG may be a form of coping or secondary appraisal (Boals, Jayawickreme, et al., 2022), this would put the theoretical premise that PTG is an experience shared by many individuals into question.

A less profound reason for the lack of significant changes may alternatively be the choice of analysis method in this study. The experience of veridical PTG may not be identified when using methods which assume that the whole sample follows

one general trajectory over time (Chopik et al., 2022). Several recent longitudinal studies on PTG have used LGCM analysis but were not able to identify positive changes at group level (Blackie & McLean, 2022; Laceulle et al., 2022) over a time period of one year. As PTG seems to not be the default experience after experiencing significant adversity, methods which focus on identifying subgroups within populations could be more useful. Latent class trajectory analyses such as growth mixture modelling (GMM) may help identify individuals who show PTG and factors which predict their distinct trajectory (Infurna & Jayawickreme, 2019). However, these methods require relatively large sample sizes, so may not lead to robust findings if the PTG group is too small (e.g., < 5%; Herle et al., 2020) or the length of the study too short.

While the study results at least challenge the idea that that most individuals experience significant changes (both in form of PTG as well as temporary decreases) in their current-standing PTG in the months after their adverse experience, the study design does not allow for definite conclusions about the empirical trajectory of veridical PTG along the PRAISE dimensions or whether trait resilience aids individuals in developing PTG. Future studies may use longer assessment periods and examine whether subgroups emerge to answer this research gap.

6.3.5 Strengths, limitations and future research

The first strength of this study is the use of validated and multidimensional measures to examine the relationship between trait resilience and veridical PTG. This approach allowed for the identification of nuanced associations between resilience dimensions and PTG intercepts. The benefits of assessing veridical PTG over perceived PTG have been well established in Section 1.1.2 (p. 6). The second strength is the use of LGCM to analyse the data, rather than relying on simple change scores. While a latent class approach might be ultimately more useful to identify PTG trajectories, the use of LGCM is a significant advance in the current-

standing PTG literature, compared to previous analysis approaches (see Section 2.2.3.2, p. 43). The third strength of this study is the relatively large sample size and conceptually grounded pre-screening process for participants, ensuring that the sample is composed of individuals who fit the theoretical characteristics of those who may experience PTG (Boals et al., 2010). This is also a significant improvement over past studies using current-standing PTG measures, which have mostly relied on smaller student populations and did not examine whether the experienced events were perceived as impactful or unexpected (see Section 2.2.3.3).

Several limitations should be acknowledged. First, by including only three assessment time points, the study was unable to analyse non-linear changes in current-standing PTG (Curran et al., 2010). As a form of changes in psychological functioning, PTG is not expected to continue indefinitely but stop and plateau at some point. Considering research on hedonic adaptation (Diener et al., 2006), the trajectory of current-standing PTG may even show a slight decline after reaching a peak, ultimately balancing out slightly above the pre-trauma baseline. Second, this study is longitudinal but not prospective, as it does not include pre-adversity data. Changes over time were thus not measured in reference to pre-trauma baseline current-standing PTG, but rather reflect changes during a 4-month window starting a few weeks or months after the exposure to adversity. This is particularly important as changes during the first days and weeks after adversity exposure may differ from the changes during the weeks and months after (Infurna et al., 2022). The delay in assessment may also affect the data on trait resilience, which were collected after the reported event. While the time since the event (which was not significantly associated with any PRAISE dimensions in the present study) was controlled for to mitigate the effect of time passed, it does not allow for making inferences about changes that may have happened before or after the assessed time window. Therefore, it is highly advised to assess baseline well-being before the experience of adverse life events in future longitudinal research on veridical PTG. Third, the study

duration of four months is relatively short. While it is substantially longer than most studies identified in Chapter 2 (only two exceeded this study's duration), veridical PTG may need substantially more time to emerge, as discussed in Section 6.3.4. Therefore, a duration of at least 18 months after event exposure might be a promising starting point of future studies of veridical PTG (Mangelsdorf et al., 2019).

Finally, the inclusion of a no-adversity control group could be considered in future studies. A control group consisting of individuals who did not experience an adverse event prior to the study was not included in this study. While PRAISE levels reported in previous studies provided broad reference values to evaluate whether the sample of the present study scored higher or lower, a reference group assessed at the same time would provide more robust insights and would have been preferable, even in non-prospective study designs (Blackie & Hudson, 2022).

6.3.6 Conclusion

This study aimed to examine the multidimensional relationship between trait resilience and veridical PTG in individuals with recent exposure to adversity longitudinally, using latent (linear) growth curve modelling. The sample of UK adults showed stability in PTG during the examined time window of four months on group level. A predictive association between trait resilience and veridical PTG (changes over time) was not observed, but particularly individuals with higher levels of Resistance (Ecological Resilience) and Recovery (Engineering Resilience) at the begin of the study reported higher levels of each PTG dimension at each follow-up survey. The strength of the association varied across PTG dimension, indicating that internal resources (i.e., the Strength dimension) are more predicted by trait resilience than external resources (i.e., the Relationships dimension). The inclusion of multidimensional resilience- and well-being measures in longitudinal datasets is highly advised to extend research on recovery and growth processes after trauma, and unidimensional approaches may miss important details. Furthermore, future

studies may use prospective study designs with a longer assessment period and a non-adversity control group or analyse trajectories on the individual level.

Chapter 7 General discussion

This thesis sought to answer the question of whether and how trait resilience predicts the development of veridical PTG over time. Both constructs were assessed multidimensionally. For the assessment of veridical PTG over time, a new comprehensive current-standing measure – the PRAISE scale – was developed and psychometrically validated. Section 7.1 briefly revisits the aims and main findings of each chapter. In the empirical research conducted to address the main research question, no clear evidence for an empirical association between trait resilience and veridical PTG was found. However, it cannot be ruled out that a significant relationship between the two constructs exists, but the data assessed did not allow this association to be detected. This is further discussed in Section 7.2. Despite this null finding, the present thesis developed three important knowledge contributions. These are discussed in Section 7.3. Strengths and limitations which expand beyond those for single chapters are addressed in Section 7.4. Finally, the implications for future research on the relationship between trait resilience and veridical PTG as well as research on PTG in general are discussed in Section 7.5.

7.1 Summary and discussion of main findings

While a multidimensional and psychometrically validated trait resilience measure was readily available for the purpose of this thesis (see Section 1.2.1, p. 21), the choice of a measure for the assessment of veridical PTG was not as clear. To identify the available options, a scoping review of published current-standing PTG measures was conducted in Chapter 2. Only one of six identified measures – the C-PTGI – has been used in more than one study. Furthermore, the measures were mostly used to explore the differences between perceived and veridical PTG and rarely included in studies with more than two assessment time points. None of the available measures seemed appropriate to address the present thesis's research question, as they were either 1) developed for specific study designs, 2)

unidimensional, 3) not thoroughly psychometrically validated, or 4) only included adapted items from the original PTGI and therefore had limited comprehensiveness.

A new current-standing PTG measure was developed in Chapter 3 – the PRAISE scale. Its items were selected from a pool of 190 items from across six different (perceived) PTG measures, with the aim to comprehensively address each of the five PTG dimensions proposed by Tedeschi and Calhoun (1996). The items were reworded following the process described by Frazier and colleagues (2009), to capture recent current-standing levels instead of perceived changes. The final PRAISE scale includes small adjustments following an initial confirmatory factor analysis on a general UK sample (n = 569) and has 28 items that capture current-standing levels of each PTG dimension in the past two weeks.

The psychometric validation of the PRAISE scale was conducted in Chapter 4 on a general UK sample assessed at two time points (n_1 = 619, n_2 = 92). This included an examination of the factor structure, convergent validity of each dimension, test-retest reliability of each dimension, and the predictive validity of the Relationships dimension. Overall, the PRAISE scale showed good psychometric properties and a factor structure of five correlated dimensions, but the factor fit indices were relatively low. Fit indices improved when a Bayesian CFA was carried out that allowed for small cross-loadings, indicating that items slightly overlap across the dimensions.

In Chapter 5, the factor model fit of the 5-dimensional PRAISE scale was compared to the fit of other current-standing PTG measures, namely the 5-dimensional C-PTGI and the unidimensional C-PTGI-SF, in a general UK sample (n = 303). Cross-loading items were observed for both multidimensional measures to a similar extent, indicating that this is not only a design issue in the PRAISE scale. The PRAISE scale showed the best factor fit of the three measures. Considering its good psychometric properties and more comprehensive range of items, it was subsequently used to examine the main research question in Chapter 6.

Chapter 6 examined the question of whether trait resilience predicts the development of veridical PTG in the short-term after recent adverse experiences. A longitudinal (but not prospective) study design was used, including three assessments over a time of four months. The analysis sample comprised 285 individuals from the UK who reported an unexpected and personally significant adverse experience in the six months prior to the first survey. Current-standing PTG showed remarkable stability over time, and none of the trait resilience dimension predicted veridical PTG in any of the five PRAISE dimensions. While different trait resilience dimensions predicted baseline current-standing PTG levels, there was no evidence that trait resilience predicted veridical PTG over time.

7.2 The relationship between trait resilience and veridical PTG

This thesis found no empirical evidence for an association between trait resilience and veridical PTG over four months in a general UK population. This observation is particularly surprising for the resilience dimension of Reconfiguration (Adaptive Capacity), considering that it incorporates traits associated with an individual's ability to adjust in the face of adversity. However, these null findings need to be critically reflected on, both from a methodological perspective and in context of the wider literature.

Individuals showed stability in all five PRAISE dimensions over the study duration of four months, suggesting that no veridical PTG was observed in the sample. The non-significant associations between the trait resilience dimensions and veridical PTG dimensions may therefore simply be due to the lack of veridical PTG, such that there was no longitudinal change in the dataset that could be predicted by trait resilience.

There are two possible reasons that may explain this stability: one explanation is methodological and the other is consistent with recently published

research on veridical PTG. The methodological explanation is tied to the study design. The study was not prospective and did not control for baseline (pre-adversity) assessments of either construct. For some individuals, a period of up to seven months could have passed between adversity exposure and first-survey assessment. Despite assessing recent experiences of adversity, this study design does not allow for an accurate examination of the time course of veridical PTG if pre-adversity baseline assessments are not controlled for in the analyses.

However, although the observed evidence shows that trait resilience does not predict veridical PTG in the four months following an adverse experience, the strong cross-sectional association between the two constructs suggests at least a conceptual relationship. Specifically, current-standing PTG seem to be most strongly predicted by the dimension of Resistance (Ecological Resilience): individuals who believed that they have a high ability to resist adversity and maintain stability have also reported higher PRAISE levels in each of the five dimensions. This is not the first time that this resilience dimension has demonstrated a robust association with well-being (Maltby et al., 2015). A link between these two constructs may be explained by self-efficacy, which correlated significantly with the five current-standing PTG dimensions (see Section 4.2.3) as well as the Resistance (Ecological Resilience) dimension in a separate study (Maltby et al., 2019)[7]. Self-efficacy may predict both constructs and controlling for self-efficacy could help isolate the association between trait resilience on PTG. Future research may therefore investigate whether the cross-sectional association between Resistance and current-standing PTG holds when controlling for self-efficacy.

The second explanation for these null findings is conceptual and is consistent with recent prospective studies that have also found no empirical evidence for veridical PTG on sample level over time periods of up to 20 months after event

[7] Notably, the referenced study measured Ecological Resilience not with the EEA Resilience scale but with the Resilient Systems Scale.

exposure. The experience of veridical PTG may thus emerge much later than the observed time frame or be exceptionally rare (Boals, 2023). This point is discussed in greater detail in the knowledge contribution of this thesis below in Section 7.3.3.

7.3 Knowledge contributions

In this section, the key contributions of this thesis are discussed and linked to the existing literature. Specifically, this thesis provided contributions to knowledge in the form of insight into the use of current-standing PTG measures, the development and validation of the PRAISE scale, and an empirical investigation in the longitudinal course of veridical PTG over four months.

7.3.1 How current-standing measures of PTG have so far been used

The first knowledge contribution of this thesis is the first-in-field scoping review of which current-standing PTG measures have been used in longitudinal research, the study designs they were embedded in, and the research questions they had addressed (see Chapter 2).

Despite the rise in criticism against cross-sectional assessments of perceived PTG (Infurna & Jayawickreme, 2019), current-standing PTG measures have only been used on a small scale so far. The scoping review found that most current-standing PTG measures only include adapted versions of the original 21 PTGI items, have been used in only one study each, and were not thoroughly validated. Although these measures allow researchers to assess trajectories of PTG over longer periods of time, most studies have operationalised veridical PTG as simple change scores between two time points within a relatively short time frame (see Section 2.3.3, p. 49) and have mainly addressed questions regarding the association between perceived and veridical PTG (see Section 2.3.2).

There are a few notable exceptions of empirical investigations that have used longitudinal study designs and analysis methods that extend beyond change scores across two time points. There is the combined use of the PTGI and C-PTGI in an

RCT to assess the impact of a mental health intervention on perceived and veridical PTG (using linear hierarchical regression; Roepke, Benson, et al., 2018; Roepke, Tsukayama, et al., 2018), the use of a current-standing PTG measure in an experience sampling design (correlating predictors with variance in PTG within one day; Blackie et al., 2017), and the inclusion of a brief 5-item current-standing PTG measure to examine veridical PTG trajectories weekly over the course of one year using LGCM analysis (Jayawickreme et al., 2021). However, this scoping review found these study designs to be exceptions that deviated from most of the existing research on veridical PTG. Most studies which examine trajectories of PTG in more complex research designs and over longer periods of time (e.g., Corman et al., 2021; Infurna et al., 2022) instead used proxy constructs such as Life Satisfaction to capture trajectories of changes over time. A future systematic review could expand on the findings of the scoping review by also including studies which use proxy measures of PTG to explore the range of different study designs and research approaches which have so far been used.

So far, researchers may have been cautious to use current-standing PTG measures for studies which require larger research budgets, considering these measures have limited comprehensiveness and psychometric validation. Yet, current-standing measures would allow researchers to examine changes in PTG-specific dimensions over time – possibly more accurately than proxy measures, which were not developed for this purpose (Jayawickreme, Infurna, et al., 2021). The second knowledge contribution of this thesis – the PRAISE scale – was therefore developed to address the need for a thoroughly validated, comprehensive multidimensional current-standing PTG measure.

7.3.2 The PRAISE Scale of PTG

The second knowledge contribution of this thesis is the development and validation (total *n* = 1,776) of the PRAISE scale. The PRAISE scale is designed to

assess veridical PTG over longer periods of time, covering all five PTG dimensions described by Tedeschi and Calhoun (2004) comprehensively and without being limited to adaptations of the 21 original PTGI items, which have been criticised (Jayawickreme et al., 2018). This is important because individuals can experience posttraumatic changes in many different ways, which becomes evident in the range of items across different PTG measures displayed in Appendix 2. These individual experiences may not be sufficiently covered in more narrow measures (Weststrate et al., 2022).

The validation process of the PRAISE scale (Chapter 4) was very systematic in comparison to other current-standing PTG measures and the good psychometric properties – including scalar invariance over time (see Section 6.2.3) – supports its use. The combination of its multidimensional and comprehensive assessment and its thorough psychometric validation makes the PRAISE scale unique amongst current-standing measures of veridical PTG. As it measures the same five dimensions as used in the PTGI (Tedeschi et al., 2017; Tedeschi & Calhoun, 1996), findings can also be easily compared with studies that use this most commonly used measure of perceived PTG.

The PRAISE scale can be used in longitudinal, ideally prospective, study designs to examine trajectories in veridical PTG. As the PRAISE scale assesses current-standing levels of PTG-related well-being based on the experiences of the past two weeks, the interval between assessments should be at least two weeks. Veridical PTG could be analysed in different ways. One option is the use of LGCM to draw trajectories over time (Jayawickreme, Blackie, et al., 2021). Another viable option may be the use of growth mixture modelling (GMM; Chopik, 2021), which has a benefit over LGCM in that it allows to identify different classes which display different trajectories over time in the same sample (e.g., the majority of individuals shows a stable trajectory, and small subsamples show significant positive or negative changes over time).

7.3.3 Stability of current-standing PTG over time

This thesis joins a range of other recent longitudinal studies (outlined below) in finding little to no empirical evidence for veridical PTG (i.e., positive changes in PTG-related constructs) after the experience of adversity over time. Instead of positive changes, this thesis found stability in the dimensions Relationships, Appreciation of Life, Strength, and Existence and a slight decline in Possibilities over a 4-month period, using LGCM. However, considering that PTG is conceptualized as a process that develops over time (Tedeschi & Calhoun, 2004), it may not be reasonable to expect positive changes to emerge after only a few months following an adverse experience.

On the basis of their meta-analysis of longitudinal data, Mangelsdorf and colleagues (2019) suggested that studies on veridical PTG may require at least 18 months after event exposure to identify positive changes. Their meta-analytical computations on studies looking into changes in PTG-related constructs suggested positive trajectories for positive relationships and environmental mastery, but these were only observed around two years after the adverse experience and initially decreased. No evidence for significant changes were identified for other constructs such as meaning in life and spirituality; self-esteem even seemed to significantly decline over time. Furthermore, in a recent longitudinal study of posttraumatic change trajectories up to 20 months after an adverse experience, Infurna and colleagues (2022) found stability in life satisfaction, gratitude, compassion, generativity, meaning in life, and spirituality[8]. Stability over one year has also been found in characteristics such as empathy, humility and compassion in individuals with recent relational transgression (Blackie & McLean, 2022), and openness to experiences in individuals with recent experiences of adversity (Forgeard et al., 2022).

[8] The authors also reported a brief temporary decrease in life satisfaction and meaning in life, which recovered to baseline in the first two months after event exposure.

Short-term studies using change scores of the C-PTGI over a period of 5-12 weeks have even detected an average decrease in most PTG dimensions over time (e.g., Boals et al., 2019; Frazier et al., 2009; Owenz & Fowers, 2018). Corman and colleagues (2021) also identified significantly negative change scores for proxy measures assessing positive orientation to others, personal growth, strength, spirituality, and life satisfaction changes before and five months after a hematopoietic stem cell transplantation.

In summary, there is little to no robust empirical evidence for veridical PTG found in single longitudinal and even prospective studies of up to 20 months after exposure to an adverse event. This challenges the claim that adverse experiences can promote positive psychological changes. Most individuals usually either experience stability or negative changes (depreciation) following adversity, and the experience of veridical PTG may be more the exception than the rule (Weststrate et al., 2022). However, this does not necessarily mean that veridical PTG does not exist. Veridical positive changes as described in the PTG model (see Figure 1.1, p. 5) may just be much rarer and difficult to find than mere perceptions of PTG. In his review of empirical evidence for PTG trajectories, Boals (2023, p. 7) concludes that *"the prevalence rate of [veridical] PTG is likely very low (0%-10%)"*. This number is much smaller than the empirically observed prevalence of perceived PTG of 53% (Wu et al., 2019). Finding adequate methodological approaches and study designs to efficiently identify this small minority may be the most important priority for researchers to advance the science of PTG (Boals, 2023). This point is further discussed in Section 7.5.1.

7.4 Strengths and limitations of the overall thesis

This thesis is the first-in-field examination of the association between trait resilience and veridical PTG. The strengths and limitations of each empirical chapter

have already been addressed in their respective discussion sections. In this section, cross-cutting strengths and limitations of the thesis are addressed.

The first strength of this thesis is its use of relatively sophisticated statistical analysis approaches across chapters. Specifically, a Bayesian CFA approach was used for the validation of the PRAISE scale factor structure, and a LGCM was used to explore the variability of each PRAISE dimension over time and the predictive effect of each trait resilience dimension. This addressed the call of researchers for better validation of PTG measures (Frazier et al., 2014) and more advanced analytical approaches in the examination of PTG (Infurna & Jayawickreme, 2019). Particularly when considering that the psychometric properties of most current-standing PTG measures have received little attention in the past (see Section 2.2.2), and that most studies on veridical PTG have used simple change scores to operationalise PTG (see Section 2.2.3.2), this is a major methodological strength of the research presented in this thesis.

The second strength of this thesis is its consistency in the study samples. The demographic characteristics of the sample used to psychometrically validate the PRAISE scale in this thesis resemble the demographic characteristics of the sample examined in the longitudinal study. The PRAISE scale showed similar psychometric properties in different (but demographically comparable) samples collected for the validation process (Appendix 12). Due to constraints in resources and time, maximising the sample size of the target population was prioritised over establishing cross-cultural validity. This approach provided more certainty that the PRAISE scale could be used on a UK sample to examine this thesis' main research question. As further elaborated in Section 7.5.1, validation studies involving more diverse samples are recommended for future research.

The first limitation addressed in this section is the possible impact of COVID-19 on the samples acquired for the research in this thesis. All samples were collected during the COVID-19 pandemic; the first in March 2020 and the last in December

2021. It is possible that the experiences associated with the COVID-19 pandemic – including lockdowns – have affected the participant's exposure to adversity and their available resources and coping strategies. The exposure to multiple and prolonged stressors in the context of PTG is so far underexplored (Jayawickreme & Blackie, 2016). However, Weststrate and colleagues (2022) hypothesize that the observed stability in PTG trajectories may result from repeatedly re-experiencing the negative emotions and thoughts of their adverse event in the months afterwards, due to situational triggers. While the impact of COVID-19 may have differed at different time points of sample collection, the high salience of covid-related consequences may have prevented overall positive veridical changes in individuals.

The second limitation relates to the use of self-report measures of trait resilience, PTG, and other constructs in this thesis. This applies to the PRAISE scale development as well as the longitudinal study on its association with trait resilience. Some of the limitations of the PTGI and other measures of perceived PTG were resolved in the PRAISE scale (see Section 3.3.2, p. 67). However, some limitations such as possibly inaccurate or mood-based self-assessments (Moum, 1988) may still have applied given the use of self-report assessments. Future quantitative studies may profit from integrating observable behaviour or observer reports (Schubert et al., 2019; Shakespeare-Finch & Enders, 2008) for the assessment of veridical PTG or trait resilience, where people might be inclined to report higher scores on these desirable qualities.

7.5 Implications for future research

As a by-product of the main research aim, this thesis has highlighted the challenges that measuring veridical PTG poses. This does not only include the use of an appropriate measure, but also the choice of study design and data analysis approach. Before advancing into empirical research on the predictors of veridical PTG, such as trait resilience, future efforts should prioritise the development of

robust study designs which can reliably identify veridical PTG (Boals, 2023). While solving this challenge is beyond the scope of this thesis, the knowledge contributions described in Section 7.3 are valuable for informing future research. The implications for future studies are discussed in the first part of this section. The second part outlines future directions for the research on the relationship between trait resilience and veridical PTG.

7.5.1 Building on the knowledge contributions of this thesis

The present thesis contributed to the collective effort to assess veridical PTG by introducing and validating the PRAISE scale. The new measure can be flexibly used in future studies to assess current-standing levels of psychological functioning in the five dimensions within which PTG have been frequently reported. While it provided promising psychometric properties within UK samples, the validation process of the PRAISE Scale can still be extended, for example by analysing its divergent validity and cross-cultural validity. Culturally sensitive translations (Charles et al., 2022) to other languages would also help to facilitate longitudinal studies of veridical PTG beyond the English speaking world. Considering the reported stability of well-being in individuals after adversity (Blackie & McLean, 2022; Mangelsdorf et al., 2019), future validation efforts may also want to assess the measure's sensitivity for changes. This could be done by examining PRAISE trajectories in an adversity and a comparison group, utilising a prospective study design with assessments before and after an adverse event. Despite overall stability, individuals have shown a temporary decrease in PTG-related well-being in the immediate aftermath of adversity (i.e., up to two months; see Infurna et al., 2022), which might be a good benchmark to demonstrate sensitivity to veridical changes using the PRAISE scale.

In combination, Chapters 2 to 5 can help researchers identify the best measure suited for their study design and research question. For larger panel surveys in which the lengths of measures need to be as short as possible, a

unidimensional measure such as the C-PTGI-SF or the state PTG measure may be useful. For a more comprehensive multidimensional assessment of current-standing PTG, the validated PRAISE scale may be the best option.

Finally, the observed stability across PTG dimensions and related constructs in this and other longitudinal studies raises the question whether a general trajectory of PTG should be realistically expected at a sample level. The development experience of veridical PTG seems to be rare, complex, and highly individual (Weststrate et al., 2022). According to Boals (2023), future studies should ideally examine trajectories of both positive outcomes (e.g., PTG dimensions) and negative outcomes (e.g., posttraumatic stress symptoms) in prospective longitudinal study designs which include at least one assessment before an adverse experience and multiple assessments afterwards, to determine changes in psychological functioning. A trajectory of veridical PTG would be characterised by an initial decrease in PTG dimensions and increase in negative outcomes, reflecting the individual's struggle with the adverse experience. Over time, negative outcomes would decrease and positive outcomes (but not necessarily all PTG dimensions) would increase beyond pre-trauma levels.

There are signs that the research community is becoming aware of this issue. After 20 years of research on perceived PTG and simple study designs using change scores between two time points, researchers have called for methodologically more rigorous research on PTG (Frazier et al., 2014; Infurna & Jayawickreme, 2019). In 2019, Infurna and Jayawickreme advocated for the use of GMM, which has the advantage over LGCM in that it allows the identification of different latent classes which show different trajectories of PTG dimensions over time (Chopik, 2021).

In the most recent discussions concerning PTG research designs, Weststrate and colleagues (2022) have suggested to combine qualitative and quantitative analyses on long case studies of single individuals or small groups. Furthermore, researchers have suggested the detailed assessment of event characteristics

(Luhmann & Fassbender, 2021) and the use of non-adversity control groups to determine whether veridical changes can really be attributed to the experience of the reported event (Jayawickreme, Infurna, et al., 2021). While not many studies have so far conducted empirical research on PTG using these approaches, these discussions are a promising sign for advancements in the research designs of PTG studies in the upcoming years.

7.5.2 Further investigation of the relationship between trait resilience and veridical PTG

Given the challenges of reliably measuring veridical PTG, it may be more sensible to explore the empirical associations between trait resilience and separate processes described in the PTG model, such as the management of emotional distress, deliberate rumination, and narrative development. As outlined in Section 1.3 (p. 25), different forms of trait resilience may be more relevant at different stages in the PTG process. Future research could focus on mapping the role of different trait resilience dimensions onto the different processes in the PTG process. For example, resistance may predict better management of emotional distress in the early stage of the PTG process, while Reconfiguration may be more relevant at the later stages when individuals may develop a new personal narrative and adjust their behaviour. Once robust assessment strategies for veridical PTG have been identified, these findings could then be brought together and validated in a larger longitudinal model, for example via path analysis.

Some empirical evidence on the relationship between trait resilience and processes included in the model of PTG already exist, for example for the association between trait resilience and psychological distress (Jeamjitvibool et al., 2022). However, these studies mostly do not differentiate between different forms of trait resilience. Furthermore, not all processes in the PTG model have received much empirical attention yet, at least not in regard of their relationship with trait resilience

(e.g., deliberate rumination). Clarifying these relationships may be possible even with some initial correlational research, which ultimately may inform a larger model (e.g., via path analysis) with which the predictive effect of trait resilience on the whole model of PTG can be examined.

Finally, future research on the association between trait resilience and veridical PTG may profit from including a measure of social resources as a part of an individual's resilient capacities. Positive social relationships are not just an outcome dimension of veridical PTG (in form of the 'Relationships' dimension) but are also considered to be an integral part in the process of developing PTG (see Section 1.1.1.2, p. 4). In a recent review of trait resilience measures, Maltby and Hall (2022) have also identified Social Cohesion (positive experiences of social care, support and cohesion) as a fourth dimension[9], in addition to the three resilience dimensions covered in Section 1.2.1. Traits associated with positive social connections and experiences may thus be a worthwhile addition to future survey designs.

7.6 Conclusions

This thesis aimed to examine whether trait resilience predicted veridical PTG over time. Trait resilience – specifically traits associated with an individual's ability to resist stressors and recover from set-backs – seems to be positively associated with baseline levels of PTG-related well-being. However, current-standing levels of PTG showed remarkable stability over time, and there was no evidence to show that trait resilience predicted trajectories of veridical PTG.

However, the stability in PTG dimensions observed in this and other research studies also shows that researchers who conduct longitudinal studies on veridical PTG face study design challenges beyond the choice of a suitable measure.

[9] The three other dimensions identified in this paper are Recovery (quick and easy recovery, remain stable under stress), Sustainability (ability to function and sustain activities within context of goal-oriented behaviour), and Adaptability (flexibility, easily accommodate to change, open for new situations) which *"fit well with the engineering, ecological, and adaptive capacity resilience systems"* (Maltby & Hall, 2022, p. 11).

Veridical PTG may be rarer than often assumed, and measurable changes may only become visible after a long period of time. Ideally, future quantitative studies will utilise prospective study design spanning over two or more years. As adverse events are rarely predictable and only a small number of individuals may develop veridical PTG, requirements of analysis methods such as growth mixture modelling (which allow to identify subsamples with different trajectories) need to be considered in future study design. Such studies likely require a large amount of resources, unless they are embedded within established cohort studies.

While the development of effective research designs is labour-intensive, this groundwork needs to be laid out before predictors of veridical PTG, such as trait resilience, can be robustly examined. This thesis contributed to this goal, by introducing and validating the PRAISE scale which can be integrated into large longitudinal surveys. Future studies may also focus on longitudinal case studies of individuals and groups, or examine single mechanisms outlined in the PTG model.

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Appendix 1

List of Studies Using a Current-standing PTG Measure

#	Publication
1	Frazier, P. A., Tennen, H., Gavian, M., Park, C. L., Tomich, P. L., & Tashiro, T. (2009). Does self-reported posttraumatic growth reflect genuine positive change? *Psychological Science*, *20*(7), 912–919. https://doi.org/10.1111/j.1467-9280.2009.02381.x
2	Gunty, A. L., Frazier, P. A., Tennen, H., Tomich, P. L., Tashiro, T., & Park, C. L. (2011). Moderators of the relation between perceived and actual posttraumatic growth. *Psychological Trauma: Theory, Research, Practice, and Policy*, *3*(1), 61–66. https://doi.org/10.1037/a0020485
3	Johnson, S. F., & Boals, A. (2015). Refining our ability to measure posttraumatic growth. *Psychological Trauma: Theory, Research, Practice, and Policy*, *7*(5), 422–429. https://doi.org/10.1037/tra0000013
4	Roepke, A. M., Benson, L., Tsukayama, E., & Yaden, D. B. (2018). Prospective writing: Randomized controlled trial of an intervention for facilitating growth after adversity. *Journal of Positive Psychology*, *13*(6), 627–642. https://doi.org/10.1080/17439760.2017.1365161
5	Roepke, A. M., Tsukayama, E., Forgeard, M. J. C., Blackie, L. E. R., & Jayawickreme, E. (2018). Randomized controlled trial of SecondStory, an intervention targeting posttraumatic growth, with bereaved adults. *Journal of Consulting and Clinical Psychology*, *86*(6), 518–532. https://doi.org/10.1037/ccp0000307
6	Owenz, M., & Fowers, B. J. (2018). Perceived post-traumatic growth may not reflect actual positive change: A short-term prospective study of relationship dissolution. *Journal of Social and Personal Relationships*, *36*(10), 3098–3116. https://doi.org/10.1177/0265407518811662
7	Boals, A., Bedford, L. A., & Callahan, J. L. (2019). Perceptions of change after a trauma and perceived posttraumatic growth: A prospective examination. *Behavioral Sciences*, *9*(10), 1–12. https://doi.org/10.3390/bs9010010
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9	Iimura, S., & Taku, K. (2018). Positive Developmental Changes after Transition to High School: Is Retrospective Growth Correlated with Measured Changes in Current Status of Personal Growth? *Journal of Youth and Adolescence*, *47*(6), 1192–1207. https://doi.org/10.1007/s10964-018-0816-7
10	Yanez, B. R., Stanton, A. L., Hoyt, M. A., Tennen, H., & Lechner, S. (2011). Understanding perceptions of benefit following adversity: How do distinct assessments of growth relate to coping and adjustment to stressful events? *Journal of Social and Clinical Psychology*, *30*(7), 699–721. https://doi.org/10.1521/jscp.2011.30.7.699
11	Blackie, L. E. R., Jayawickreme, E., Tsukayama, E., Forgeard, M. J. C., Roepke, A. M., & Fleeson, W. (2017). Post-traumatic growth as positive personality change: Developing a measure to assess within-person variability. *Journal of Research in Personality*, *69*, 22–32. https://doi.org/10.1016/j.jrp.2016.04.001
12	Jayawickreme, E., Blackie, L. E. R., Forgeard, M. J. C., Roepke, A. M., & Tsukayama, E. (2021). Examining Post-Traumatic Growth as Positive Personality Change: Do Major Negative Life Events Impact Well-Being through Short-Term Changes in Posttraumatic Growth? *Social Psychological and Personality Science*, *13*(4), 1–12. https://doi.org/10.1177/19485506211043381

Appendix 2

List of Unique PTG Items

Source	Item	Selected
	Possibilities	**6 / 14**
CIOQ (P)	I am more determined to succeed in life now	
PTGI	I developed new interests	x
PTGI	I established a new path for my life	x
PTGI	New opportunities are available which wouldn't have been otherwise	x
PTGI	I am able to do better things with my life	
PTGI	I am more likely to try to change things that need changing	
PWB-PTCQ	I am open to new experiences that challenge me	
PWB-PTCQ	I am hopeful about my future and look forward to new possibilities	
SRGS	I rethought how I want to live my life	x
SRGS	I learned that I want to accomplish more in life	x
SRGS	I learned to be open to new information and ideas	x
SRGS	I realized I have a lot to offer other people	
SRGS	I learned that I have something of value to teach others about life	
SRGS	I learned that I want to have some impact on the world	
	Relationships	**6 / 48**
CIOQ (P)	I'm a more understanding and tolerant person now	x
CIOQ (P)	I value other people more now	x
CIOQ (P)	I value my relationships much more now	
CIOQ (P)	I have a greater faith in human nature now	
PBS	As a result of this event, I am more sensitive to the needs of others	
PBS	Because of this event, I learned how good people can be	
PBS	Because of this event, I am more compassionate to those in similar situations	
PBS	Because of this event, I feel more a part of my community	
PBS	As a result of this event, I learned that my family loves me	
PBS	Because of this event, I am more understanding of those in need	
PBS	Because of this event, I am more aware of how much my family means to me	
PBS	Because of this event, I am more aware of how much people care for one another	
PBS	Because of this event, I have a greater faith in other people	
PBS	Because of this event, I know my neighbors better	
PBS	Because of this event, I show more caring to others	
PBS	Because of this event, I feel more positive about my community	
PBS	This event taught me that people will always be there for you	
PBS	Because of this event, I am closer to my neighbors	
PBS	Because of the event, I am closer to people I care about	
PTGI	I have a greater sense of closeness with others	x
PTGI	I have more compassion for others	x
PTGI	I more clearly see that I can count on people in times of trouble	
PTGI	I am more willing to express my emotions	
PTGI	I put more effort into my relationships	
PTGI	I learned a great deal about how wonderful people are	
PTGI	I better accept needing others	
PWB-PTCQ	I have strong and close relationships in my life	
PWB-PTCQ	I am a compassionate and giving person	
PWB-PTCQ	I am grateful to have people in my life who care for me	
SRGS	I learned to be nicer to others	x
SRGS	I learned that there are more people who care about me than I thought	x
SRGS	I developed new relationships with helpful others	
SRGS	I became more accepting of others	
SRGS	I learned to respect others' feelings and beliefs	
SRGS	I learned better ways to express my feelings	
SRGS	I learned to appreciate the strength of others who have had a difficult life	
SRGS	I learned how to reach out and help others	

Source	Item	Selected
SRGS	I learned to listen more carefully when others talk to me	
SRGS	I learned to communicate more honestly with others	
SRGS	I learned that it's okay to ask others for help	
SRGS	A prior relationship with another person became more meaningful	
SRGS	I developed a stronger sense of community, of belonging, that I am part of a larger group	
SRGS-R	I experienced a change in how I treat others	
SRGS-R	I experienced a change in my belief about how many people care about me	
TS	I realized how much my family cares about me	
TS	My relationship with my family became more important	
TS	My relationship with my family became more meaningful	
TS	Now I know that I can count on my friends in difficult times	
	Appreciation of Life	**6 / 28**
CIOQ (P)	I don't take life for granted anymore	
CIOQ (P)	I live every day to the full now	
CIOQ (P)	I look upon each day as a bonus	
CIOQ (P)	I no longer take people or things for granted	
PBS	Because of this event, I find myself placing less emphasis on material things	x
PBS	As a result of this event, I live more for the moment	x
PBS	Because of this event, I live my life more simply	
PBS	Because of this event, my priorities in life are different	
PTGI	I changed my priorities about what is important in life	x
PTGI	I can better appreciate each day	x
PTGI	I have a greater appreciation for the value of my own life	
PWB-PTCQ	I like myself	
PWB-PTCQ	I accept who I am, with both my strengths and limitations	
PWB-PTCQ	I don't worry what other people think of me	
PWB-PTCQ	I respect myself	
SRGS	I don't take most things for granted anymore	x
SRGS	I learned to approach life more calmly	x
SRGS	I learned to look at things in a more positive way	
SRGS	I learned not to let hassles bother me the way they used to	
SRGS	I learned to live for today, because you never know what will happen tomorrow	
SRGS	I learned not to "freak out" when a bad thing happens	
SRGS	I learned to get less angry about things	
SRGS	I learned to be a more optimistic person	
SRGS	I learned to be myself and not try to be what others want me to be	
SRGS	I learned to accept myself as less than perfect	
SRGS	I changed my life goals for the better	
SRGS	I learned not to take my physical health for granted	
TS	I learned to be more patient	
	Strength	**6 / 27**
CIOQ (P)	I feel more experienced about life now	
PBS	This event taught me I can handle anything	
PBS	Because of my experiences with this event, I learned how to cope more effectively	
PBS	Because of this event, I am a more assertive person	
PBS	I am a more effective person because of what I went through with this event	
PBS	This event made me a stronger person	
PBS	Because of this event, I am a more capable person	
PTGI	I have a greater feeling of self-reliance	x
PTGI	I am better able to accept the way things work out	x
PTGI	I know better that I can handle difficulties	
PTGI	I discovered that I'm stronger than I thought I was	
PWB-PTCQ	I have confidence in my opinions	
PWB-PTCQ	I feel I am in control of my life	
PWB-PTCQ	I handle my responsibilities in life well	

Source	Item	Selected
PWB-PTCQ	I know what is important to me and will stand my ground, even if others disagree	
PWB-PTCQ	I am able to cope with what life throws at me	
SRGS	I learned to work through problems and not just give up	x
SRGS	I learned to deal better with uncertainty	x
SRGS	I gained new knowledge about the world	
SRGS	I learned that I was stronger than I thought I was	
SRGS	I learned to take more responsibility for what I do	
SRGS	I feel freer to make my own decisions	
SRGS	I learned to be a more confident person	
SRGS	I learned to stand up for my personal rights	
TS	I learned that I am stronger than I thought I was	x
TS	I learned to be more confident in myself	x
TS	Now I know I can handle difficulties	
	Existence	**5 / 19**
CIOQ (P)	I don't worry about death at all anymore	
PBS	Because of this event, I am more spiritual	x
PBS	Because of this event, I have a greater faith in God	
PBS	Because of this event, I am more religious	
PTGI	I have a better understanding of spiritual matters	
PTGI	I have a stronger religious faith	
PTGI-X	I have a greater sense of harmony with the world	x
PTGI-X	I feel better able to face questions about life and death	x
PTGI-X	I feel more connected with all of existence	
PTGI-X	I have greater clarity about life's meaning	
PWB-PTCQ	My life has meaning	x
PWB-PTCQ	I have a sense of purpose in life	
PWB-PTCQ	I feel that my life is worthwhile and that I play a valuable role in things	
SRGS	I learned that there is a reason for everything	x
SRGS	I developed / increased my trust in God	
SRGS	I understand better how God allows things to happen	
SRGS	I learned to find more meaning in life	
TS	My faith in God increased	
TS	My confidence in God increased	
	None / Unclear	**0 / 9**
PBS	I gained financially as a result of this event	
PBS	As a result of this event, I gained material possessions	
PWB-PTCQ	I am always seeking to learn about myself	
SRGS	My life now has more meaning and satisfaction	
SRGS	I learned to think more about the consequences of my actions	
SRGS	I learned to take life more seriously	
SRGS	I now better understand why, years ago, my parents said/did certain things	
SRGS	I learned that most of what used to upset me were little things that aren't worth getting upset about	
SRGS	I became better able to view my parents as people, and not just parents	

Appendix 3

Original Wording and 'Current-Standing' Translation of the PRAISE alpha PTG Items

#	Original item	Current-standing translation
Possibilities		
2	I developed new interests [B]	I have developed new interests
7	New opportunities are available which wouldn't have been otherwise [B]	I have made the most of new opportunities
12	I established a new path for my life [B]	I have followed new paths in my life
17	I learned to be open to new information and ideas [C]	I have been open to new information and ideas
22	I rethought how I want to live my life [C]	I have rethought how I want to live my life
27	I learned that I want to accomplish more in life [C]	I have felt motivated to accomplish a lot in life
Relationships		
1	I'm a more understanding and tolerant person now [A]	I have been an understanding and tolerant person
6	I have more compassion for others [B]	I have been compassionate towards others
11	I value other people more now [A]	I have valued other people highly
16	I learned that there are more people who care about me than I thought [C]	I have felt that there are people who care about me
21	I have a greater sense of closeness with others [B]	I have had a great sense of closeness with others
26	I learned to be nicer to others [C]	I have been nice to others
Appreciation of Life		
5	I can better appreciate each day [B]	I have been able to appreciate each day
10	I don't take most things for granted anymore [C]	I have not taken most things for granted
15	As a result of this event, I live more for the moment [G]	I have been able to live for the moment
20	I changed my priorities about what is important in life [B]	I have changed my priorities about what is important in life
25	I learned to approach life more calmly [C]	I have been able to approach life calmly
29	Because of this event, I find myself placing less emphasis on material things [G]	I have placed low emphasis on material things
Strength		
3	I am better able to accept the way things work out [B]	I have been able to accept the way things work out
8	I learned to be more confident in myself [D]	I have been confident in myself

#	Original item	Current-standing translation
13	I learned to deal better with uncertainty [C]	I have been able to deal with uncertainty
18	I learned to work through problems and not just give up [C]	I have worked through problems and did not just give up
23	I have a greater feeling of self-reliance [B]	I have had a great feeling of self-reliance
28	I learned that I am stronger than I thought I was [D]	I have thought of myself as a strong person
Existence		
4	My life has meaning [E]	I have felt that my life has meaning
9	I feel better able to face questions about life and death [F]	I have felt able to face questions about life and death
14	I have a greater sense of harmony with the world [F]	I have felt a great sense of harmony with the world
19	I learned that there is a reason for everything [C]	I have believed that there is a reason for everything
24	Because of this event, I am more spiritual / religious [G]	I have felt spiritual or connected to a higher power

Note. Source: [A] = CIOQ, [B] = PTGI, [C] = SRGS, [D] = TS, [E] = PWB-PTCQ, [F] = PTGI-X, [G] = PBS.

Appendix 4

Mean, Standard Deviation and Factor Loadings of Each PRAISE Item in the Samples Described in Chapter 4 and 5

		Chapter 4 T1 (*n* = 619)			Sample Chapter 5 (*n* = 303)		
#	Item	*M*	*SD*	Loading	*M*	*SD*	Loading
Factor 1: Possibilities		**19.19**	**3.96**		**20.16**	**4.40**	
26	Motivated to accomplish a lot	3.26	1.04	.76	3.40	1.10	.75
7	Made most of new opportunities	3.21	0.92	.70	3.44	0.98	.69
12	Followed new paths in my life	2.72	1.11	.62	3.07	1.08	.67
17	Open to new information / ideas	3.87	0.71	.54	3.90	0.78	.59
2	Developed new interests	2.85	1.08	.45	3.04	1.14	.60
21	Rethought how to live my life	3.29	1.08	.26	3.32	1.22	.40
Factor 2: Relationships		**23.1**	**3.56**		**23.48**	**3.84**	
6	Compassionate towards others	3.92	0.75	.72	4.00	0.83	.75
25	Been nice to others	4.06	0.67	.70	4.14	0.66	.66
20	Great sense of closeness	3.33	1.06	.66	3.57	1.05	.73
11	Valued other people highly	3.83	0.82	.65	3.79	0.84	.74
16	People care about me	4.07	0.89	.59	4.05	0.92	.62
1	Understanding and tolerant	3.89	0.77	.57	3.92	0.80	.66
Factor 3: Appreciation of Life		**16.97**	**3.10**		**17.4**	**3.64**	
5	Appreciate each day	3.37	1.00	.74	3.50	1.08	.82
24	Approach life calmly	3.5	0.93	.67	3.50	0.93	.75
15	Live for the moment	3.13	1.02	.61	3.43	1.00	.73
10	Not taken things for granted	3.59	0.85	.37	3.57	0.94	.59
28	Low emphasis on material things	3.38	0.98	.22	3.41	1.09	.30
Factor 4: Strength		**20.87**	**3.96**		**21.52**	**4.12**	
8	Confident in myself	3.22	1.05	.76	3.37	1.08	.68
27	Thought of myself as strong	3.37	1.04	.71	3.50	1.07	.69

18	Worked / did not just give up	3.79	0.78	.58	3.91	0.82	.60
13	Able to deal with uncertainty	3.41	0.94	.57	3.44	0.95	.69
3	Accept the way things work out	3.64	0.86	.57	3.65	0.83	.66
22	Feeling of self-reliance	3.45	0.93	.57	3.64	0.90	.63
Factor 5: Existence		**14.63**	**3.67**		**15.65**	**3.97**	
4	My life has meaning	3.32	1.05	.73	3.51	1.07	.79
14	Sense of harmony with the world	2.55	1.02	.70	2.92	1.07	.79
19	There is a reason for everything	3.09	1.16	.55	3.48	1.12	.51
9	Face questions about life / death	3.40	0.96	.42	3.46	1.08	.44
23	Spiritual / connected to higher	2.25	1.21	.39	2.27	1.34	.42

Note. Factor loadings are calculated for a correlated 5-dimensional factor structure (Model C). Items are abbreviated.

Appendix 5

SUR Assumption Test Statistics for each PRAISE Dimension Equations

	Normality of Residuals	Homoscedasticity	
Equation	Shapiro-Wilk	Breusch-Pagan	White
Possibilities	$W(573) = .9963$, $p = .213$	$\chi^2(1) = 1.51$, $p = .219$	$\chi^2(20) = 37.25$, $p = .011$
Relationships	$W(573) = .9789$, $p < .001$	$\chi^2(1) = 9.88$, $p = .002$	$\chi^2(20) = 46.05$, $p < .001$
Appreciation of Life	$W(573) = .9888$, $p < .001$	$\chi^2(1) = 0.10$, $p = .886$	$\chi^2(20) = 16.66$, $p = .675$
Strength	$W(573) = .9768$, $p < .001$	$\chi^2(1) = 1.12$, $p = .291$	$\chi^2(20) = 18.03$, $p = .585$
Existence	$W(573) = .9952$, $p = .072$	$\chi^2(1) = 3.19$, $p = .074$	$\chi^2(20) = 18.97$, $p = .524$

Appendix 6

Information Sheet with the Items, Instructions, and Scoring of the PRAISE Scale (1/2)

The PRAISE Scale of Post-Traumatic Growth

What is the PRAISE Scale?

The Possibilities, Relationships, Appreciation of Life, (Personal) Strength, and Existence (PRAISE) Scale is a multidimensional measure designed to assess posttraumatic growth (PTG) in longitudinal studies. The measure assesses positive psychological functioning during the past two weeks and covers five domains widely discussed in the PTG literature. Repeated measures allow to calculate change scores and analyse trajectories over time. The PRAISE Scale consists of 28 items rated on a 5-point Likert scale (Strongly disagree – Strongly agree).

PRAISE Dimension	**Items**
Possibilities:	2, 7, 12, 17, 21, 26
Relationships:	1, 6, 11, 16, 20, 25
Appreciation of Life:	5, 10, 15, 24, 28
Strength:	3, 8, 13, 18, 22, 27
Existence:	4, 9, 14, 19, 23

Who developed the PRAISE Scale?

The PRAISE Scale was developed in the UK, as part of the PhD research of Felix Lewandowski[a]*. The development of the PRAISE Scale was supervised by Laura E. R. Blackie[a], Eamonn Ferguson[a], and Mike Slade[b]. The citation for the PRAISE Scale is:

Lewandowski, F., Ferguson, E., Slade, M., & Blackie, L. E. R. (in preparation). *The PRAISE Scale: Measuring Posttraumatic Growth in Longitudinal Studies*.

[a] *School of Psychology, University of Nottingham, United Kingdom*
[b] *School of Health Sciences, Institute of Mental Health, University of Nottingham, United Kingdom*
* *Corresponding author: felix.lewandowski@nottingham.ac.uk*

Appendix 6

Information Sheet with the Items, Instructions, and Scoring of the PRAISE Scale (2/2)

Think about how you have felt in the **past two weeks**. Please indicate the degree to which each of the following statements applies to you:

#	Item	Strongly disagree **1**	Disagree **2**	Neither agree nor disagree **3**	Agree **4**	Strongly agree **5**
1	I have been an understanding and tolerant person	O	O	O	O	O
2	I have developed new interests	O	O	O	O	O
3	I have been able to accept the way things work out	O	O	O	O	O
4	I have felt that my life has meaning	O	O	O	O	O
5	I have been able to appreciate each day	O	O	O	O	O
6	I have been compassionate towards others	O	O	O	O	O
7	I have made the most of new opportunities	O	O	O	O	O
8	I have been confident in myself	O	O	O	O	O
9	I have felt able to face questions about life and death	O	O	O	O	O
10	I have not taken most things for granted	O	O	O	O	O
11	I have valued other people highly	O	O	O	O	O
12	I have followed new paths in my life	O	O	O	O	O
13	I have been able to deal with uncertainty	O	O	O	O	O
14	I have felt a great sense of harmony with the world	O	O	O	O	O
15	I have been able to live for the moment	O	O	O	O	O
16	I have felt that there are people who care about me	O	O	O	O	O
17	I have been open to new information and ideas	O	O	O	O	O
18	I have worked through problems and did not just give up	O	O	O	O	O
19	I have believed that there is a reason for everything	O	O	O	O	O
20	I have had a great sense of closeness with others	O	O	O	O	O
21	I have rethought how I want to live my life	O	O	O	O	O
22	I have had a great feeling of self-reliance	O	O	O	O	O
23	I have felt spiritual or connected to a higher power	O	O	O	O	O
24	I have been able to approach life calmly	O	O	O	O	O
25	I have been nice to others	O	O	O	O	O
26	I have felt motivated to accomplish a lot in life	O	O	O	O	O
27	I have thought of myself as a strong person	O	O	O	O	O
28	I have placed low emphasis on material things	O	O	O	O	O

Appendix 7

Participant Information Sheet of the Pre-Screening Survey Used in Chapter 6

Participant Information Sheet
School of Psychology
University of Nottingham

Well-being and Health After Major Negative Life Events
Ethics Approval Number: s12333

Researcher:
Dr. Laura Blackie – Laura.Blackie@nottingham.ac.uk
Dr. Charlotte Scott – Charlotte.Scott@nottingham.ac.uk
Felix Lewandowski – Felix.Lewandowski@nottingham.ac.uk

This is an invitation to take part in a research study about the impact of recent negative life events on your well-being, health and eating behaviour. Before you decide if you wish to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

In this survey, you will be asked to briefly describe one recent negative life event that happened this year. We will ask you some questions about the impact of this negative event on you and some basic demographic information. We will also ask you about your weight and height. It will take you around 5 minutes to complete this survey, for which you will be compensated in line with prolific payment recommendations.

Some participants will be invited to three paid follow-up surveys on prolific.co over the upcoming 17 weeks. If you are selected, you will receive an invitation to the first follow-up survey via Prolific. The three follow-up studies will take between 6-9 minutes. You will be reminded of the negative event you reported in this survey in all subsequent surveys as we will display the event description you provided in the initial survey. The subsequent surveys will ask several questions regarding your personality, well-being, health and eating behaviour, and the current impact of the negative event on you. Each survey participation will be compensated in line with prolific payment recommendations.

Participation in this study is totally voluntary and you are under no obligation to take part. You may skip any question you do not want to answer. You are free to withdraw at any point before or during the study by closing the browser window and clicking on “Stop without Completing” on the prolific window. You can also withdraw (i.e., “return”) a study after it has been completed by selecting the “submissions” tab on Prolific and select the red looped arrow of this study while awaiting review. Please keep in mind that you will not be paid for the study if you withdraw from the study or exceeded the maximum time limit of 30 minutes, as per prolific participation rules. All data collected will be kept confidential and used for research purposes only. It will be stored in compliance with GDPR regulations.

As an online participant in this research, we are obliged to make you aware that there is always a potential risk of intrusion by outside agents, for example through hacking, and therefore the possibility of being identified.

If you have any questions or concerns, please don’t hesitate to ask the researchers by contacting them via prolific anonymously or with the email address provided at the top of this page. You may also contact the researcher with questions about the study at any point throughout or after the study.

If you have any complaints about the study, please contact:
Stephen Jackson (Chair of Ethics Committee)
stephen.jackson@nottingham.ac.uk

Appendix 8

Consent Form of Each Survey Used in Chapter 6

Consent Form
School of Psychology
University of Nottingham

Well-being and Health After Major Negative Life Events
Ethics Approval Number: s12333

Researcher:
Dr. Laura Blackie – Laura.Blackie@nottingham.ac.uk
Dr. Charlotte Scott – Charlotte.Scott@nottingham.ac.uk
Felix Lewandowski – Felix.Lewandowski@nottingham.ac.uk

Please read the following information carefully before deciding if you wish to participate:

- I have read and understood the Information Sheet.
- I have been provided with the email addresses of the researchers and had the opportunity to ask questions about the study.
- If I have asked questions they have been answered satisfactorily.
- I understand that I am free to withdraw from the study at any time and without giving a reason.
- I understand that the event description data I provide will be shown to me (and only me) in subsequent surveys to allow me to answer questions in reference to this event.
- I give permission for my data from this study to be shared with other researchers provided that my anonymity is completely protected.

"This study has been explained to me to my satisfaction, and I agree to take part. I understand that I am free to withdraw at any time." Do you agree to participate in this research study?

□ **YES**: By ticking this box I authorize that I agree with the statements above and that I agree to take part. I understand that I am free to withdraw at any time by closing my browser window.

□ **NO**: I do not agree to take part in this survey.

Appendix 9

Debrief Form of the Pre-Screening Survey Used in Chapter 6

Debriefing Information
School of Psychology
University of Nottingham

Well-being and Health After Major Negative Life Events
Ethics Approval Number: s12333

Researcher:
Dr. Laura Blackie – Laura.Blackie@nottingham.ac.uk
Dr. Charlotte Scott – Charlotte.Scott@nottingham.ac.uk
Felix Lewandowski – Felix.Lewandowski@nottingham.ac.uk

Background:
Previous studies have shown that some people experience changes in their well-being, health and eating behaviour after they have experienced major negative life events. In this study, we examine if and how these changes unfold over a short amount of time, and whether there are personality and event characteristics that predict these changes.

Design and Dependent Measures:
In the first survey, participants describe and evaluate a recent major negative life event. A number of individuals will be invited to three follow-up surveys in which they are asked questions about their well-being, eating behaviour, personality and their thoughts and feelings towards the event they initially described.

Intended Analysis:
We will use statistical methods like multiple linear regressions, correlations and latent trajectory analysis to analyse the data while keeping your identity anonymised. The results of this study might be published in academic journals and in one of the researcher's PhD thesis.

Support Service Information:
If, during your participation in this research, you experienced any distress or concern regarding any aspect of your life or well-being, we encourage you to contact an appropriate support service. All of these helplines provide confidential support for anyone affected by mental illness or looking for advice.

- The charitable organisation **Mind** offer advice and support for anyone concerned about their mental health. They can be contacted at: 0300 123 3393 on weekdays, between 9am and 6pm. More information can be found with this link: https://www.mind.org.uk/information-support/
- The charitable organisation **SANE** are available every day to phone from 4:30pm to 10:30 pm on 0300 304 7000. SANE also offer a text-based service. Information on this service can be found with this link: http://www.sane.org.uk/what_we_do/support/textcare/
- **British Red Cross** https://www.redcross.org.uk/
- **Let's Talk Well-Being** is based in Nottinghamshire, Derbyshire, & Leicestershire and self-referral for mental health conditions. http://www.nottinghamshirehealthcare.nhs.uk/letstalkwellbeing
- The eating disorder charity **B-Eat**: www.b-eat.co.uk. Email: help@b-eat.co.uk; Telephone: 0808 801 0677.
- If you feel you are in crisis, the **Samaritans** can be phoned for free 24/7 on 116 123.
- Find more information about what support you can receive if you are affected by **COVID19** with this link: https://www.gov.uk/find-coronavirus-support

Other helplines for more specific problems, as well as links to online services, can be found on the **NHS** website: https://www.nhs.uk/conditions/stress-anxiety-depression/mental-health-helplines/

Appendix 10

Mean, Standard Deviation and Factor Loadings of Each PRAISE Item at Time Points 1, 2 and 3 in Chapter 6 (n = 285)

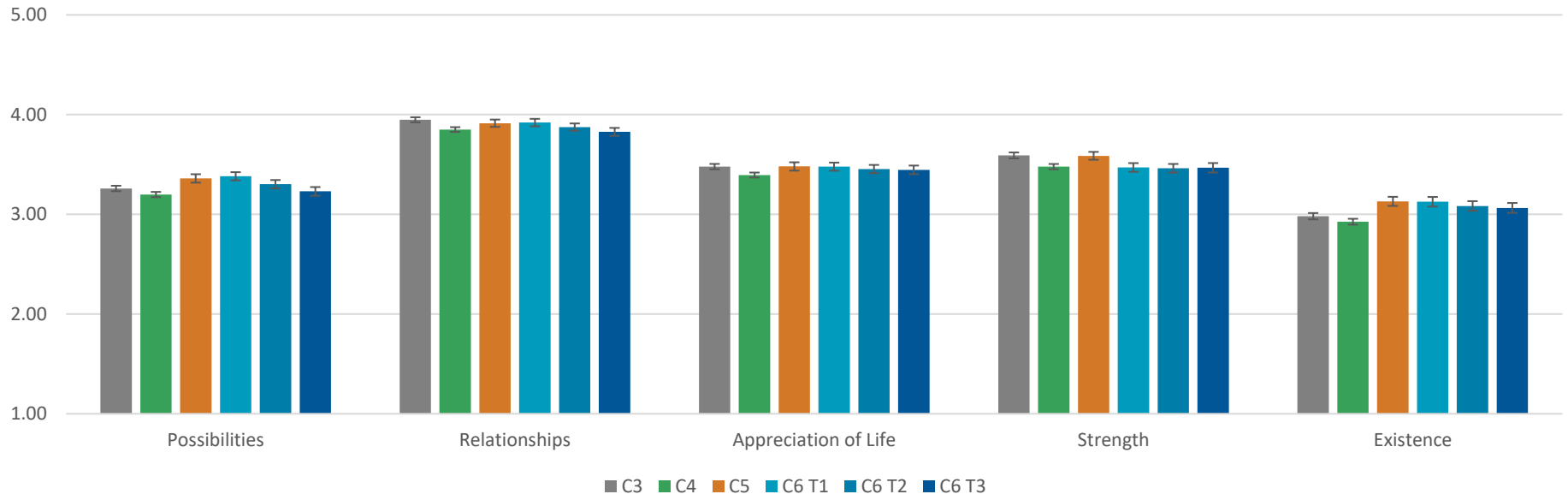
		Time Point 1			Time Point 2			Time Point 3		
#	Item	*M*	*SD*	Loading	*M*	*SD*	Loading	*M*	*SD*	Loading
Factor 1: Possibilities		**20.29**	**4.16**		**19.81**	**4.40**		**19.38**	**4.40**	
26	Motivated to accomplish a lot	3.41	1.02	.76	3.29	1.10	.84	3.20	1.12	.76
7	Made most of new opportunities	3.44	0.97	.65	3.40	1.00	.72	3.39	1.05	.74
12	Followed new paths in my life	3.07	1.12	.66	2.99	1.10	.65	2.90	1.17	.62
17	Open to new information / ideas	3.84	0.78	.58	3.86	0.74	.48	3.82	0.85	.61
2	Developed new interests	3.08	1.14	.55	2.94	1.11	.54	2.79	1.09	.46
21	Rethought how to live my life	3.45	1.03	.38	3.34	1.05	.40	3.29	1.10	.34
Factor 2: Relationships		**23.50**	**3.80**		**23.25**	**3.67**		**22.96**	**4.05**	
6	Compassionate towards others	4.06	0.76	.75	3.93	0.76	.79	3.92	0.88	.81
25	Been nice to others	4.17	0.76	.69	4.14	0.70	.74	4.07	0.75	.69
20	Great sense of closeness	3.45	1.05	.64	3.49	0.97	.64	3.42	1.06	.65
11	Valued other people highly	3.88	0.80	.67	3.80	0.84	.67	3.80	0.87	.72
16	People care about me	4.00	0.93	.64	4.00	0.90	.57	3.90	1.03	.55
1	Understanding and tolerant	3.96	0.87	.65	3.90	0.77	.69	3.85	0.87	.64
Factor 3: Appreciation of Life		**17.39**	**3.44**		**17.27**	**3.49**		**17.23**	**3.63**	
5	Appreciate each day	3.42	1.04	.80	3.43	1.07	.83	3.35	1.07	.84
24	Approach life calmly	3.44	0.95	.70	3.45	0.95	.78	3.41	0.97	.67
15	Live for the moment	3.34	1.02	.73	3.28	1.03	.73	3.27	1.07	.77
10	Not taken things for granted	3.71	0.89	.48	3.68	0.92	.50	3.69	0.88	.58
28	Low emphasis on material things	3.48	1.02	.26	3.43	0.93	.22	3.50	1.01	.32
Factor 4: Strength		**20.82**	**4.41**		**20.77**	**4.39**		**20.80**	**4.80**	
8	Confident in myself	3.21	1.15	.72	3.17	1.09	.76	3.27	1.15	.83
27	Thought of myself as strong	3.49	1.09	.80	3.39	1.04	.80	3.44	1.14	.74

18	Worked / did not just give up	3.82	0.79	.63	3.84	0.81	.66	3.72	0.88	.74
13	Able to deal with uncertainty	3.27	0.95	.66	3.31	0.98	.62	3.28	1.08	.70
3	Accept the way things work out	3.56	0.86	.64	3.54	0.91	.68	3.49	1.00	.68
22	Feeling of self-reliance	3.47	1.01	.67	3.52	0.98	.63	3.59	0.96	.62
Factor 5: Existence		**15.63**	**4.05**		**15.42**	**4.06**		**15.32**	**4.22**	
4	My life has meaning	3.38	1.14	.80	3.48	1.10	.83	3.38	1.08	.82
14	Sense of harmony with the world	2.89	1.11	.69	2.90	1.02	.73	2.85	1.14	.78
19	There is a reason for everything	3.38	1.19	.47	3.28	1.21	.53	3.27	1.17	.63
9	Face questions about life / death	3.35	1.10	.52	3.26	1.09	.45	3.31	1.09	.51
23	Spiritual / connected to higher	2.62	1.32	.41	2.49	1.31	.42	2.52	1.31	.42

Note. Factor loadings are calculated for a correlated 5-dimensional factor structure. Items are abbreviated.

Appendix 11

PRAISE Item Means Reported in Chapters 3 (n = 569), 4 (n = 619), 5 (n = 303), and 6 (n = 285)



Note. The samples C3, C4, and C5 comprised of a general population. The three C6 samples reported the experience of a personally significant adverse event. Means were used instead of scores for comparison reasons, as the range of possible scores differs across dimensions due to the different number of items in them.

Appendix 12

Bayesian CFA Results for 5 Correlated Dimensions and Small Item Cross-loadings in the PRAISE Scale in Chapters 4 (n = 619), 5 (n = 303), and 6 (3 time points with n = 285 each)

Sample	*n*	MCI	Priors	CFI	TLI	RMSEA [90% CI]	PPP
Chapter 4 T1	619	30000	*N*(0, 0.01)	.909	.896	.053 [.051 - .054]	.000
Chapter 5	303	30000	*N*(0, 0.01)	.895	.892	.061 [.058 - .063]	.000
Chapter 6 T1	285	30000	*N*(0, 0.01)	.876	.857	.068 [.066 - .071]	.000
Chapter 6 T2	285	30000	*N*(0, 0.01)	.890	.876	.066 [.063 - .069]	.000
Chapter 6 T3	285	30000	*N*(0, 0.01)	.902	.894	.063 [.060 - .065]	.000

Note. MCI = Markov Chain Iterations. CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root-mean-square error of approximation. PPP = Posterior Predictive P-values. Priors of *N*(0, 0.01) assume item cross-loadings of ±0.20.