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This issue would not have been possible without the myriad contributions from the larger psychology community. We acknowledge the accomplishments of the departing editorial team and welcome the new editors.

We are indebted to each and every one of the individuals listed below, as well as to all of our readers.

First, to our faculty advisor, Dr. Howard Steele, who trusted us to safeguard the legacy of this journal;

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To our copy editors whose tireless attention to detail helped us to produce a well-crafted issue;

To Themis Kung, our newly appointed layout editor, whose creative acumen allowed us to improve our journal's aesthetic appeal exponentially;

To all the authors who trusted us with their work–we thank you for your intellect, passion, and patience—

Thank you.

Letter from the Editors

Our team is proud to present Volume 22, Issue 1 of The New School Psychology Bulletin. Given today's climate of political unrest and cultural debates over women's rights, we are grateful for those in academia who add to our understanding of trauma and its far-reaching impacts, as well as document the unique experiences of women. In addition to their shared themes of trauma and the body, these articles represent a range of methodologies and perspectives within psychology.

Jiwani and Henritze describe a micro-phenomenological approach to increasing memory specificity among individuals with post-traumatic stress disorder.

Graham captures the state of current research on the relationship between event centrality and post-traumatic growth with a systematic review.

This issue also marks some changes within the editorial team. Rebecca Dolgin and Heleen Raes have stepped down from the team after several years of work on the bulletin, and we welcome Olivia Altman and Ethan Beberness in their place. Thank you to all those who contributed to this publication.

Sincerely,

Olivia Altman
Amudha Balaraman
Ethan Beberness
Rebecca Dolgin
Elia Goffi
Heleen Raes

Assessing the impact of Micro-phenomenology on Memory Specificity and Re-experiencing

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Episodic autobiographical memories are associated with the subjective sense of a self as continuous over time. Individuals diagnosed with depression or PTSD show cognitive alterations and maladaptive processes associated with autobiographical memory. One of these impairments is the tendency to recall episodic autobiographical memory with decreased specificity, also known as overgeneralized memory (OGM). OGM is associated with a limited capacity to mentally "time travel" or re-experience the past with vivid sensory and perceptual details. This study aims to assess whether the micro-phenomenological interview (MPI) may be effective in improving overgeneralized memory and access to sensory-perceptual details. MPI is a semi-structured interview that assists participants in directing attention towards visual, auditory, and affective dimensions of experience and focuses on a few seconds of experience within an autobiographical memory. It was hypothesized that the application of the MPI would increase the accessibility of episodic details which, in turn, would lead to the reduction of overgeneralized memory. The efficacy of MPI was assessed relative to the free recall of a positive memory using the Autobiographical Memory Test (AMT) and Autobiographical Memory Questionnaire (AMQ) with adults ($N = 7$) between ages 24-30. Preliminary results indicate that the MPI led to a significant increase in memory specificity ($p < .05$) and increases in the re-experiencing of visual imagery ($p < .05$). These findings demonstrate the potential of the MPI as a clinical tool to improve memory specificity in populations suffering from disorders such as depression and PTSD.

Keywords: micro-phenomenology, memory, overgeneralized memory, autobiographical memory

Assessing the Impact of Micro-Phenomenology on Memory Specificity and Re-Experiencing

Episodic autobiographical memory is considered an important human evolutionary achievement and a central feature associated with the experience of a self that is continuous overtime (Markowitsch & Staniloiu, 2011; Tulving, 2005). Research on episodic autobiographical memories, a term which is used interchangeably with episodic memory, has demonstrated how the self is experienced through space and time (Conway & Jobson, 2012; Markowitsch & Staniloiu, 2011). In their attempt to describe the nature of autobiographical memories, Conway and Pleydell-Pearce (2000) describe three hierarchical levels of representation of autobiographical knowledge: lifetime periods, general events, and event-specific knowledge (ESK), or episodic memories respectively. ESK differs from the other levels of representation as it consists of sensory-perceptual information. The term was intended to "refer to any highly specific knowledge unique to a single or extended representation of experience(s)" (Conway & Jobson, 2012, pp. 55-6). Williams et al. (2007) describe ESK as experience-near records of sensory-perceptual and conceptual features of experience. Given the importance of visual processing to human cognition, ESK has been described to be mostly conceived and accessed as visual images while also containing other sensory and affective information (Conway, 2009; Conway & Jobson, 2012; Greenberg & Knowlton, 2014).

However, complex episodic memories containing a high degree of detailed sensory-perceptual and affective features are harder to retrieve as it may be difficult to stabilize attention on a single autobiographical episodic memory and produce a verbal description (Petitmengin, 2006). This study explores the nature of episodic memories through the use of a recently developed interview method known as the micro-phe-

nomenological interview (MPI; Petitmengin, 2006) which assists interviewees in exploring and sustaining access to sensorial and affective content of memory and providing a verbal description. It is hypothesized that the MPI will lead to a greater re-experiencing of memory. Additionally, this exploration and sustained access to autobiographical memory is hypothesized to lead to an improvement in episodic specificity of memory and future imagination.

Episodic Autobiographical Memories and Future Imagining

Tulving (2005) argues that only human beings possess the ability to engage in autonoetic consciousness, a phenomenon which describes the awareness of one's existence across time. Through this unique ability, humans can project themselves back into a specific moment in time and reexperience happenings that occurred previously in one's life as well as project oneself into the future and imagine future self-referential events (Klein, 2015; Lehner & D'Argembeau, 2016). Lemogne et al. (2006) described autonoetic consciousness as a) necessary for episodic memory retrieval and b) "the ability to relive subjective experiences from the encoding context by mentally traveling back in time," (p. 260). Episodic memory has also been described as a confluence of autonoetic consciousness, subjective time, and the experience of self (Markowitsch & Staniloiu, 2011). However, a distinction has been drawn between semantic autobiographical memory (such as time and place of birth) and episodic autobiographical memories which presuppose autonoetic consciousness (Markowitsch & Staniloiu, 2011).

Tulving (1985, 2001, 2002) also proposed a relationship between episodic memory and episodic future imagining through the presence of autonoetic consciousness in both constructs. Recent studies have demonstrated neural and cognitive resemblance between episodic memory and episodic future imagining (Addis et al., 2007; Beaty et al., 2019; Schacter et al., 2017). Szpunar (2010) describes episodic future imagining as "the ability to simulate specific personal episodes that may potentially occur in the future." (p. 142). Schacter and Addis (2007) argue that given the neural and functional correlates between episodic memory and episodic future thinking, a shared memory system (SMS) is at work. Thus, understanding the nature of episodic autobiographical memories is important to a deeper understanding of the nature of a continuous individual self which exists in the past and the future (Conway & Jobson, 2012).

In an attempt to develop a process model to better understand episodic autobiographical memory systems, Conway and Pleydell-Pearce (2000) proposed a hierarchical level of SMS, as noted earlier. Acknowledging the similarity between ESK and episodic memory, Conway (2009) further refined the model by suggesting that there is likely a more complex system at work at this level of the SMS. Within ESK, the most basic unit of memory is described as an episodic element, which is fragmentary sensory perceptual information. This information is rapidly lost unless attached to a conceptual frame (Conway & Jobson, 2012). The combination of a conceptual frame and episodic element constitutes a simple episodic memory whereas a complex episodic memory organizes one or more simple episodic memories together with a common higher order conceptual frame (Conway, 2009). As such, what was previously described as a single layer ESK, is now described as a far more complex, multi-layered structure.

Additionally, while episodic elements may contain a variety of sensory perceptual information, visual imagery has been described as the most important for memory (Greenberg & Knowlton, 2014). Most episodic memories are believed to contain predominantly visual imagery data and visual imagery purportedly can integrate widely distributed memory networks which may facilitate long-term episodic memory (Conway, 2009; Conway & Jobson, 2012). To access this layer of memory, Conway and Pleydell-Pearce (2000) describe a generative retrieval process whereby a top-down search can be activated using a conceptual representation which can lead to the identification of a lifetime period or a general event followed by ESK. The disruption of this search process has been a suggested symptom of emotional disorders (Conway and Pleydell-Pearce, 2000; Williams et al., 2007).

Overgeneralized Memory

Overgeneralization is the disruption of the generative search process whereby it stops before reaching ESK and remains at the level of life or general event (Williams et al., 2007). Many research studies have found that Major Depressive Disorder (MDD) and Post Traumatic Stress Disorder (PTSD) are characterized by retrieval of autobiographical memory in an overgeneralized way (Dalgleish & Werner-Seidler, 2014; Hitchcock et al., 2017; Williams et al., 2007). Attempting to explain the emergence of overgeneralized memory (OGM), Conway and Pleydell-Pearce's (2000) SMS model emphasizes the impact of the working self, whereby a person's past knowledge as well as current and future goals inhibit access to autobiographical memories that do not align with self-views. Williams et al., (2007) proposed a new model which considers OGM as a consequence of maladaptive processes such as capture and rumination, functional avoidance, and impairments in executive control.

OGM is typically measured using a cueing methodology, whereby participants are provided with cue words that vary in their emotional valence and asked to recall an autobiographical episodic memory that is

specific to a single time and place (Williams et al., 2007). Those exhibiting OGM typically tend to recall categorical memories (events that have occurred multiple times) or overgeneralized memories (memories that describe a period longer than a single day) rather than a specific memory (Brown et al., 2013). The impact of OGM is not limited to memory but also episodic future thinking, which is the act of imagining future events. Miloyan et al. (2014) propose the Reconstructive Memory Model (RMM), which suggests that the future imagining is dependent on the nature of present episodic retrieval. In other words, how we recall memories (overgeneralized or not) impacts future imagining, and thus improving OGM can have a dual effect on improving both memory and future imagining specificity. OGM may also have a causal link with other psychological functions including impaired problem solving and increased risk of onset and slower recovery from affective disorders (Dalgleish & Werner-Seidler, 2014; Williams et al., 2007). Additionally, overgeneralized memory is considered an important phenomenon because of its presence in individuals with a history of emotional disorder even if the individual is not currently experiencing an episode and thus might indicate a future vulnerability to such disorder (Williams et al., 2007).

There is limited evidence that Cognitive Behavioral Therapy (CBT) resolves overgeneralized memory (Barry et al., 2019) and, as such, a number of new interventions have been developed that target specific impairments such asto attention and memory to treat and prevent affective disorders. These include memory specificity training (Raes et al., 2009), concreteness training (Watkins et al., 2009), mindfulness training (Heeren et al., 2009), competitive memory training (Korrelboom et al., 2009), imagery-based training of future autobiographical episodes (Blackwell & Holmes, 2010), life review/reminiscence therapy (Arean et al., 1993), and episodic specificity induction (McFarland et al., 2017). A number of studies focused on healthy populations have demonstrated underlying mechanisms that drive improvements in specificity such as increased cognitive flexibility (Heeren et al., 2009) and improved executive function (Madore & Schacter, 2014). Many of these interventions support the participants in improving access to episodic details of memories.

Even amongst a healthy population, accessing, sustaining access to, and verbally describing episodic details or subjective experience can be incredibly challenging for several reasons. First, stabilizing attention on a concrete experience beyond a few moments is incredibly difficult as objects or images in a memory may cue other memories and divert attention (Petitmengin, 2006). This is particularly challenging for depressed and dysphoric individuals who are likely to have their attention captured by ruminative thinking (Williams et al., 2007). Second, while describing memories, one tends to focus on what might be referred to as the "satellite dimensions" of experiences, such as conceptual or procedural knowledge, evaluations, or commentaries, rather than the internal process of the experience (Cavaletti & Heimann, 2019; Petitmengin, 2006). This is supported by Conway's (2009) model which hypothesizes that episodic elements are attached to a conceptual frame. As such, in retrieving memories, one often recalls the conceptual aspect of the memory without fully exploring the episodic elements attached to the conceptual frame. Third, even if attention is stabilized and the focus is on the inner experience, it may be difficult to know what to focus on within the inner experience without training and understanding of various sensory-perceptual and transmodal dimensions of experience (Petitmengin, 2006, 2007). Petitmengin (2007) describes the transmodal dimension as characteristics of experience (such as intensity or rhythm) that are not tied to a specific sense but rather can be experienced across multiple senses. This may be especially true for autobiographical memories laden with emotion. In a comparison of freely recalled memories versus memories recalled via cognitive interview, Engelberg and Christianson (1999) demonstrated a persistent underestimation of emotional intensity in the free recall of memory versus the cognitive interview. As such, a guided interview may help expand access to more sensory-perceptual data from autobiographical episodic memories.

Micro-phenomenology Interview

One tool that has not yet been tested to improve OGM is the micro-phenomenological interview (MPI). Initially developed as an elicitation interview by Vermersch (1999), the MPI is a technique to guide a person to recall a very specific experience and examine it with great precision (Valenzuela-Moguillansky, 2013). The interview method has been used in the context of cognitive science (Braboszcz, 2012) to better understand mind wandering, a term used to describe drifting of attention when trying to focus. It has also been used in pedagogical settings (Maurel, 2009), to study meditation (Petitmengin et al., 2019a), and in clinical fields (Petitmengin et al., 2007; Valenzuela-Moguillansky, 2013). The MPI begins with the assumption that a large part of our experience is unnoticed. The experience of touching or seeing an object, listening to music, imagining or remembering something is largely difficult to access for reflection or verbal description. Our conscious minds are focused on the object or content of our attention. The difficulty of access is not because access to this experience is out of reach but that accessing it requires certain expertise. The MPI was developed in order to assist those being interviewed to become more aware

and describe precisely the unrecognized part of their experience (Petitmengin, 2006; Petitmengin et al., 2019b; Valenzuela-Moguillansky, 2013).

The MPI is conducted as a one-on-one interview with a trained micro-phenomenological nterviewer. A micro-phenomenological interview begins with identifying an *epoché* or bracketing (developed by German philosopher Edmund Husserl) by helping participants select a very specific moment in time and place (which may last just a few seconds) and exploring the sensory dimensions of this specific experience (Beyer, 2018; Petitmengin, 2006; Vermersch, 1999). Once a specific moment is chosen, the interviewee is supported into an evocation state whereby a given past experience is recalled as if re-enacted from an "embodied position" (Vermersch, 2009). The goal of the evocation is to mentally time travel to the experience being described and for that experience to become more vivid than the present moment. This vividness is achieved by retrieving the temporal and spatial context followed by the visual, auditory and tactile sensations associated with the experience (Petitmengin et al., 2019b). The level of evocation of the interviewee can be measured by the interviewer using previously identified non-verbal, verbal, and para-verbal markers (Petitmengin, 2006; Valenzuela-Moguillansky, 2013). Once the evocation state has been established, the interviewer can ask questions to create an outline of the temporal evolution of a memory followed by directing attention to finer levels of the episodic element. These processes have been described as diachronic and synchronic dimensions of experience, respectively (Valenzuela-Moguillansky, 2013). The diachronic dimension is engaged by asking questions that assist the participant in explaining the unfolding of the experience. These questions, such as "How did you start?" and, "What happened then?" are used to better understand the progression within the *epoché*. The questions exploring the synchronic dimension focus on a specific moment of the unfolding (Petitmengin et al., 2019b).

Exploring the finer dimensions of experience may also involve exploring the sensory dimension of abstract emotions through questions to locate and/or describe the sensory experience of emotion. For example, if an interviewee describes feeling sadness in an experience, the interviewer might ask, "Is this sadness located somewhere?" or, "When you feel sad, what do you feel?" The questions in the MPI method are "content-free," in that the interviewer does not introduce any new language or make any inferences in asking about the experience (Petitmengin, 2006). It is likely and expected that the interviewee may revert to the satellite dimensions during the interview and is gently guided back to the internal processing of the chosen experience (Cavaletti & Heimann, 2019; Valenzuela-Moguillansky, 2013). The iterative structure of the MPI is designed to ensure consistent evocation of the experience.

Relative to free recall, the MPI may be better suited for the experience of assisting participants in accessing autonoetic experience or mentally time traveling into episodic autobiographical memories for several reasons. First, the MPI method supports participants to direct attention beyond the visual dimension of episodic elements as suggested by Conway (2009) towards other sensory content such as the auditory dimension and body positioning and sensations. Conway and Pleydell-Pearce (2000) cite a number of studies where the more sensory detail available for recall, the greater likelihood of accuracy in recall of autobiographical memories. The use of the MPI method has been shown to improve the accuracy of recall and decision-making processes relative to free recall (Petitmengin et al., 2013). The MPI supports participants in bringing attention to and expanding the sensory understanding of what Williams et al. (2007) describe as "conceptual-affective" components of experience. Second, the MPI begins with the generation of an evocation which helps stabilize attention on a single memory and avoids interviewees from being able to use a cue from one memory to jump to another memory or experience. Third, the MPI helps interviewees from veering into the satellite or conceptual dimensions of a memory whereby the participant may speak about the conceptual frame of a memory rather than the sensory perceptual content of the episodic element. Finally, unlike other tools such as mindfulness-based interventions, the MPI method helps participants in producing a verbal description of the sensations and mental contents, something which requires guided support and training (Petitmengin, 2006).

Given the intensive and embodied nature of the MPI exploration into autobiographical memories, the experience of MPI may serve as an episodic specificity induction. While other methods such as memory specificity training (Raes et al., 2009) and concreteness training (Watkins et al., 2009) focus on training participants to focus on specific memory retrieval which lasts less than a day, participants in a MPI are trained to direct their attention precisely on just a few seconds of experience. Training the mind towards more specificity has shown to reduce symptoms of depression (Watkins et al., 2009) and a logical hypothesis might be that greater specificity and precision may lead to an increased reduction in symptoms. Additionally, by directing attention beyond the visual dimension, interviewees may expand cognitive flexibility by expanding attentional awareness beyond habitual patterns as well as expanding the capacity of awareness, a key component of increasing cognitive flexibility (Martin & Rubin, 1995). Cognitive

flexibility has shown to explain some of the impact of mindfulness training on improving memory specificity (Heeren et al., 2009). Finally, similar to guided mindfulness training, the MPI helps participants direct attention towards sensations, thoughts, and emotions. However, unlike mindfulness training, the MPI also assists participants, as stated above, in producing a verbal description.

The Current Study and Hypotheses

Given the potential of the MPI in improving the exploration of episodic autobiographical memories, the current study aims to assess the impact of the MPI on enhancing autonoetic consciousness, episodic specificity of memories, and future imaginations relative to free recall of memories. This pilot study included participants from the community and utilized positive memories. Four hypotheses were tested as part of this study and are described below.

The first hypothesis (H1) is that the MPI will improve the autonoetic consciousness in participants relative to free recall. In other words, participants will have a greater sense of re-experiencing a past event after the MPI. The rationale for this hypothesis is multifold. First, the MPI allows participants to stay close to the experience of the memory and avoid the satellite dimensions such as describing the context, procedural knowledge, judging, or commenting on the experience (Cavaletti & Heimann, 2019; Petitmengin, 2006). Second, the MPI will also assist participants in staying with a memory and not using a cue from one memory to jump off to another memory. Thus, the ability to stay with the experience of a memory for a longer duration is hypothesized to improve autonoetic consciousness.

The second hypothesis (H2) assessed in this study is that the MPI will improve access to sensory perceptual and affective content of memories. Specifically, this study assesses participants' awareness of visual, auditory, and emotional dimensions of experience in a memory. This is hypothesized because the evocation component of the MPI directs and guides participants to retrieve the sensory and perceptual content of memories. Additionally, Conway (2009) and Conway and Pleydell-Pearce (2000) point out that the nature of ESK or episodic elements is predominantly visual. While visual content may be easier to access, this study aims to further this theory and contend that other dimensions and content of memories exist but are difficult to access without guidance. Engelberg and Christianson (1999) point out that free recall of autobiographical memories led to underestimates of emotional intensity while a guided interview led to a more accurate recall of emotional intensity.

The third hypothesis (H3) is that the MPI will improve episodic specificity in memories and future imaginations in unrelated autobiographical memories and imaginations. This was hypothesized because the MPI induces participants to explore sensory and affective components of memory in a highly specific way, focusing only on a few seconds of experience. Additionally, it assists participants in stabilizing attention which is more difficult to achieve with free recall. The high degree of specificity and attention that is practiced with the MPI is believed to improve participants' capacity to recall memories and project imaginations with more specificity.

The fourth and final hypothesis (H4) is that the improvement in autonoetic consciousness or experience of reliving a memory will be correlated with the improvement in specificity. This hypothesis is based on the assumption that support for H1 and H3 will be found. The demonstration of H1 may be an indicator of whether the MPI was effective in the induction of autonoetic consciousness and that induction may lead to an improvement in episodic specificity more broadly.

Method

Participants

Due to the lockdown caused by the proliferation of COVID-19, data from only seven participants (4 female) were collected relative to the initially anticipated 25 participants. Participants were recruited either through social media or flyers. Any adult who spoke English was eligible to participate in the study. Participants expressed interest via email and were scheduled for the study via email. All participants were students at The New School and received either a $20 gift card or research credits for participation. Sample demographics are reported in Table 1. The age of the participants ranged from 24-30 years (M = 26.7, SD = 2.56). Fifty-seven percent (n = 4)

Table 1

Sample Demographic Characteristics

Variable	N = 7[1]
Age	26.71 (2.56)
Male	*3 (42.86%)*
Non-Hispanic White	*2 (28.57%)*
Asian	*4 (57.14%)*
Multiracial	1(14.29%)
College	7 (100%)
Income	
Less than $20,000	4 (57.14%)
$50,000-$74,999	2 (28.57%)
$75,000 - $99,999	1(14.29%)

Note. Mean (SD); n (%); College = Bachelor's degree or above

described themselves as Asian, 28% (n = 2) as white, and 14% (n = 1) as multiracial. All participants confirmed that English is their primary language.

Measures

Autobiographical Memory Questionnaire (AMQ).

The AMQ was developed by Fitzgerald and Broadbridge (2013) to better understand and explore the phenomenological properties of episodic autobiographical memories. The AMQ is based on a theoretical model that tests four latent constructs of belief, recollection, impact, and rehearsal. Of the four, recollection was the construct most relevant in this study as it assessed the self-reported phenomenological experience of autonoetic consciousness as proposed by Tulving (1972). As part of this construct, the authors include the experience of reliving, traveling back in time, seeing, hearing, and emotionally embodying the memory in question. In order to fit the needs of this study, the instructions in the AMQ were modified. The original AMQ instructed participants to imagine a past stressful memory. The instructions for the present study asked participants to report on their experience recalling a memory during the experiment. An acceptable level of internal consistency was demonstrated (α_1 = .76).

The Autobiographical Memory Test (AMT).

The AMT was also applied in this study to assess episodic specificity. Introduced by Williams and Broadbent (1986) in their study to assess memory-mood phenomena, the AMT aims to assess memory specificity by offering valenced cue words to participants and asking them to retrieve specific memories that occur at a specific time and in a specific place and that did not last more than 24 hours. Participants suffering from overgeneralized memory tend to respond to these instructions with either categoric memories, which are memories that happen repeatedly, or overextended memories, which refer to events that last longer than a day (van Vreeswijk & de Wilde, 2004). Six positive and six negative valenced cue words were used to assess memory specificity and an additional six positive, and six negative valenced cue words were used for future imaginations. The words were drawn from previous studies on the AMT (Dritschel et al., 2014) and Affective Norms for English Words (ANEW): Instruction Manual and Affective Ratings (Bradley & Lang, 1999). The memories and future imaginations were coded as either specific (score of 2), not specific (score of 1), or non-answer/non-response (0). To assess inter-rater reliability, 28% of the responses were re-coded by an independent coder blind to the two conditions (free recall, MPI). An acceptable level of inter-rater reliability was found (α_1 = .75).

Experimental Procedure and Analysis

The experiment lasted approximately 90 minutes per participant. Participant responses were collected via Qualtrics. The experiment began with participants first providing consent and then demographic information. Next, participants were instructed to provide free recall of a specific positive memory from their recent past. To encourage specificity, participants were instructed to share a memory that they directly experienced at one time and in one place and asked to provide as much detail as possible (see free recall script in the Appendix). After completing the free recall, participants were given a math filler and asked to complete the AMQ and AMT, respectively, for the memory that they shared during the recall. After completing the AMQ and AMT, participants were given another math filler before the MPI was conducted. The MPI was conducted using a different positive memory from their recent past. Participants were instructed that they were free to not respond to any question and/or stop the interview at any time for any reason (see MPI script in the Appendix). At the conclusion of the MPI, participants were given another math filler followed by the AMQ using the memory explored through the MPI and the AMT for memory and future imaginations. All procedures were reviewed and approved as part of a supervised research methods class. Paired-sample t-tests were conducted to test H1-H3 and a correlational analysis was conducted to test H4. All analyses were carried out using statistical software SPSS.

Results

The skewness and kurtosis of the average score on the cue-word memory test after free recall (n(7), skew = .361, SE = .794, kurtosis = -.738, SE = 1.587) and after the MPI (n(7), skew = -.556, SE = .794, kurtosis = -2.234, SE = 1.587) were higher than the acceptable average. See Table 2 for a summary of results from the first hypothesis (H1). H1, which posited that the MPI will improve the autonoetic consciousness in participants relative to free recall, was supported. Participants reported a significant increase in the experience of reliving the original event (M_{diff} = -1.571, SD = 1.134, 95% CI [-.2.620, -.523]), t(6) = -3.667, p = .010) and traveling back in time (M_{diff} = -1.429, SD = 1.397, 95% CI [-.2.721, -.136]), t(6) = -2.705, p = .035). H2, which predicted that the MPI will improve access to sensory perceptual and affective content of memories relative to free recall was partially supported. The experience of seeing the memory was significant (M_{diff} = -.571, SD = .535, 95% CI [-1.066, -.077]), t(6) = -2.828, p = .030), while the experience of hearing the event was not significant (M_{diff} = -.571, SD = 2.507, 95% CI [-.2.890, 1.747]), t(6) = -.603, p = .569), and

Table 2

Paired Samples Test Assessing Difference in Perceived Autonoetic Consciousness.

Item	*Mean*	*SD*	*t*	*p*
Reliving the Original Event	-1.571	1.134	-3.667	.010
Traveling back and participating in the event	*-1.42857*	1.39728	-2.705	.035
Seeing the Event in the mind	*-.571*	.535	-2.828	.030
Experiencing the event spatially	*-.286*	.756	-1.000	.356
Feeling the Emotions that were felt then	-.429	1.988	-.570	.589
Hearing the Event in the mind	-.571	2.507	-.603	.569

Note. *SD* = Standard Deviation; df = 6 for all comparisons.

Table 3

Paired Sample T-Tests comparing AMT after free recall and MPI

AMT Categories	*Mean*	*SD*	*t*	*p*
Past Positive	-0.43	0.32	-3.58	0.012
Past Negative	*-0.14*	0.18	-2.12	0.078
Past Total	*-0.29*	0.23	-3.29	0.017
Future Positive	*-0.14*	0.33	-1.16	0.289
Future Negative	-0.05	0.13	-1.00	0.356
Future Total	-0.10	0.21	-1.19	0.28

Note. *SD* = Standard Deviation; df = 6 for all comparisons.

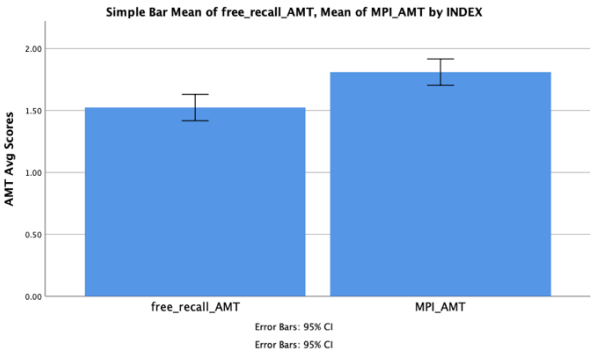
neither was a question around feeling the emotions that were felt (M_{diff} = -.429, *SD* = 1.988, 95% CI [-2.267, 1.410]), *t*(6) = -.57-, *p* = .589). However, in attempt to gain a comprehensive view, the recollection construct as described by Fitzgerald and Broadbridge (2013), which included reliving, time travel, seeing, hearing, and emotion, was averaged and a t-test was conducted to compare the mean responses on this construct versus free recall, which was found to approach significance (M_{diff} = -.91429, *SD* = .99235, 95% CI [-1.832, .00349]), *t*(6) = -2.438, *p* = .051).

H3, which predicted that the MPI would improve episodic specificity in memories and future imaginations in unrelated autobiographical memories compared to free recall, was also partially supported. Looking at past memories, specificity improved significantly in participant recall of positively valenced memories (M_{diff} = -.428, *SD* = .317, 95% CI [-.721, -.135]), *t*(6) = -3.567, *p* = .012) and specificity in improving negatively valenced memories approached significance (M_{diff} = -.142, *SD* = .178, 95% CI [-.30764, -.021]), *t*(6) = -2.121, *p* = .078). Looking at the total AMT, specificity improved significantly relative to free recall (M_{diff} = -.285, *SD* = .230, 95% CI [-.498, -.072]), *t*(6) = -3.286, *p* = .017, see Figure 1). Episodic specificity in future imaginations did show a mean improvement but it was not statistically significant for the positively valenced cue words (M_{diff} = -.142, *SD* = .325, 95% CI [-.443, .158]), *t*(6) = -1.162, *p* = .289), negatively valenced cue words (M_{diff} = -.047, *SD* = .125, 95% CI [-.164, .068]), *t*(6) = -1.00, *p* = .356), or overall average (M_{diff} = -.095, *SD* = .212, 95% CI [-.291, .101]), *t*(6) = -1.188, *p* = .280). See Table 3 for a summary of the results.

Finally, H4 proposed that the improvement in autonoetic consciousness or experience of reliving a memory would be associated with the improvement

Figure 1

Avg AMT score difference for past memories



in specificity. Although statistically significant support for H4 was not found, average AMT scores appeared to correlate negatively with the average total recollection score, contrary to the predicted direction ($n = 7$, $r = -.727$, $p = .064$).

Sensitivity Analysis

Given the small sample size and resulting high skew and kurtosis, we also ran the Wilcoxon's rank-sum tests which is a non-parametric test, in addition to the t-tests. The results did not change such that all significant findings were the same for both t-tests and Wilcoxon's rank-sum tests.

Discussion

Despite a small sample size, several important findings have emerged from this study. The aim of this study was to assess whether the MPI may be able to assist in improving access to autonoetic sensory recollection of episodic memories and reduce OGM by improving episodic specificity. The MPI did improve autonoetic consciousness in participants relative to free recall, as participants' responses to traveling back in time and reliving the experience significantly improved. Autonoetic consciousness is a critical element necessary for episodic memory retrieval and improvement in participant's ability to travel back in time is likely to improve retrieval of memories (Conway & Jobson, 2012; Lemogne et al., 2006). The second hypothesis was partially supported as participants significantly improved in accessing visual imagery but were not able to improve their experience of auditory or emotional recall significantly. The finding of improvement in access to visual imagery aligns well with Conway's (2009) argument that episodic memories are often stored and represented in the form of visual images. Thus, if episodic memories are visually dominated, then the improvement in visual imagery using the MPI relative to free recall makes sense. Improvement in access to emotional and auditory dimensions was not significant, though both factors were showing trends of improvement. Post-hoc power analysis suggests that the study with the present sample size was only powered to detect large differences. Finally, the recollection subscale developed by Fitzgerald and Broadbridge (2013) showed a trend toward an improvement in the MPI relative to free recall. Overall, a larger sample size may demonstrate that MPI improves autonoetic consciousness and access to sensory-perceptual data. Future research may want to assess whether improvement in self-reported autonoetic consciousness is accompanied by improved executive functioning as has been seen in episodic specificity inductions in other studies (Jing et al., 2016, 2020; Madore et al., 2019). Additionally, capturing physiological data such as heart rate variability or assessing for interoceptive awareness may also explain the underlying mechanisms associated with improved autonoetic recollection.

The third hypothesis was also partially supported. The current study found that episodic specificity significantly improved after the MPI when recalling past memories using the AMT cue word paradigm. These results demonstrate the potential of the MPI as a useful tool in improving episodic specificity in a community sample. Looking at the results, specificity improved more with positively valenced cue words relative to negatively valenced cue words. This may be due to the fact that the MPI and free recall memory tasks asked participants to recall positive memories. However, the study did not show a significant improvement in episodic specificity in future imaginations. This may be due to a number of reasons. First, the sample size in the study might be too small to capture an effect. Second, as the MPI induced a memory, the impact on future imagining may be less than on memories. Finally, the study design had ordered the past cue-words before the future cue-words and that may have led to some participant fatigue. Counterbalancing past and future may have yielded different results.

The final hypothesis, which attempted to identify the improvement in self-reported autonoetic recollection as an underlying mechanism for improvement in episodic specificity, was not supported. This may imply that improvement in self-reported autonoetic consciousness and accessing more sensory perceptual data does not lead to an improvement in memory specificity. However, this result may also be due to different mechanisms at play within the MPI in improving autonoetic consciousness and episodic specificity. Finally, this result may also be due to the small sample size.

The findings have important implications for research and clinical practice. From a research perspective, the findings build on the work by Engelberg and Christianson (1999) which suggests that guided interviews may help access greater memory content relative to free recall of memories. Additionally, given that visual recall improved in participants following the MPI supports prior work which contends that visual imagery may be critical to how autobiographical and long-term memory is stored. From a clinical perspective, this study demonstrates that the MPI may be able to improve autonoetic sensory recollection and episodic specificity. Our findings provide preliminary evidence for a novel clinical method that can be integrated into future interventions for several memory-related psychopathologies including depression and PTSD. By applying commonly used measures for autobiographical memory not previously assessed in prior work with the MPI, the findings

from the current study contribute to the growing body of literature on micro-phenomenology and its potential for clinical utility.

Limitations and Future Directions

The major limitation of this study was the sample size. The small sample size led to greater skewness and kurtosis in some of the assessed variables. This limitation can be addressed by increasing the size of the sample, which may lead to a more normal distribution of data. Our study provides the basis for several lines of future research. First, comparisons between inducing negative or neutral memory with the MPI on positively or negatively valenced cues may indicate ways to reduce avoidance of negative memories. Additionally, future studies might focus on the impact of the MPI on clinical populations (such as people with depression, PTSD, and/or anxiety) to assess if similar results are found. A comparison of the MPI to other inductions such as the episodic specificity induction (Jing et al., 2016, 2019;

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Appendix A

Induction Scripts

Free Recall Induction

Today, I'd like to invite you to think of a positive memory from the last one year. It can be any memory where you felt positive emotions. Please think of something that happened to you and that you directly experienced at one time and in one place. Choose something that you remember well. When you are ready, I would like you to recall the memory and share it with me in as much detail as possible.

Micro-phenomenology Interview Induction

Now I would like to invite you to think of a positive memory from the last one year. It should be different from the one you recalled and shared with me directly earlier.

It can be any memory where you felt positive emotions. Please think of something that happened to you and that you directly experienced at one time and in one place. Choose something that you remember well. When you are ready, let me know and we will proceed further.

Today, if you agree, we are going to do something called a micro-phenomenological interview. This interview is a way for us to explore your memory in great detail and precision. In order to do this, I will ask you a series of questions to help you go back to the experience. I will also at times re-state what you have shared to assist you in going back and also to ensure that I have correctly understood what you have shared.

You are free to choose to not respond to any question and you may ask to pause or stop the interview at any time for any reason.

So if you agree, I would like to invite you to give me a brief description of the memory you have chosen.

(wait for the description)

Is there a particular moment that you would like to focus on in this experience?

(once agreed, proceed to the interview guide)

A Systematic Review of the Relationship Between Event Centrality and Posttraumatic Growth

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This paper applied a systematic review methodology to investigate the relationship between event centrality (EC) and posttraumatic growth (PTG). Five databases were searched with 18 papers included for review. Results indicated a robust, positive correlation between EC and PTG (r range = 0.34 - 0.59, all $p < 0.001$). Event centrality was also consistently observed to be positively associated with a maladaptive posttraumatic outcome, posttraumatic stress (PTS; B range .38 - .68, all $p < 0.001$). Several cognitive factors–deliberate rumination, intrusive rumination, psychological flexibility and negative self-cognitions–were observed to differentiate pathways between PTG and PTS in cases of high EC. Several of these relationships were not observed to be significant in cases of low EC, highlighting the clinical significance of these factors *within* the EC-PTG/PTS relationships. Results suggest that these cognitive factors may be useful targets for intervention within applied/clinical settings, pending further experimental research.

Keywords: event centrality, posttraumatic growth, posttraumatic stress

Introduction

Exposure to traumatic events (an event that results in an experience of overwhelming stress) is an unfortunate, and ubiquitous, part of the human experience. Epidemiological data supports the omnipresence of trauma, with Frans et al. (2005) estimating that 90% of the world's population will experience at least one traumatic event in their lifetime. While specific populations are exposed to an increased risk of experiencing traumatic events (such as refugees, soldiers, and emergency workers), traumatic experiences often strike indiscriminately and can result in clinically significant psychological distress and impairment (Kessler et al., 2017). Trauma-exposed individuals are observed to be at increased risk of developing post-traumatic stress disorder (herein PTSD; American Psychiatric Association, 2013), amongst a range of other metal health difficulties (e.g. mood and other anxiety disorders; Brooks et al., 2020). While psychological research has typically focused on the negative phenomena associated with trauma exposure, some research has identified positive, adaptive outcomes for individuals that have been exposed to traumatic events. Tedeschi and Calhoun (2004) offered a seminal paper on the concept of posttraumatic growth (PTG), defined as "The experience of positive change that occurs as the result of a struggle with a highly challenging life crisis" (p.1). Tedeschi and Calhoun (2004) observe that PTG can manifest in five domains: increased appreciation for life; improved relationships; increased sense of personal strength; identification of new core values; a richer existential and spiritual life. Indeed, while the concept of PTG is relatively new to psychology, it should be noted that the notion of benefit emerging from suffering is long-standing across many philosophical and spiritual traditions (Whitehead et al., 2018).

Another trauma-related psychological concept that has received significant attention from researchers is that of event centrality (EC). EC is a cognitive construct that is defined as the extent to which an individual perceives an event as central to their identity (Berntsen & Rubin, 2006). An event that is highly centralized with respect to one's identity functions as a reference point for an individual's sense of self, view of the world, and consequent behavior within it. Early research on EC identified a robust positive correlation between EC and symptoms of posttraumatic stress (PTS), a finding that has been consistently supported by previous literature (Boals & Ruggero, 2016; Kramer et al., 2020; Roland et al., 2014). Symptoms of PTS include intrusive thoughts, flashbacks, nightmares, emotional dysregulation, hypervigilance, and difficulty maintaining close relationships (American Psychiatric Association, 2013). That withstanding, research has also identified a positive correlation between EC and PTG (Barton et al., 2013; Blix at el., 2014; Boals et al., 2010), and a flurry of

research on the EC-PTG relationship has been published over recent years. While the EC-PTG research base has grown, no respective systematic review has been published focusing on the relationship between the two concepts. Tangentially, the existing literature base has consistently applied the same measurement instruments–the Centrality of Events Scale and Posttraumatic Growth Inventory. The Centrality of Events Scale (CES; Bernsten & Ruben, 2006) is a seven-item questionnaire designed to measure EC, or the extent to which an event is viewed as central to one's identity. The Posttraumatic Growth Inventory (PTGI; Tedeschi et al., 2017) is a 21-item scale designed to measure PTG, or the degree of reported positive changes experienced in response to major life crises. Both instruments are consistently observed to be highly reliable, with Cronbach's α values of > 0.8 typically reported.

Given the ubiquity of trauma exposure, identifying factors that lead to adaptive posttraumatic outcomes (i.e. PTG) is extremely desirable. Consequently, in light of the recent increase in publications exploring the EC-PTG relationship–and the lack of an associated systematic review–this paper will systematically review the literature base that explores the relationship between EC and PTG. This paper aims to investigate the direct relationship between both factors and identify any factors that may influence the relationship (i.e., mediating or moderating variables). Given the established positive associations between EC and PTS (e.g. Boals & Ruggero, 2016), this paper also aims to identify any factors that may differentiate the EC-PTG relationship from the EC-PTS relationship. The clinical implications of findings will also be considered, along with any suggestions for future research.

Methods

This paper implemented a systematic review methodoogy and narrative synthesis approach to address its research question. The study was not preregistered due to author oversight.

Databases

The search databases utilized for this systematic review were: Embase, MEDLINE, Web of Science, Google Scholar, and PsycINFO. All databases were searched in September 2021. No date range was set during the search.

Inclusion and Exclusion Criteria

The following inclusion criteria were selected: given the selected topic of investigation, all included studies must have utilized a sample population of individuals that have experienced a traumatic event or events; all included studies must have utilized the PTGI and CES measurement instruments (as they are validated scales that measure the phenomena in question; by extension included studies must have an empirical element, either entirely quantitative or mixed-methods); all included studies must have been published in English. Publications from any year were included.

With respect to exclusion criteria, qualitative studies were excluded; studies investigating the relationship between event centrality and posttraumatic stress only (i.e. without considering posttraumatic growth) were excluded; studies that did not utilize the PTGI and CES measurement instruments were excluded.

Search strategy

Given the discussed inclusion and exclusion criteria, this systematic review applied an adapted SPIDER framework (Cooke et al., 2012) to build its search terms. The primary selected search terms were: trauma, event centrality, posttraumatic growth, posttraumatic growth inventory, and centrality of events scale. Several derivatives were also inputted (see Table 1 in Appendix A for full list). A SPIDER framework was used over PICO as the research question was not concerned with intervention, comparison, or outcomes, rather particular phenomena of interest (EC and PTG).

Using the "advanced search" features of the databases selected for search, the search terms identified in Table 1 were linked with logical Boolean operators to search for all possible combinations of the search terms. Search terms within a particular SPIDER heading group (e.g. Post Traumatic Growth Inventory; PTGI) were linked with the operator "OR". The groups themselves were linked by the operator "AND". Table 2 displays the search terms and Boolean operator combinations that were applied for each database, and any database-specific filters that were applied.

Study Selection

Following database searches using the search terms detailed in Table 2 (see Appendix B), the titles and abstracts of search results were manually browsed by one reviewer and assessed with respect to inclusion and exclusion criteria. Papers that met inclusion criteria were recorded within a tab of a Microsoft Excel document; each database's included search results were recorded within a respective tab. Once publications that met inclusion criteria were identified for each of the five databases selected for search, results were combined within a master tab of the Microsoft Excel document, and any duplicates were removed. Each of the remaining papers was then accessed fully and reviewed in line with inclusion/exclusion criteria, and then either selected for data extraction/review or excluded. A manual reference

search of all articles included for review was also conducted in an effort to identify any remaining publications that met inclusion criteria. The publication date of studies included for review ranged from 2011-2021.

Assessment of Quality

In order to assess for quality/risk of bias within the studies selected for review, this study utilized STROBE checklist tools to assess for reporting transparency (the specific STROBE checklist tool applied will depend on the research design of each reviewed study; e.g. cross-sectional, time-series etc.; Cuschieri, 2019). Risk of bias was then assessed for using the Effective Public Health Practice Project (EPHPP) quality assessment tool for quantitative studies (Thomas et al., 2004).

Results

Selection Process

Database searches using the discussed search terms and filter provided a total of 1,685 results. Following a manual title and abstract search, combined results from the five databases selected for search totaled 58 papers, of which 19 duplicates were removed (total n = 39). These papers were fully accessed, and 20 further papers were excluded from analysis. Of the 20 papers that were excluded, six were removed as they did not contribute to this paper's research objectives beyond associating EC and PTG using correlational analyses; four were removed as they did not consider event centrality; two did not consider PTG; three did not explore trauma-related phenomena; five did not apply the PTGI, or did not clearly discuss results related to the measure. Following abstract/title screening, one full-text paper could not be accessed for review (Wolfe & Ray, 2015). Consequently, a total of 18 papers were included for review. A manual reference search was also conducted for the papers included for review, but returned no new publications for inclusion (only duplicates/excluded articles). Figure 1 shows a flowchart of the selection process (see Appendix C).

Participant Characteristics

The total number of participants across each of the papers included for review totaled 8,077. The majority of participants were female (65.4%) and white (49.2%). The weighted average age across each of the studies was 22.98 years. Of the 18 studies included for review, 12 sampled participants living in America, nine of which sampled American university students. Table 3 shows a breakdown of participant characteristics by paper selected for inclusion, along with descriptive statistics for the total data set (see Appendix D).

Study Results

The common factor shared by each of the 18 studies included for review was an analysis of the relationship between event centrality and posttraumatic growth, with each of the studies exploring a distinct factor (or factors) with respect to the EC-PTG relationship. The following subsections will first detail extracted results with respect to the EC-PTG relationship, and then detail extracted results with respect to emergent themes. Each paper's results are detailed in Table 4 (Appendix E).

The Event Centrality-Posttraumatic Growth Relationship

Allbaugh et al. (2016) observed a significant positive correlation between EC and PTG (r = .47, p = .01). Bakaitytė et al. (2020) applied a longitudinal design and observed consistent EC-PTG positive correlation for their total sample across three time points (t1: r = .34, p < .001; t2: r = .34, p < .001; t3: r = .37, p < .001; 6-month follow up between time periods). Barton et al. (2013) found significant positive correlations between EC and PTG in an undergraduate subsample (r = .59, p < .001), but did not find a significant correlation within a treatment-seeking subsample; they posit that the validity of this result is limited by a small sample size for the treatment-seeking subsample, and its restricted range of EC scores (EC scores were high for the subsample, with little variation). Glad et al. (2020) observed a significant positive association between EC and PTG. Kramer et al. (2020) observed the total effect of EC on PTG within a serial mediation model to be significant (β = .43, SE = .06, p < .001). Interestingly, Onu et al. (2019), investigating a sample of HIV-diagnosed outpatients in Nigeria (of which the HIV diagnosis was explored as the index traumatic event), observed a significant negative correlation between EC and PTG (r = -.48, p < .001).

Posttraumatic Growth and Posttraumatic Stress in Cases of High Event Centrality

Clauss et al. (2021), applying structural equation modelling, observed that EC predicted both PTS and PTG, (B = .42 and .40, respectively, p < .001). Roland et al. (2014) observed via regression analysis that EC uniquely predicted both PTG and PTS outcomes in a sample of El Salvadorian teachers exposed to pervasive violence. Applying a multivariate regression model, they observed that when added to a model predicting PTG, EC increased the level of variance explained by the model (ΔR^2 = 0.14, ΔF(1, 246) = 43.17, p < 0.001); when EC was added to a model predicting PTS, it also increased the level of variance explained by the model, though the R2 change was comparably small (ΔR^2 = 0.01, ΔF = (1, 246) = 4.88, p = 0.05). Schuettler et al. (2011)

applied a stepwise regression to predicted PTS and PTG; the final models accounted for 48% of PTG variance ($F(3, 101) = 29.54$, $p < .0001$) and 66% of PTS variance, with EC observed to be a significant predictor variable in both models ($B = .38$, $p < .001$ for PTS; $B = .52$, $p < .001$ for PTG). These results were also replicated in a similar paper by the same authors when applying a wide range of control variables, with EC observed to be the strongest predicting variable of PTG (Boals et al., 2011). Applying Structural equation modelling to test a hypothesized mediation model, Wang et al. (2020) observed that EC was positively associated with PTS ($\beta = .68$ $p < .001$, 95% CI = .636 - .730), and PTG (β = .45, $p < .001$, 95% CI = .34 to .54), and EC was found to significantly mediate the path between PTS and PTG (indirect effect = .305, $p < .001$, 95 % CI = .23 to .37). Groleau et al. (2013), applying hierarchical linear regression, observed that EC uniquely contributes to both PTG and PTS after controlling for rumination and several other factors. EC was observed to uniquely contribute to 4% of the variance in PTG ($\Delta F = 10.91$, $p = .01$), and 2% of the variance in PTS ($\Delta F = 8.29$, $p = .01$). Boals et al. (2011) also observed the correlation between EC and PTG to be stronger when participants' PTS scores were below the clinical cut-off range ($r = .57$, $p < .0001$), relative to when PTS scores were above the clinical cut-off range ($r = .25$, $p = .01$).

Regarding the relationship between PTG and PTS, Clauss et al. (2021) observed a significant association ($r = .19$, $p = .05$); Roland et al. (2014) observed no significant correlation; Schuettler et al. (2011) observed a significant correlation ($r = .40$, $p < .001$); as did Boals et al. (2011; $r = .44$, $p < .001$); Wang et al. observed a significant negative association between PTS and PTG ($\beta = -.31$, $p < .001$, 95% CI = -.45 to -.18); Groleau et al. (2013) observed no significant association between PTG and PTS ($p > .05$).

Aspects of Cognition as Differentiators of PTG/PTS Pathways

Results related to aspects of cognition are reported in Table 5 (Appendix F). Results are then discussed in detail individually, and will be synthesized in later discussion.

Allbaugh et al. (2016) applied hierarchical multiple regression analyses in order to investigate the effects of rumination type (differentiated as brooding, reflecting, intrusive, or deliberate) and EC on PTG and PTS outcomes: they observed that their regression model significantly predicted PTS ($F = 11.94$, $p = .01$; $R^2 = .40$), with EC ($b = .32$, $p = .01$), brooding ($b = .19$, $p = .05$), and reflecting ($b = .23$, $p = .01$) identified as significant positive predictors of PTS. Their model also significantly predicted PTG ($F = 8.53$, $p = .01$; $R^2 = .32$), with EC ($b = .36$, $p = .01$) and deliberate rumination ($b = .41$, $p = .01$) identified as significant positive predictors of PTG.

Barton et al. (2013) examined the effect of post-traumatic cognitions (negative cognitions about the self, negative cognitions about the world, and self-blame) on PTS and PTG. Their hierarchical regression analysis revealed a significant model that predicted PTS ($F = 218.37$, $p < .001$, $R^2 = .46$), with both event centrality ($\beta = .40$, $p < .001$), and posttraumatic cognitions ($\beta = .41$, $p < .001$) observed to be significant predictors. Event centrality was observed to have a significant positive interaction effect with posttraumatic cognitions ($\beta = .14$, $p < .001$), where a combination of high EC and posttraumatic cognitions was associated with the highest level of PTS symptoms. A second hierarchical regression model also significantly predicted PTG ($F = 147.87$, $p < .001$, $R^2 = .37$), with event centrality ($p < .001$, $\beta = .65$) and posttraumatic cognitions ($p < .001$, $\beta = -.14$) identified as significant predictors. When separate multiple regression analyses were rerun for high EC and low EC groups predicting PTG, both regression models were found to be significant, with EC identified as a positive predictor of PTG; however, posttraumatic cognitions were not identified as a significant predictor of PTG in the low EC model.

Boykin et al. (2020) investigated the role of psychological flexibility (a concept derived from the third-wave psychological intervention acceptance and commitment therapy [ACT], defined in-text as "the ability to persist in a behavior despite urges to do otherwise") within the PTG/PTS relationship. They observed a significant interaction between event centrality and psychological flexibility on PTS severity ($B = 2.10$, $p = .01$), with slope analysis indicating that low psychological flexibility is associated with greater PTS symptoms as EC increased. There was no observed association between EC and PTS at high levels of psychological flexibility. Thus, the effect of EC on PTS is interpreted to be moderated by psychological flexibility. While event centrality and psychological flexibility also independently predicted perceived PTG (both relationships were positive and significant), no significant interaction effect was observed ($B = -4.68$, $p = .08$), suggesting that psychological flexibility does not moderate the relationship between EC and PTG.

Clauss et al. (2021) investigated the effects of positive and negative trauma-related metacognitive beliefs on EC and PTS/PTG. They defined positive metacognitive beliefs as active appraisal of a traumatic event (e.g. "I must go over events to make sense of them"), and negative metacognitive beliefs as intrusive, distressing cognitions (e.g. "I could lose my mind if I continue to think this way"). Applying structural equation

modeling and path analysis to test for interactive effects, the authors observed that EC (B = .37, p < .001) and the interaction term (EC x negative metacognitive beliefs; B = -.13, p =.04) significantly predicted PTG, but negative metacognitive beliefs alone did not (B = .13, p = .14; R^2 =.17, p < .01). Slope analysis indicated that the positive association between EC and PTS was significantly stronger at higher (B = .54, p < .001), versus lower (B = .20, p = .05) levels of negative metacognitive beliefs. Inversely, the positive association between EC and PTG was significantly stronger at lower (B =.55, p < .001), rather than higher (B = .21, p = .05) levels of negative metacognitive beliefs. Positive metacognitive beliefs did not significantly predict either PTG or PTS. The EC and positive metacognitive beliefs interaction term significantly predicted PTS (B = .18, p = .03; R^2 =.28, p < .001), but not PTG. Slopes analysis indicated that the EC and PTS positive association was significant at higher (B = .62, p < .001), but not lower (p > .05), levels of positive metacognitive beliefs.

Kramer et al., (2020) applied a serial multiple mediation model, and identified several mediating pathways. Deliberate rumination was found to significantly mediate the relationship between EC and PTG; the EC-PTG relationship was also sequentially mediated by PTS and then deliberate rumination (all at p < .001).

Lancaster et al. (2015) applying path analysis, observed good model fit with their final model PTG (R^2 = .55) and PTS (R^2 = .35) were strongly predicted by this model). Event centrality was observed to have a direct effect on both PTG and PTS, and an indirect effect on both outcomes via negative cognitions about the self, which had a positive effect on PTS and a negative effect on PTG; deliberate rumination was also found to mediate the pathway between CES and PTG, via intrusive rumination, which also had a direct effect on PTS – though the authors note that longitudinal research is required to clarify the relationship between intrusive and deliberate rumination, and whether intrusive rumination leads to deliberate rumination. All paths were significant at p < .01. Refer to p. 12 of the article for graphic.

Applying structural equation modelling, Brooks et al. (2017) observed that EC mediated the positive relationship between intrusive rumination and deliberate rumination (z = 2.82, p < .001), and the positive relationship between intrusive rumination and PTS (z = 2.60, p = .009); intrusive rumination was also observed to have a direct effect on PTS (B=.66, p < .001). However, while their model observed a significant positive association between deliberate rumination and PTG (r = .20, p = .01), it did not find that deliberate rumination significantly predicted PTG as hypothesized.

A Longitudinal Perspective on the EC-PTG Relationship

Bakaitytė et al. (2020) examined group differences over time (assessing three time points, each 6 months apart) between a sample of females that had experienced intimate partner violence (IPV) within 2 years of sampling at t1, and a sample of females that had experienced IPV more than 2 years before t1. Those who experienced recent IPV had lower levels of PTG at t1 relative to the comparison group, but experienced a significant increase in PTG between t1 and t3. The comparison group (< 2 years since IPV at t1) had higher initial levels of PTG, but no significant PTG change occurred between t1 and t3. EC was the only significant (positive) predictor of t1 PTG for both groups, yet it was not a significant predictor of the rate of change in PTG across either group.

Blix et al. (2015) examined the longitudinal relationship between EC and PTG in a sample of workers exposed to a 2011 bombing attack. Applying a cross-lagged autoregressive model, data was collected at two time periods (t1 = 9 months after bombing event; t2 = 21 months after bombing event). Results indicated that both EC and PTG levels were stable across time. A significant positive association was observed between EC and PTG at both t1 and t2, however, the relationship appeared to attenuate across time (t1: r = .46, p = .01; t2: r = .30, p = .01). No time-lagged effects of EC on PTG, or PTG on EC were observed. Glad et al. (2020) hypothesized that EC would mediate the association between terrorist attack survivor's peritraumatic reactions during the attack and later PTG, but did not find evidence to support this hypothesis.

Sapach et al. (2019) adapted the CES to record event centrality valence (whether the traumatic index event was appraised positively or negatively), and investigated if time since trauma influenced EC valence. Their investigation found no significant effect of time on EC valence.

EC as a Moderator Between PTG and Mental Health Outcomes

Investigating a sample of HIV positive participants, Onu et al. (2019) applied a regression moderation model that predicted health-related quality of life. The model depicted the interaction of PTG and EC, revealing a positive prediction for the intimate/social relationship (b = .23; t = 3.7; p < .001) and cognitive/mental health (b = .24; t = 3.65; p < .001) dimensions of the health-related quality of life instrument. Results suggested that the more an individual centralized their identity with respect to their HIV diagnosis, the more likely that their PTG would yield better mental health and relationship-related outcomes.

Event Valence

Sapach et al. (2019) adapted the CES to record event centrality valence (whether the traumatic index event was appraised positively or negatively). Their published regression analyses indicated that positive appraisals of traumatic events were negatively related to PTS, and positively related to PTG; negative and central appraisals of traumatic events were positively related to PTS, and negatively related to PTG. Post-hoc ANOVAs and Tukey's HSD tests indicated that the positive valence event centrality group reported significantly higher scores on all PTGI subscales relative to the negative event centrality group (all $p < 0.001$).

Trauma Type

Sapach et al. (2019) adapted the CES to record event centrality valence (whether the traumatic index event was appraised positively or negatively) and assessed if trauma type had an effect on EC valence. Post-hoc Tukey's HSD tests revealed that the sexual assault index trauma group was associated with significantly higher negative EC relative to a natural disaster index trauma group ($p = 0.01$, 95% CI [− 15.79, − 0.96]). There were no other statistically significant group differences.

Wamser-Nanney et al. (2020) investigated if trauma type moderated the effect of EC on trauma-related outcomes (PTG and PTS). Applying moderation regression analyses, they observed that EC was positively related to PTS for all trauma types, but there was a significant interaction term for sexual trauma ($B = .24$, SE = .11, $p = .05$), suggesting that the positive relationship between EC and PTS is strongest when the index traumatic event is a sexual trauma. No significant trauma-type interaction terms were found for the PTG model, with PTG found to be significantly predicted (all $p < .05$) by EC for all trauma types. Boals et al. (2011) observed that excluding participants from their data set whose index trauma event did not meet "conventional"-standards for being considered a traumatic event had no effect on their results.

Discussion

The EC-PTG Relationship

Synthesis of results that directly investigate the relationship between event centrality and posttraumatic growth reveals a largely unified picture. With the exception of Onu et al. (2019), each reviewed study observes a significant, positive relationship between EC and PTG. Significant effect sizes (Pearson's r when interpreting correlational analyses, or Beta values when interpreting regression analyses) range from .30 (Blix et al., 2015) to .59 (Barton et al., 2013), with the majority of results appearing to fall around ~.4. This indicates that a medium, positive effect size is consistently observed across the studies included for review–many of the observed effect sizes can also be interpreted as large, when they are considered within the context of resulting from social science research (Funder & Ozer, 2019). Consequently, the reviewed body of literature largely observes that high EC is associated with high PTG.

As noted, Onu et al. (2019) offered the only contrary result with respect to the positive association between EC and PTG. The result was highly significant ($p < .001$), with a medium-to-large effect size ($r = -.48$). Interestingly, despite this markedly contrarian result with respect to the consensus of the literature body-at-large, the result is not discussed in the text, and is only observable within the paper's tables and mentioned within the abstract. It is possible that the specificity of the paper's index trauma event (HIV diagnosis)–which is unique with respect to the articles included within this paper for review – may have limited the external validity of the paper's results. It is also possible that cultural factors may have played a role in this result, as the paper was also the only article included for review that utilized a Nigerian (and indeed, African) sample population (the potential impact of cultural factors on the EC/PTG relationship will be discussed in more detail later, as there is an important point to be made). That withstanding, significant, positive associations were observed between EC and PTG across a range of culturally diverse samples– Lithuanian females (Bakaitytė et al., 2020), Norwegian citizens (Blix et al., 2015; Glad et al., 2020), British citizens (Brooks et al., 2017), El Salvadoran teachers (Roland et al., 2014), Chinese adolescents (Wang et al., 2020), and a host of American samples (e.g. Sapach et al., 2019), perhaps suggesting that Onu et al.'s (2019) observation of a significant, negative EC/PTG relationship may be a product of their unique index trauma event.

That withstanding, the relationship between EC and PTG is largely observed to be significant–from both a statistical and clinical perspective. Boals et al. (2011) observed EC to be the largest predictor variable of PTG relative to a host of correlated variables; Groleau et al. (2013) estimated that 4% of PTG variance is uniquely (positively) predicted by EC; Roland et al. (2014) observed that adding EC into a multivariate regression model that predicted PTG caused a 14% increase in the model's explanatory value (as measured by the R2), with EC observed to have a significant, positive relationship with EC. Synthesis of results overwhelmingly indicates that a significant, positive relationship exists between EC and PTG, perhaps with the caveat that the index trauma event is not related to HIV diagnosis.

Considering PTS

As noted in the introduction, the positive relationship between EC and PTG is particularly intriguing when considered within the context of EC's relationship with alternative posttraumatic outcomes–i.e. posttraumatic stress. When considered in isolation, the conclusion that EC and PTG are positively associated can be interpreted to suggest that high EC is an entirely positive psychological variable, as it is associated with an adaptive posttraumatic outcome, PTG. However, when considered within a wider context–particularly with respect to PTS, a maladaptive posttraumatic outcome–the nature of the EC/PTG relationship is revealed to be considerably more nuanced. Indeed, Boals et al. (2011) conceptualized high EC to be a "double-edged sword", as it is observed to be positively associated with both PTG and PTS–apparently contrasting outcomes. This relationship was confirmed by the articles included for review, with each of the studies that included a measure of PTS as an outcome variable observing it to have a significant, positive association with EC, with the observed effect sizes falling within the medium-to-large range (min observed: B = .38 for Schuettler et al. (2011); max observed: B = .68 for Wang et al., (2020). Each of the articles included for review that investigated the EC/PTS relationship also explored the EC/PTG relationship, and consistently observed significant, positive associations.

With respect to the relationship between PTG and PTS, the reviewed literature revealed a range of conflicting associations–some observed significant, medium effect sizes that were positive (e.g. Schuettler et al., 2011), some observed significant, medium effect sizes that were negative (e.g. Wang et al., 2011), and some observed no significant relationship between PTS and PTG (e.g. Groleau et al., 2013). Perhaps the best potential explanation for this range of contrasting results is suggested by Roland et al. (2019) who posit that independent factors are involved in the pathways between EC and posttraumatic outcomes. Consequently, these factors would act as confounding variables, and account for the inconsistent correlations observed across the reviewed literature. The reviewed literature supports Roland et al.'s (2019) assertion, with various cognitive phenomena observed to independently mediate (and in some cases moderate) the pathways between EC and PTG/PTS (these factors will be discussed in detail shortly). Indeed, the independence of positive and negative trauma-related outcomes has been empirically supported for some time (Linley et al., 2003).

Consideration of Longitudinal Data

Given that the majority of the research included for review applied cross-sectional designs, no causal conclusions were drawn with respect to the relationship between EC and PTG. That withstanding, three studies included for review applied longitudinal designs. Bakaitytė et al. (2020) observed PTG grew over an 18-month period for participants who had recently (< 2 years) experienced intimate partner violence, while PTG levels did not change over the study period for those that had experienced IPV > 2 years before the time of study. While EC was observed to positively predict PTG, it did not affect the rate of change in PTG via time-lagged effects. Consequently, the authors argued that EC and PTG are parallel processes triggered by the same index-trauma event, rather than causally related phenomena along a temporal chain. Results of the other studies included for review that applied longitudinal designs support this conclusion, with Blix et al. (2015) also observing no time-lagged effects of EC on PTG (or vice-versa), and Sapach et al. (2020) observing that EC did not mediate the relationship between peritraumatic reactions to trauma and later PTG (30-32 months post-trauma). Aside from also suggesting that EC and PTG may be parallel processes rather than causally related, both Sapach et al. (2020) and Blix et al. (2015) note that it is possible that the relationship between EC and PTG is better captured by short-term effects that were not captured by their study designs. Consequently, in order to robustly conclude that EC and PTG are parallel processes, rather than causally related, further longitudinal research (particularly with a shorter time lag since the index trauma event) is required.

Cognitive Factors as Differentiators of Posttraumatic Outcomes

As noted earlier, several of the studies included for review investigated the effect of a range of cognitive phenomena on the EC/PTG relationship, specifically exploring if any such factors differentiated the pathways between event centrality and adaptive and maladaptive posttraumatic outcomes (i.e. PTG vs PTS). Within the seven studies included for review that investigated the role of cognitive phenomena within the EC and PTG/PTS relationship, there were two broad approaches to analysis: one group applied mediational analyses in order to identify if cognitive phenomena sat between EC and posttraumatic outcomes within a mediational model; the second group applied moderation analyses in order to investigate if cognitive phenomena influenced the relationship between EC and posttraumatic outcomes. The cognitive phenomena investigated can be grouped into three categories: rumination (with several subtypes considered), beliefs concerning the self, and psychological flexibility (a central concept of ACT, defined as the ability to pay attention to the present moment and behave in accordance with core values; Gloster at al., 2011).

Deliberate rumination (conscious cognitive appraisal related to the index trauma event) was

consistently observed to have a positive, direct relationship with PTG. Kramer et al. (2020) observed the rumination type to mediate the relationship between EC and PTG. That withstanding, Brooks et al. (2017) did not observe deliberate rumination to mediate the EC/PTG relationship. Moderation analyses did not observe any moderating effect of deliberate rumination on the EC/PTG (or PTS) relationship. Intrusive rumination (automatic, unwanted, distressing thoughts related to the index trauma event) was consistently observed to be positively related with PTS, with some results suggesting that intrusive rumination mediates the relationship between EC and PTS (Lancaster et al., 2015), though this was not observed by all mediation models included for review. Consequently, results suggest that deliberate rumination is strongly associated with PTG, and intrusive rumination is strongly associated with PTS, and that both rumination types may act as mediating factors between EC and their respective associated posttraumatic outcome. While more research is required to confirm the mediating effect of these factors, these results have potential clinical significance as they differentiate hypothetical pathways between EC and PTG/PTS outcomes.

Barton et al. (2013), Lancaster et al. (2015), and Clauss et al. (2021) investigate three fundamentally similar cognitive constructs: posttraumatic cognitions, negative self-cognitions, and negative metacognitive beliefs (respectively). Each of these constructs encompasses negative appraisals of the self, and will be grouped under the term negative self-cognitions. Results across each of the studies paint a consistent picture: negative self-cognitions are positively associated with PTS, and negatively associated with PTG. Mediation analyses indicate that negative self-cognitions act as a mediating factor between EC and both PTS and PTG. Moderation analyses by both Barton et al. (2013) and Clauss et al. (2021) suggest that negative self-cognitions act as a moderating variable, where high EC interacts with high negative self-cognitions to increase PTS; Clauss et al. (2021) also observe an effect where high EC interacts with low negative self-cognitions to increase PTG. Accordingly, results consistently suggest that negative self-cognitions act as both mediating and moderating factors between EC and posttraumatic outcomes, with increased negative self-cognitions associated with increased PTS in cases of high event centrality, and decreased negative self-cognitions associated with increased PTG in cases of high event centrality. The observation by Barton et al. (2013) that negative self-cognitions did not impact PTG in cases of low EC highlights the point that cognitive factors do not impact posttraumatic outcomes alone; the index trauma event must also be interpreted to be central to one's identity in order for cognitive factors to have an effect of posttraumatic outcomes. As discussed by Barton et al. (2013), if a negative event is construed as highly central, then subsequent "self-talk" (i.e. posttraumatic cognitions) become critical in determining (and differentiating) posttraumatic outcomes.

The final, broad cognitive phenomena discussed by the research included for review is that of psychological flexibility, which was investigated by Boykin et al. (2020) only. Psychological flexibility was observed to have a positive direct relationship with PTG and a negative direct relationship with PTS. An interaction effect was also observed with EC, where high EC and low psychological flexibility combined to predict increased PTS. No significant interaction effect was observed between EC and psychological flexibility on PTG. Thus, results suggest that increased psychological flexibility can act as a moderating factor that reduces PTS in cases of high EC.

Trauma Type

Sapach et al. (2019) and Wamser-Nanney et al. (2020) investigate the effect of index trauma type on posttraumatic outcomes (in cases of high event centrality), with both studies observing sexual trauma to be the only trauma type that is significantly (positively) associated with PTS relative to other trauma types (no other index trauma type was observed to have a significant effect on posttraumatic outcomes within either study). A potential moderating factor of the association between sexual trauma and PTS in cases of high EC is suggested by Sapach et al.'s (2019) investigation, which applied an adapted version of the CES which recorded event centrality valence (whether the index trauma is appraised as a positive or negative turning point in life). Results indicated that negatively appraised events with high EC are most closely positively associated with PTS (and negatively associated with PTG), and that sexual traumas are most likely to be negatively appraised relative to other index trauma types. These results suggest that an objective factor (index trauma type) is moderated by a subjective factor–cognitive appraisal of the index trauma event. The power of subjective factors (relative to objective trauma exposure) is also highlighted by an observation by Boals et al. (2011), who noted that the exclusion of participants from their study whose index trauma event did not meet "conventional" standards of trauma exposure had no effect on their results. Consequently, these results can be interpreted to suggest that objective trauma exposure (i.e. type of trauma experienced) has much less of an impact on subsequent posttraumatic outcomes (or the lack thereof) relative to subjective factors such as event centrality, trauma appraisal, or the previously discussed cognitive factors.

Applied Significance of Findings

Primarily, this review finds strong evidence that suports the existence of a positive relationship between event centrality and posttraumatic growth, with event centrality also observed to have a strong, positive relationship with posttraumatic stress. From a clinical perspective, this "double-edged sword" effect is confounding–event centrality, itself a cognitive variable, can be manipulated via psychological intervention (Vermeulen et al., 2019), however, any changes to an individual's event centrality following trauma exposure would simultaneously reduce (or increase) potential exposure to maladaptive and adaptive posttraumatic outcomes. Consequently, it is arguably more useful to identify mechanisms/targets of intervention whereby the risk of maladaptive outcomes is reduced, without effecting (or even while increasing) a client's potential for adaptive outcome development. This review's results appear to have differentiated several such mechanisms/targets of intervention.

Results suggest that for clients with a high level of EC following experience of a traumatic event, encouraging deliberate rumination, while attempting to mitigate negative self-cognitions, are evidence-based objectives for psychological interventions that are likely to encourage posttraumatic growth. Meanwhile, attempting to reduce negative self-cognitions and intrusive rumination, and encouraging the development of psychological flexibility (as per ACT) are evidence-based objectives for psychological interventions that are likely to reduce posttraumatic stress in clients with high EC. Consequently, these factors serve as tangible cognitive targets for intervention. That withstanding, this conclusion is entirely hypothetical, as research has yet to be conducted that attempts to manipulate the discussed factors via psychological intervention for clients with high EC in order to observe any potential (differentiating) effects on posttraumatic outcomes. This would be a useful area for future research. Nevertheless, this paper's results serve as a useful indicator of potential targets for intervention. As discussed by Bernard et al. (2015), clinicians cannot simply erase the memory of trauma exposure from clients' minds, they must instead work with modifiable variables that are associated with posttraumatic outcomes–and therein lies the applied significance of the discussed results, as the discussed (subjective) factors associated with posttraumatic outcomes are modifiable via a range of cognitive-based intervention modalities.

Limitations

This section will first consider the paper's meta-limitations, and then the limitations of the studies included for review. The primary meta-limitation of this paper is that a single reviewer completed the review process, exposing both the data screening and extraction steps to potential bias. Furthermore, systematic reviews that apply a narrative synthesis methodology are potentially exposed to a lack of transparency (and higher degree of subjectivity) relative to other review methods, as the data that is reported and subsequently discussed is at the author's discretion. Snilstveit et al. (2012) recommend that narrative syntheses should strictly adhere to transparent reporting of methods, and objective (table-based) reporting of results in order to increase transparency. It is hoped that the transparent reporting of the Methods and Results sections will allow readers to clearly identify how data was extracted and results interpreted for discussion. Following completion, this systematic review was itself reviewed for meta-limitations using the PRISMA 2020 Checklist (Page et al., 2021), meeting its review criteria.

The studies included for review by this paper largely share the same set of quality assessment characteristics and limitations, which are specified per paper within the Results table. As noted, a STROBE quality assessment and EPHPP assessment were carried out for each paper, to assess for reporting transparency and risk of bias respectively. Regarding the STROBE assessment, the only consistently unreported criterion was that of sensitivity analyses/consideration of statistical power (item 12(e) within the STROBE review checklist). As observed by Perugini et al. (2018), this is by far the most frequent reporting omission observed across psychological studies. Given that sensitivity analyses are observed to play a key role in assessing the robustness of statistical model results, it is unfortunate that this analysis is typically unreported. That withstanding, Perugini et al. (2018) observe that in the absence of discussion of power/sensitivity analyses, one must adopt a "meta-analytic mindset" and consider evidence across a broad range of studies on a topic, rather than consider evidence from a single study alone. It is hoped that such an accumulation of evidence within this systematic review–which has revealed a largely cohesive set of results–will help to mitigate the risk to validity caused by the widespread lack of reporting and discussion of sensitivity analyses.

Aside from underreporting of STROBE item 12(e), the majority of papers included for review were observed to have highly transparent reporting quality. The only notable exceptions were that of Blix et al. (2015), who failed to give any descriptive data of their sample participants (item 14(a) within the STROBE checklist), and that of Onu et al. (2019), who offered no interpretation of a result that negatively associated EC and PTG, which was the only result of its kind observed across the reviewed literature base – thus failing to meet item 20

within the STROBE review checklist.

While the quality of reporting across each of the studies included for review was observed to be high, that is not to say that they are without risk of bias, as recorded by the EPHPP tool. Indeed, many of the studies share a similar set of limitations. 15 of the 18 studies included for review applied cross-sectional designs, which means that no cause-and-effect related conclusions can be drawn with respect to the relationship between EC, PTG and other related factors. Instead, only potential action pathways can be suggested that should be explored by future studies that apply alternative research designs. Of the three longitudinal studies included for review, no evidence was found of a temporal relationship between EC and PTG, but these results are far from conclusive; the typical data collection period since the index trauma experience was varied, and was largely no less than nine months (it is possible that the time since index trauma was shorter for some participants of Bakaitytė et al. [2020], though it is not possible to tell as the index trauma event was not shared by participants in this study, as was the case for both Blix et al. [2015] and Glad et al. [2020]). Consequently, a temporal relationship between EC and PTG may occur (and only be observable) within a shorter post-index trauma timeframe. Further research is required to identify if such a temporal relationship exists, or to clarify if EC and PTG emerge as parallel (interacting) processes following experience of an index trauma event.

The final key limitation observed by the EPHPP tool is that of sample bias. Almost 50% of total participants were observed to be of White ethnicity, with the second-largest ethnic group (Asian) making up only 13.7% of sample participants. Females were also overrepresented within the total sample (65.4% of participants), and the weighted average age across studies was 22.98 years old. 12 of the included samples were recruited in America, with nine of the studies recruiting American college students specifically. Consequently, the external validity of results may be limited to young, White, American females from non-clinical populations. Given that the cross-cultural validity of the EC/PTG relationship has been observed to be inconclusive (albeit with a limited research base that applies a novel measurement instrument; Taku et al., 2021), this is a significant limitation, and future research would be well advised to utilize more demographically and culturally diverse samples.

Conclusions

This systematic review has explored the relationship between event centrality and posttraumatic growth. There is strong evidence of a robust, positive relationship between EC and PTG. There is also strong evidence of a robust, positive relationship between event centrality and posttraumatic stress, with EC observed to be positively associated with both PTS and PTG–maladaptive and adaptive posttraumatic outcomes, respectively. The pathways between high event centrality and these posttraumatic outcomes appear to be differentiated by a range of cognitive factors–most significantly deliberate rumination (positively associated with PTG), intrusive rumination (positively associated with PTS), negative self-cognitions (positively associated with PTS and negatively associated with PTG), and psychological flexibility (negatively associated with PTS). Results that show these cognitive factors to have reduced effect on posttraumatic outcomes in cases of low event centrality highlight the clinical significance of these cognitive factors within the EC-PTG/PTS relationships, rather than as independent factors that influence posttraumatic outcomes alone.

Results also revealed that there is little association between index trauma event type (i.e. objective trauma exposure) and posttraumatic outcomes, with robust associations instead observed between posttraumatic outcomes and subjective factors (such as EC and the other discussed cognitive variables); this highlights the power of these subjective factors in the post-trauma experience–it is not exposure to trauma that directly leads to posttraumatic growth or stress, rather an individual's subjective interpretation of the traumatic event leads to posttraumatic outcomes (or the lack thereof). This subjective interpretation of events can be targeted by clinicians via a range of cognitive intervention modalities, with the targets of intervention potentially being the very factors identified by this review as differentiators of the pathways between EC and PTG/PTS (i.e. rumination, negative self-cognitions, and psychological flexibility). As many of the studies included for review were cross-sectional, it would be useful for future research to attempt to manipulate these cognitive factors in participants with high EC. It would also be useful for future research to apply longitudinal designs with short follow up periods (< 9 months) that investigate the EC/PTG relationship to identify if there is a temporal (causal) relationship between the two factors, or if they exist as interacting parallel processes following exposure to trauma.

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Appendix A

Table 1
Secondary search terms

Criteria	*Description*	*Search Terms*
Sample	Trauma-exposed individuals	Trauma; traumatic stress; traumatized
Phenomenon of Interest 1	*Event Centrality*	Event Centrality; Centrality
Phenomenon of Interest 2	*Posttraumatic Growth*	Posttraumatic Growth; Post traumatic Growth
Design	*Any*	-
Evaluation	Post Traumatic Growth Inventory	Post Traumatic Growth Inventory; Posttraumatic growth inventory
Evaluation 2	Centrality of Events Scale	Centrality of Events Scale
Research design	*Quantitative; mixed methods*	-

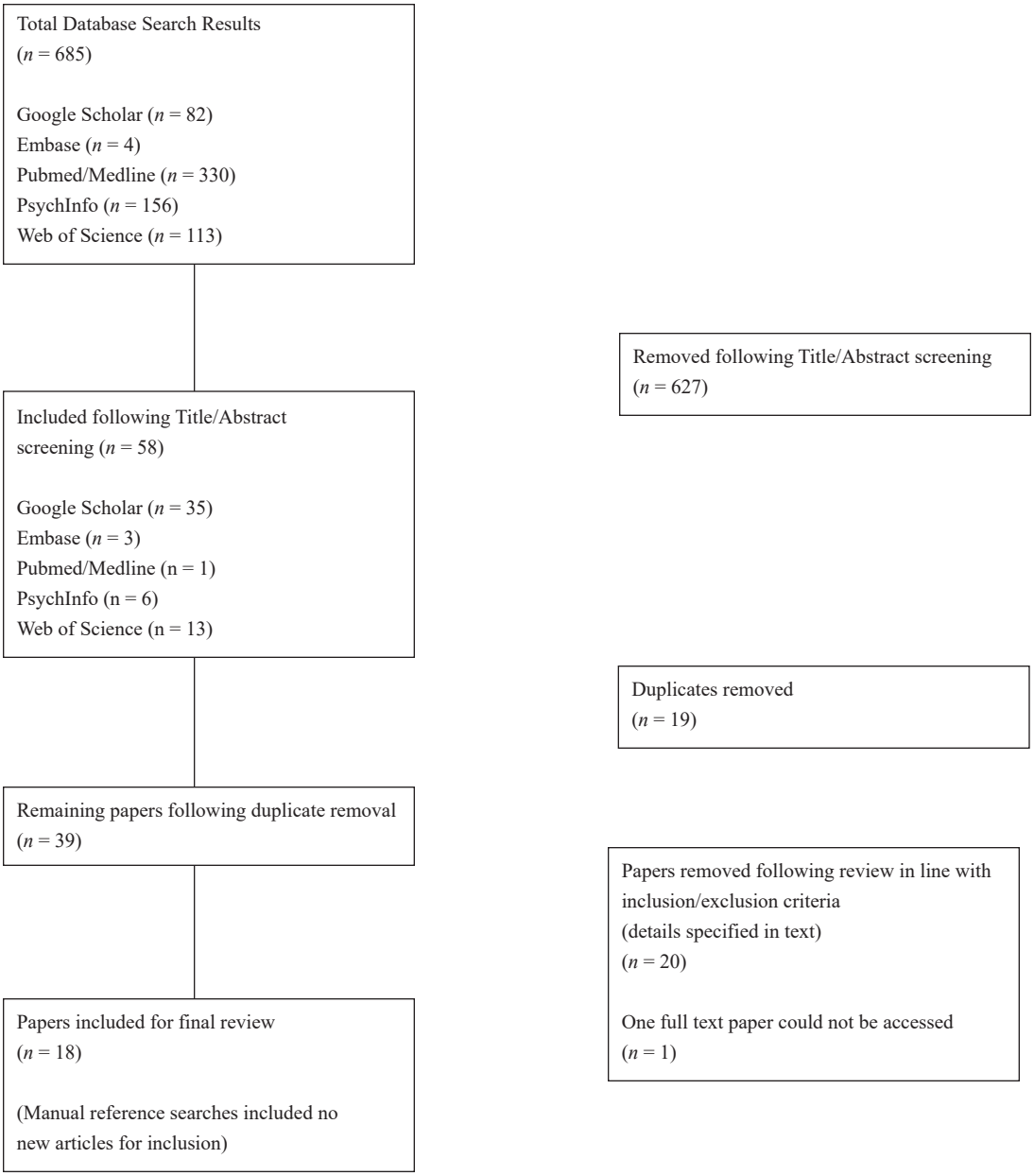
Appendix B

Table 2
Database Search Procedure

Database	Search Terms/String Used	Filters	Note
Google Scholar	(Trauma OR Traumatised OR Traumatic Stress) AND (event centrality OR Centrality) AND (post traumatic growth OR posttraumatic growth) AND ("post traumatic growth inventory" OR "posttraumatic growth inventory") AND ("centrality of events scale")	-	Quotation marks ("") were applied to PTGI and CES search terms in order to search for the exact phrase
Embase	*(Trauma OR Traumatised OR Traumatic Stress) AND (event centrality OR Centrality) AND (post traumatic growth OR posttraumatic growth) AND (post traumatic growth inventory OR posttraumatic growth inventory) AND (centrality of events scale)*	-	-
Pubmed/ Medline	*(Trauma OR Traumatised OR Traumatic Stress) AND (event centrality OR Centrality) AND (post traumatic growth OR posttraumatic growth) AND (post traumatic growth inventory OR posttraumatic growth inventory) AND (centrality of events scale)*	"English" was selected for "Language" filter; "Human" was selected for "Subject" filter	-
PsycInfo	*(Trauma OR Traumatised OR Traumatic Stress) AND (event centrality OR Centrality) AND (post traumatic growth OR posttraumatic growth) AND (post traumatic growth inventory OR posttraumatic growth inventory) AND (centrality of events scale)*	"Posttraumatic growth inventory" selected for "Tests and Measures" filter	-
Web of Science	*(Trauma OR Traumatised OR Traumatic Stress) AND (event centrality OR Centrality) AND (post traumatic growth OR posttraumatic growth) AND (post traumatic growth inventory OR posttraumatic growth inventory) AND (centrality of events scale)*	"English" applied to "Language" filter; "Articles" applied to "Publication type" filter (meeting abstracts, reviews excluded)	Using "advanced analysis" feature, all non-psychology categories were excluded from search results (e.g. surgery, critical care medicine, orthopedics, dentistry, ophthalmology); as a final step, the search results were re-searched using the term "Centrality", as initially returned results were numerous (n=8,914) and repeatedly met exclusion criteria when the manual database search commenced.

Appendix C

Figure 1
Flowchart of Selection Process



Appendix D

Table 3
Participant characteristics breakdown

Study Authors	Total *n*	Qualitative description	Ethnicity							Gender		Age (years)	
			White	Black	Hispanic	Asian	Multi-racial	Other	Not disclosed	M	F	Mean Avg age	SD & Range (if available)
Allbaugh et al. (2016)	163	Young American adults (undergrad students) with interpersonal violence experiences	134	10	8	4	4	0	3	33	130	18.9	*SD* = 1.0 Range = 18–22
Bakaitytė,et al. (2020)	217	Lithuanian females exposed to intimate partner violence	-	-	-	-	-	-	-	0	217	38.92	*SD* = 10.29
Barton et al. (2013; Sample A)	500	American Undergraduate students	284	60	90	39	0	27	0	155	345	20.9	*SD* = 4.03 Range = 18-52
Barton et al. (2013; Sample B)	53	American participants recruited from psychological service	37	5	5	2	0	4	0	0	53	34.12	*SD* = 9.79 Range = 18-54
Blix et al. (2015)	207	Ministerial employees at time of Oslo bombing	-	-	-	-	-	-	-	-	-	-	-
Boals et al. (2011)	929	American undergraduate students	548	149	139	46	0	47	0	322	603	20.1	*SD* = 3.6 Range = 18-60
Boykin et al. (2020)	125	American college students with a history of trauma-exposure	46	24	0	0	0	55	0	60	65	19.55	*SD* = 2.03
Brooks et al. (2017)	250	British trauma-exposed sample recruited from various community institutions	220	0	0	0	0	0	30	64	186	35.21	*SD* = 13.41 Range = 16-79
Clauss,et al. (2021)	139	American college students with a history of trauma-exposure	122	6	1	8	0	2	0	38	101	19.39	*SD* = 1.69 Range = 18-27
Glad et al. (2020)	204	Survivors of the Utoya island massacre	-	-	-	-	-	-	-	109	95	19.4	*SD* = 4.6 Range = 13.3-56.8
Groleau, et al. (2020)	187	American undergraduate students screened for trauma exposure	124	36	4	10	0	13	0	72	115	21.4	*SD* = 4.95
Kramer et al. (2020)	269	American undergraduate students meeting DSM-5 PTS criterion A	234	22	0	4	0	9	0	56	213	19.08	*SD* = 1.36 Range = 18-27
Lancaster et al. (2015)	194	American undergraduate students	159	4	3	23	0	5	0	81	113	19.48	*SD* = 2.23 Range = 18-41
Onu,et al. (2019)	201	Nigerian outpatients managed for HIV	-	-	-	-	-	-	-	63	138	40.1	*SD* = 10.5

Roland et al. (2014)	257	Violence-exposed El Salvadoran teachers	-	-	-	-	-	-	-	80	177	42.02	*SD* = 13.2
Sapach et al. (2019)	479	American community members meeting DSM-5 PTS criterion A	388	43	24	14	0	10	0	249	230	48.01	*SD* = 11.76
Schuettler et al. (2011)	2,326	American undergraduate students	1,465	0	0	0	0	861	0	791	1,535	20.58	*SD* = 3.9 Range = 18-62
Wamser-Nanney (2018).	429	Young American adults who reported trauma experience	215	167	17	9	17	4	0	90	339	19.66	*SD* = 1.65 Range = 1.65
Wang et al. (2020)	948	Chinese adolescents	0	0	0	948	0	0	0	462	486	15	*SD* = 0.54 Range = 14-17
Total	8,077		3,976	526	291	1,107	21	1,037	33	2,725	5,141		
%			49.2%	6.5%	3.6%	13.7%	0.3%	12.8%	13.9%	34.6%	65.4%		
Weighted average												22.98	

Appendix E

Table 4
Results

Author	Year	Sample	Design	Key Results	STROBE Review	Limitations
Allbaugh, L. J., Wright, M.O.D., & Folger, S.F.	2016	Young American adults (undergrad students) with interpersonal violence experiences (N = 163). 79.8% female; 81.6% Caucasian; mean age: 18.9 years)	Cross-sectional	EC positively predicted PTS and PTG. Brooding repetitive thought (RT) and Reflecting RT positively predicted PTS. Deliberate RT positively predicted PTG. EC did not moderate any of the examined relationships.	Highly transparent reporting*	Cross-sectional design; homogenous sample
Bakaityte, A., Kaniusonyte, G., Truskauskaite-Kuneviciene, I., & Zukauskiene, R.	2020	217 Lithuanian females who experienced intimate partner violence (IPV). Mean age: 38.92 years	Longitudinal; 3 data collection periods @, 6-month intervals	Higher levels of PTG at the beginning of the study were positively associated with C, which was interpreted to mean that women who perceived their IPV experience as central to their identity were more likely to have higher levels of PTG. PT significantly increased over time for the participants who experienced IPV more recently. EC was not found to be significantly related to this change in PTG over the study period. Participants who experienced IPV more than 2 years ago reported higher PTG levels at the beginning of the study, but significant changes in PTG did not emerge for them over the course of the study	Highly transparent reporting	High attrition rate; sample consisted of women that were already accessing psychosocial supports, and may not be representative
Barton, S., Boals, A., & Knowles, L.	2013	Two samples were used and compared. Sample 1 = 500 American undergraduate students (69.0% female; mean age in years: 20.90). Sample 2 = 53 American females seeking psychological treatment mean age: 34.12 years)	Cross-sectional	Results related to the undergraduate sample showed that EC positively predicted both PTG and PTS. An interaction effect was also observed, where posttraumatic cognitions were associated with increased/decreased PTS/PTG when EC was highest. Results related to the treatment-seeking sample were severely constrained by limitations inherent in the data set (which were clearly discussed).	Highly transparent reporting*	Cross sectional design; treatment-seeking sample limited by small sample size and restricted range of event centrality scores
Blix, I., Birkeland, M. S., Hansen, M. B., &	2015	229 ministerial employees who were present at work during the 2011 Oslo bombing attack	Longitudinal: 2 data collection periods (TI= 9 months since attack; T2=21 months since attack)	Results revealed EC and PTG levels to be stable across time. There was a significant association between EC and PTG at TI and T2, however, the relationship attenuated over time. No time-lagged effects were found, which suggests there no long-term causal effect of EC on PTG.	Medium quality - limited descriptive data with respect to sample participants*	Results do not contribute to the literature base with respect to EC and PG development within the immediate aftermath of trauma

Table 4 contd.
Results

Author	Year	Sample	Design	Key Results	STROBE Review	Limitations
Boals, A., & Schuettler, D.	2011	929 American undergraduate students (603 female; average age: 20.1)	Cross-sectional	Event centrality was found to positively predict both PTG and PTS, after controlling for a range of factors.	Highly transparent reporting*	Cross-sectional design; homogenous sample
Boykin, D. M., Anyanwu, J., Calvin, K., & Orcutt, H. K.	2020	One-hundred and twenty-five American college students (52% female) with a history of trauma exposure average age: 19.55)	Cross-sectional	A significant interaction was observed between EC and psychological flexibility on PTS severity, where low psychological flexibility was associated with increased PTS severity when EC was high. No interaction effect was observed between EC, psychological flexibility and PTG, but both EC and psychological flexibility were found to (independently) positively predict PTG.	Highly transparent reporting*	Cross-sectional design; homogenous sample
Brooks, M., Graham-Kevan, N., Lowe, M., & Robinson, S	2017	Self-selecting adversity-exposed sample (n=250) recruited from various services across England (74.4% female; average age: 35.2)	Cross-sectional	EC was found to positively predict both PG and PTS. Contrary to the paper's hypothesis, rumination (intrusive or deliberate) was not found to mediate the relationship between EC and posttraumatic outcomes.	Highly transparent reporting	Cross-sectional design; two model fit indices (Comparative Fit Index/CFI; Tucker-Lewis index/TLI) values lacked robustness
Clauss, K., Benfer, N., Thomas, K. N., & Bardeen, J. R.	2021	139 American undergraduate students exposed to at least one traumatic event (73.4% female; average age: 19.39 years).	Cross-sectional	The positive relationship between EC and PTS symptoms became stronger as positive and negative maladaptive metacognitive beliefs increased. The positive relationship between event centrality and PTG was stronger as maladaptive negative metacognitive beliefs decreased.	Highly transparent reporting*	Cross-sectional design; homogenous sample
Glad, K. A., Czajkowski, N. O., Dyb, G., & Hafstad, G. S.	2020	204 survivors of the 2011 massacre on Utoya island. Norway (mean age at the time of the attack: 19.4 years; 47.0% female)	Longitudinal (T1 = 4-5 months since attack; T2 = 14-15 months since attack; T3 = 30-32 months since attack; EC measured @, T2, PTG measured @ T3)	A positive association was observed between EC and PTG. EC was not observed to mediate longitudinal associations between peritraumatic reactions and later PTG.	Highly transparent reporting	Specificity of the traumatic event (with high press coverage, sample group existing as a community pre-attack) may reduce external validity of findings
Groleau, J. M., Calhoun, L. G., Cann, A., & Tedeschi, R. G.	2013	187 American undergraduate students that had experienced a traumatic event in the last 2 years (61.5% female; average age: 21.4 years)	Cross-sectional	EC was observed to be a unique predictor of both PTG and PTS.	Highly transparent reporting*	Cross-sectional design; homogenous sample

Appendix E

Table 4
Results

Author	Year	Sample	Design	Key Results	STROBE Review	Limitations
Kramer, L. B., Whiteman, S. E., Witte, T. K., Silverstein, M. W., & Weathers, F. W.	2020	269 trauma- exposed American undergraduates (mean age = 19.08 years; 79.2% female)	Cross-sectional	The pathway from EC to PT was observed to be significantly positively mediated by deliberate rumination. A significant positive pathway was also observed between EC, PTS, deliberate rumination and PTG.	Highly transparent reporting*	Cross-sectional design; homogenous sample
Lancaster, S. L., Klein, R., Nadia, C., Szabo, , & Mogerman, B.	2015	194 American undergraduates (58.2% female; mean age: 19.48 years)	Cross-sectional	The effect of EC on PTG and PTS was found to be significantly mediated by negative cognitions about the self, which positively predicted PTS, and negatively predicted PTG. Deliberate rumination was observed to have a significant, positive, direct effect on PG; the pathway between EC and PTS was observed to be mediated by intrusive rumination.	Highly transparent reporting*	Cross-sectional design; homogenous sample
Onu, D. U., Ugwu, D., & Orjiakor, C. T.	2019	201 Nigerian outpatients diagnosed with HIV for at least 1 year (female: 68.7%; average age: 40.1 years)	Cross-sectional	High EC was observed to have a significant negative association with PTG. An interaction effect was observed that suggested amongst individuals with high EC related to their HIV diagnosis, it was more likely that PTG would yield positive outcomes (with respect to personal relationships and mental health outcomes).	Medium reporting transparency - negative EC/PTG correlation is not discussed in-text*	Cross-sectional design; limited external validity due to specificity of traumatic index event (HIV diagnosis)
Roland, A. G., Currier, J. M., Rojas-Flores, L., & Herrera, S.	2014	257 violence-exposed teachers from El Salvador (68.6% female; average age: 42.02 years)	Cross-sectional	EC uniquely predicted both PTG and PTS after controlling for a range of factors (demographic, depression, and violence exposure).	Highly transparent reporting*	Cross-sectional design; self-selecting sample
Sapach, M. J. T., Horswill, s. C., Parkerson, H. A., Asmundson, G. J., & Carleton, R. N	2019	479 American trauma-exposed community members (52.1% male; average age: 48.01 years)	Cross-sectional	Using a modified version of the CES that assessed for traumatic index event valence (i.e. negative or positive cognitive appraisal of the event), positively appraised EC ratings were positively related to PT and inversely related to PTSD; negatively appraised EC ratings were positively related to PTSD and inversely related to PTG. PTG, and the central-negative group reported the most PTSD.	Highly transparent reporting*	Cross-sectional design
Schuettler, D., & Boals, A. (2011).	2011	2,326 American undergraduate students (66% female; mean age=20.58 years)	Cross-sectional	EC was observed to be a positive, significant, independent predictor of both EC and PTG after controlling for a range of variables	Highly transparent reporting*	Cross-sectional design; homogenous sample

Table 4 contd.
Results

Author	Year	Sample	Design	Key Results	STROBE Review	Limitations
Wamser-Nanney, R., Howell, K. H., Schwartz, L. E., & Hasselle, A. J.	2018	429 trauma-exposed American college students (78.6% female; mean age= 19.66 years)	Cross-sectional	EC was positively associated with PTG and PTS; when sexual trauma was the index event, high EC was more strongly associated with PTS, relative to a death of a loved one' index event.	Highly transparent reporting*	Cross-sectional design; homogenous sample
Wang, N., Chung, M. C., & Wang, Y.	2020	948 Chinese adolescents (52% female; average age: 15 years)	Cross-sectional	EC was observed to significantly, positively mediate the relationship between PTS and PTG.	Highly transparent reporting*	Cross-sectional design

Appendix F

Table 4

Breakdown of results related to aspects of cognition as differentiators of PTG/PTS pathways

Author	Analysis Type	Cognitive Phenomena	Relationship with PTG	Relationship with PTS	Influence of EC	Note
Allbaugh et al. (2016)	Moderation	Brooding rumination	-	Positive direct relationship	-	EC was not observed to moderate any of the relationships investigated
		Reflecting rumination	-	Positive direct relationship	-	
		Deliberate rumination	Positive direct relationship	-	-	
Barton et al. (2013)	Moderation	Posttraumatic cognitions (PTC)	Negative direct relationship	Positive direct relationship; Significant PTC x EC interaction effect	High PTC and high EC increased PTS; PTC did not significantly predict PTG when EC was low	PTC defined as 'negative cognitions about the self, negative cognitions about the world, and self-blame'
Boykin et al. (2020)	Moderation	Psychological flexibility (PF)	Positive direct relationship; No PF x EC interaction effect on PTG	Negative direct relationship; Significant PF x EC interaction efect	High EC and Low PF increased PTS	PF defined as 'the ability to persist in a behavior despite urges to do otherwise'
Lancaster et al. (2015)	Mediation	Deliberate rumination (DR)	Positive direct relationship	-	-	
		Intrusive rumination (IR)	-	Positive direct relationship	IR observed to mediate the relationship between EC and PTS	
		Negative self-cognitions (NSC)	Negative direct relationship	Positive direct relationship	NSC observed to mediate the relationship between EC and PTS/PTG	
Clauss et al. (2021)	Moderation	Positive metacognitive beliefs (PMB)	-	Significant PMB x EC interaction effect	High PMB and High EC increased PTS	
		Negative metacognitive beliefs (NMB)	No direct relationship; Significant NMB x EC interaction effect	Positive direct relationship; Significant NMB x EC interaction effect	High EC and Low NMB increased PTG; High EC and High NMB increased PTS	NMB involves intrusive rumination
Kramer et al., (2020)	Mediation	Deliberate rumination (DR)	Positive direct relationship	-	DR observed to mediate the relationship between EC and PTG	PTS found to have a small, positive effect on DR in a sequential mediational model chain
Brooks et al. (2017)	Mediation	Intrusive rumination (IR)	-	Positive direct relationship	EC mediates relationship between IR and PTG/PTS	
		Deliberate rumination (DR)	-	-	EC found to have a small, positive effect on DR in a sequential mediational model chain	

- indicates no significant results were observed