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Post-traumatic growth in people experiencing high post-traumatic stress during the COVID-19 pandemic: The protective role of psychological flexibility

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ARTICLE INFO

Keywords:

Post-traumatic symptoms
Post-traumatic growth
Psychological flexibility
COVID-19 pandemic
Pandemic-related adjustment
Longitudinal study

ABSTRACT

The COVID-19 pandemic evokes high levels of post-traumatic stress (PTS) in some people as well as positive personal changes, a phenomenon known as post-traumatic growth (PTG). Experiencing an adverse event as traumatic is crucial for triggering PTG, therefore higher PTS is often associated with higher PTG. This longitudinal study examined the protective role of psychological flexibility in fostering PTG in a group of people reporting high PTS related to COVID-19 as compared to those with low PTS. We hypothesized that higher psychological flexibility will be associated with higher PTG in those with high PTS and that psychological flexibility would be unrelated to PTG in those with low PTS. Secondary data analysis was conducted on data from a larger project investigating the psychological impacts of COVID-19. Adult Italians (N = 382) completed online surveys at Time 1 (three months after the first national lockdown, July 2020) and Time 2 (three months later when the number of COVID-19 cases increased, October 2020). Based on the Impact of Event Scale–Revised cut-off score, two PTS groups were identified at Time 2: low PTS (below cut-off) and high PTS (above cut-off). As predicted, moderation analyses showed that after controlling for Time 1 PTS and PTG and confounding variables, Time 1 psychological flexibility was associated with higher Time 2 PTG in the high PTS group, whereas psychological flexibility was unrelated to PTG in the low PTS group. Four psychological flexibility sub-processes (present moment awareness, defusion, values, committed action) at Time 1 were related to higher Time 2 PTG in only the high PTS group. Findings advance understanding of the role of psychological flexibility in trauma reactions and pandemic mental health adjustment. Evidence-based approaches that target psychological flexibility, like Acceptance and Commitment Therapy, are likely to foster PTG and ultimately adjustment in people with high PTS during and after the pandemic.

1. Introduction

The serious negative mental health impacts of the ongoing COVID-19 pandemic have been documented internationally indicating increases in anxiety, depression, and post-traumatic stress in the general population (Kan et al., 2021; Xiong et al., 2020). This emerging global mental health crisis is likely to remain for the duration of the pandemic and into the future, after the pandemic subsides (Holmes et al., 2020). The COVID-19 pandemic has been described as a potentially traumatic event (Shevlin, Hyland, & Karatzias, 2020). Indeed, it has characteristics that typify

collective traumatic experiences (e.g., war and natural disasters) including: unpredictable, extreme, prolonged, determined by an unknown/unfamiliar danger, and life threatening (Watson, Bacigalupe, Daneshpor, Han & Parra-Cardona, 2020). The world has witnessed the relentless global spread of the COVID-19 virus with extensive corresponding death and illness. The fear of contagion and the risk of death for oneself and loved ones highlight the uncertainties and uncontrollability of life, our mortality, and the omnipresence of disease, which constitute existential threats (Bakioğlu, Korkmaz, & Ercan, 2020; Courtney, Goldenberg, & Boyd, 2020). These fears coupled with

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<https://doi.org/10.1016/j.jcbs.2022.08.008>

Received 7 December 2021; Received in revised form 17 August 2022; Accepted 22 August 2022

Available online 28 August 2022

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unprecedented large-scale ‘lockdowns’ and quarantining with associated social isolation and economic hardships (Hertz-Palmor et al., 2021; Wu, Yao, Deng, Marsiglia, & Duan, 2021), as well as a continuous deluge of negative media coverage of images of overrun hospitals, mass graves, and COVID-19 patients dying alone (Garfin, Silver, & Holman, 2020) have contributed to increases in psychological distress and reduced well-being, and for some, the experience of trauma (Pakenham et al., 2020; Xiong et al., 2020; Zhao et al., 2021).

Although most people evidence varying degrees of adjustment when exposed to potentially traumatic events (Bonanno, 2005; Galatzer-Levy, Huang, & Bonanno, 2018), post-traumatic stress disorder related-symptoms (PTS) and post-traumatic stress disorders (PTSD) are also psychological consequences with a lifetime PTSD prevalence ranging from 3.4% to 26.9% in the general U.S. population (Schein et al., 2021). PTS comprises symptoms such as reexperiencing of the traumatic event through intrusive memories or flashbacks, avoiding trauma-related stimuli, negative changes in mood and cognition including fear, sadness, guilt, or emotional numbing, hyperarousal, and increased reactivity to stimuli (American Psychiatric Association, 2013). Based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), symptoms of PTS lasting more than one month that impair functioning reflect one of the criteria for PTSD (American Psychiatric Association, 2013). PTS is also distinguished from Acute Stress Disorder which refers to a severe stress reaction characterized by traumatic symptoms that arise immediately (within 3 days and last less than 30 days) after a traumatic event (Bryant, 2018). Given the wide range of potential sources of trauma (e.g., COVID-19 illness, death of a loved one and lockdowns) and the variability in their onset and possible recurrence, most studies that have investigated trauma responses to the COVID-19 pandemic have assessed PTS via self-report measures using cut-off scores indicating the probable presence of clinically significant PTS.

Systematic reviews and meta-analyses of research into pandemic-related PTS have highlighted that between 15 and 28% of adults from the general population experienced clinically significant PTS during the first acute phase of the COVID-19 pandemic (Qiu et al., 2021; Zhang, Pan, Cai, & Pan, 2021). Evidence also suggests that longer lockdown duration is associated with a higher prevalence of PTS (Brooks et al., 2020). Nevertheless, the specific phase of a pandemic in which data are collected should be considered. A recent umbrella review of systematic reviews and meta-analyses has highlighted that the pooled prevalence of clinically significant PTS symptoms in the general population in any phase of the COVID-19 pandemic varies between 9 (95% CI: 5.0–12.0%) and 33% (95% CI: 0.0–86.0%) (Bower et al., 2022), while another systematic review on the prevalence of PTS during public health emergencies indicated that PTS tends to fluctuate with time (Zhou et al., 2021). Finally, a systematic review of pandemic-related mental health problems in health-care workers revealed that the prevalence of PTS during previous pandemics ranged from 23.4% (95% CI: 16.3–31.2%) in the initial acute phase of the pandemic to 11.9% (95% CI: 8.4–15.8%) one year into the pandemic (Allan et al., 2020).

In addition to the growing body of literature examining PTS in the context of the COVID-19 pandemic, a corresponding body of research has emerged that has investigated the positive personal changes elicited by significant pandemic-related stressors, a phenomenon known as post-traumatic growth (PTG) (Tamiolaki & Kalaitzaki, 2020; Tedeschi & Calhoun, 2004). PTG refers to the experience of positive personal change as a result of the struggle with a major life crisis or adversity (Tedeschi & Calhoun, 2004). The purpose of the present study was to examine the role of a malleable protective psychological factor called psychological flexibility in relation to PTG in people reporting high PTS as compared to low PTS. According to the psychological flexibility framework which underpins Acceptance and Commitment Therapy (ACT), psychological flexibility is defined as the ability to effectively manage unwanted inner experiencing (e.g., thoughts, memories, bodily sensations) in the present, while adjusting behaviors in the context of

changing situational demands to ensure one is behaving consistently with personal values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006, 2012). Such an investigation has the potential to yield data that can advance our understanding of the role of psychological flexibility in trauma reactions and pandemic-related mental health adjustment as well as shed light on whether psychological flexibility-based interventions might promote PTG and mitigate the adverse mental health effects of the COVID-19 pandemic.

1.1. Post-traumatic growth

PTG is an adaptive process where an adverse life event is successfully worked through, re-appraised, and new and positive life narratives are developed (Neimeyer, 2004; Park, 2010). Tedeschi and Calhoun (2004) postulated that traumatic experiences may challenge or even shatter one’s core beliefs and assumptions about self, others, and the world. In this context, PTG arises through the process of understanding the causes and meaning of an adverse event and regulating the associated elevated distress (Calhoun, Cann, Tedeschi, & McMillan, 2000; Joseph, Murphy, & Regel, 2012; Tedeschi & Calhoun, 2004). Ultimately, this leads to revised world views and positive changes that manifest in five domains: (a) greater appreciation of life; (b) strengthening of relationships; (c) bolstering of personal strengths; (d) openness to new possibilities or enhancement of life purpose; (e) spiritual development (Tedeschi & Calhoun, 1996). A recent meta-analysis indicates that around one in two people who experienced traumatic events report moderate-to-high degrees of post-traumatic growth, even though the level of PTG across studies showed high heterogeneity ranging from 10 to 77.3% (Wu et al., 2019).

According to PTG theory, experiencing an adverse event as traumatic, as occurs in PTS, is crucial for triggering positive personal changes, since PTG is initiated by the same cognitive-affective processing that leads to PTS following a traumatic event (Tedeschi & Calhoun, 2004). Nevertheless, there are mixed results on the relationship between PTS and PTG (Hamby, Taylor, Segura, & Weber, 2022), with some meta-analyses reporting a positive linear relationship between them (Liu, Wang, Li, Gong, & Liu, 2017; Schubert, Schmidt, & Rosner, 2016), but also stronger a curvilinear link (Shakespeare-Finch & Lurie-Beck, 2014).

More than twenty-five studies have analyzed PTG in the context of the COVID-19 pandemic, with most being undertaken during the first six months of the outbreak (Asmundson, Paluszak, & Taylor, 2021; Celdrán, Serrat, & Villar, 2021; Chen & Tang, 2021; Chi et al., 2020; Feng et al., 2021; Gonzalez-Mendez & Díaz, 2021; Hamam et al., 2021; Ikizer, Karanci, Gul, & Dilekler, 2021; Kaloeti, Ardiani, & Stück, 2021; Koliouli & Canellopoulos, 2021; Kowalski, Carroll, & Britt, 2021; Laslo-Roth, George-Levi, & Margalit, 2020; Liu, Ju, & Liu, 2021; Menculini et al., 2021; Na, Tsai, Southwick, & Pietrzak, 2021; Nie, Tian, & Liang, 2021; Prieto-Ursúa & Jódar, 2020; Robles-Bello, Sánchez-Teruel, & Valencia Naranjo, 2020; Stallard, Pereira, & Barros, 2021; Tomaszek & Muchacka-Cymerman, 2020; Vazquez et al., 2021; Yan et al., 2021; Zeng et al., 2021; Zhang, Shi, Qin Ren, & Wang, 2021; Zhao et al., 2021; Zhou, MacGeorge, & Myrick, 2020). Samples ranged from 119 to 29,118 participants, with the majority drawn from adults in community settings, whereas other studies focused on specific groups: discharged COVID-19 patients, people bereaved because of COVID-19, front-line medical workers, university students, parents, and survivors of prior trauma. Most of these studies were cross-sectional, with only three studies employing a longitudinal design. Regarding the latter, one assessed pre-pandemic PTG and evaluated PTG again one year into the pandemic (Na et al., 2021), while the other examined PTG prospectively starting at the beginning of the pandemic and then again at other time points within one-to four-month timeframes as the pandemic progressed (Asmundson et al., 2021; Zhou et al., 2020). The predominant pattern of findings shows that higher PTS is associated with higher PTG (e.g., Asmundson et al., 2021; Hamam et al., 2021; Na et al., 2021; Zhao et al.,

2021; Zhou et al., 2020).

Heterogeneous levels of PTG have been evinced during the pandemic in community samples around the world. Most studies assessed PTG using the Posttraumatic Growth Inventory (PTGI) (Tedeschi & Calhoun, 1996) or its short form (PTGI-SF) (Cann et al., 2010), with higher scores indicating higher PTG (ranges 0–105 for the PTGI and 0–50 for the PTGI-SF). During the first four months of the pandemic, lower levels of PTG have been reported with the PTGI in Spanish and Turkish samples (i.e., $M = 31.35$, $SD = 13.8$ and $M = 30.85$, $SD = 20.86$, respectively) (Ikizer et al., 2021; Robles-Bello et al., 2020), while higher levels have been reported in Greek and USA samples (i.e., $M = 52.84$, $SD = 21.83$ and $M = 58.34$, $SD = 26.76$, respectively) (Koliouli & Canellopoulos, 2021; Zhou et al., 2020). A study conducted on a sample of Spanish older adults further reported a mean PTG of 17.54 ($SD = 12.54$) on the PTGI-SF (Celdrán et al., 2021). Nevertheless, rates of PTG in the context of the COVID-19 pandemic have been difficult to compare as many studies have modified the PTGI and the PTGI-SF by deleting certain items, inserting ad-hoc items related to the pandemic, or changing the Likert scale. Other studies have reported rates of moderate-to-high PTG at the item or domain levels of the PTGI. Asmundson et al. (2021) found that for North American participants reporting high levels of COVID-related stress, the mean PTGI item scores reflected small degrees of PTG overall, despite 77% reporting moderate-to-high growth on at least one PTGI item. Finally, a study of 20,720 Italians found that most (67%) participants did not report substantial PTG in any PTGI-SF domain (Menculini et al., 2021); however, levels of PTG reported by high PTS individuals were not examined.

Most of the abovementioned studies focused on average mental health changes rather than examining possible individual differences. Given that most people evidence some level of adjustment in the face of a potentially traumatic event (Bonanno, 2005), an approach focusing on differences between groups of people with low and high PTS is needed to identify protective factors associated with higher PTG in people with high PTS. Hence, this study examined psychological flexibility as a mental health protective factor in those experiencing high PTS as compared to those with low PTS in the context of the COVID-19 pandemic. Finding key malleable factors that increase PTG will provide intervention targets for enhancing adaptive responding in people experiencing clinically significant PTS.

1.2. Psychological flexibility

Psychological flexibility is a transdiagnostic concept that is related to a range of inter- and intra-personal skills and is regarded as the cornerstone of mental health (Kashdan & Rottenberg, 2010). According to the psychological flexibility framework which underpins ACT, psychological flexibility enables individuals to change behavioural repertoires facilitating optimal adaptation to changing circumstances (Kashdan & Rottenberg, 2010). Psychological flexibility is fostered by six therapeutic processes: (1) acceptance – openness to inner experiencing, (2) defusion – observing feelings and thoughts without attachment, (3) present moment awareness – mindful awareness of the present, (4) self-as-context – flexible self-awareness and perspective taking, (5) values – connection to personal values, (6) committed action – values-guided effective action (Hayes et al., 2012).

On the other hand, psychological inflexibility involves the unwillingness to remain in contact with unwanted inner experiencing in the present, which in turn is associated with rigid and reactionary behavioural responses which derail the pursuit of personal values (Hayes, Strosahl, & Wilson, 2012). A substantial body of evidence demonstrates that higher psychological inflexibility is associated with greater PTS, and other negative mental health outcomes (Boykin, Anyanwu, Calvin, & Orcutt, 2020; Kumpula, Orcutt, Bardeen, & Varkovitzky, 2011; Stabbe, Rolffs, & Rogge, 2019; Thompson & Waltz, 2010). Psychological inflexibility is related to avoidance of trauma-related thoughts, emotions, images, and bodily sensations in a way that hinders recovery and

diminishes the likelihood of engagement in meaning-making and value-driven behaviors (Palm & Follette, 2011).

In contrast, psychological flexibility is a protective factor that is associated with adaptive responses to trauma and better mental health outcomes across diverse contexts (Bluett, Homan, Morrison, Levin, & Twohig, 2014; Hayes et al., 2006; Kashdan & Rottenberg, 2010), including the COVID-19 pandemic (Dawson & Golijani-Moghaddam, 2020; Gloster, Lamnisos, et al., 2020; Kroska, Roche, Adamowicz, & Stegall, 2020; Landi, Pakenham, Boccolini, Grandi, & Tossani, 2020, 2022; Pakenham et al., 2020). Two studies conducted with adult and youth community samples further highlighted that the beneficial effects of psychological flexibility are most apparent at high levels of stress (Gloster, Meyer, & Lieb, 2017; Landi, Pakenham, Benassi, et al., 2021).

Post-trauma processing theories propose that recovery from trauma entails the processing of trauma-related information so it can be integrated into one's sense of self (Foa & Kozak, 1986). Effective attempts to integrate trauma typically require some degree of exposure to distressing trauma-related thoughts, emotions, and images (Batten, Orsillo, & Walser, 2005) through utilizing acceptance and meaning-making (e.g., benefit finding) coping strategies and drawing on resources such as social support. These processes are also associated with PTG after the trauma (Park, 2010; Shang et al., 2020). Psychological flexibility is likely to enhance these processes because it involves acceptance and mindfulness-based processes that enable effective processing of distressing trauma-related inner experiencing and foster engagement in self-reflective processes that cultivate positive reappraisal of the traumatic event. In addition, psychological flexibility involves ongoing adjustments to the pursuit of personal values that are sensitive to changing contexts, which in turn sustain a sense of meaning and purpose in life that accommodate the past traumatic event.

In support of the role of psychological flexibility in fostering PTG, one study highlighted that in the aftermath of trauma, experiential avoidance (the core process in psychological inflexibility operationalized in this study as a lack of psychological flexibility), moderated the link between PTS and PTG (Kashdan & Kane, 2011). That is, consistent with post-trauma processing theories and the inverse of the psychological flexibility model, people with higher PTS and greater avoidance of aversive trauma-related thoughts, feelings, and images, reported the lowest levels of PTG and meaning in life (Kashdan & Kane, 2011). Only two studies have examined the relationship between psychological inflexibility and PTG during the pandemic (Bruno et al., 2022; Yildiz, 2021). Bruno et al. (2022) found that psychological inflexibility longitudinally predicted higher PTS and lower PTG one year after the first Italian lockdown. In contrast, Yildiz (2021) failed to find a cross-sectional relationship between psychological inflexibility and PTG. However, Yildiz (2021) did not account for variations in the levels of PTS and their links to PTG. Our research review failed to locate one published study that investigated the protective role of psychological flexibility in relation to PTG in the context of the COVID-19 pandemic.

In view of theoretical and empirical data showing that substantial levels of PTS are necessary to trigger PTG (Tedeschi & Calhoun, 2004) and that the beneficial effects of psychological flexibility are likely to be most apparent at high levels of stress (Gloster et al., 2017; Landi, Pakenham, Benassi, et al., 2021), we propose that the beneficial effects of psychological flexibility on PTG will be more pronounced in people with high compared to low PTS.

1.3. The present study

The primary aim of the present study was to investigate the longitudinal protective role of psychological flexibility and its six sub-processes in relation to PTG in people reporting high PTS related to COVID-19 as compared to those with low PTS. To this purpose we identified low and high PTS groups according to the cut-off score for the Impact of Event Scale-Revised. Based on PTG theory which asserts that an adverse event must evoke a critical level of trauma to trigger PTG and

the evidence showing that the beneficial effects of psychological flexibility are likely to be most apparent at high PTS, we hypothesized that higher psychological flexibility will be associated with higher PTG in those with high PTS and that psychological flexibility would be unrelated to PTG in those with low PTS.

2. Methods

2.1. Participants and procedures

This study used data collected from a larger longitudinal project investigating the psychological impacts of the COVID-19 pandemic (Landi et al., 2022; Pakenham et al., 2020) that has four assessment points. In this study we conducted secondary data analysis using data from two assessment points. The first occurred three months after the first national Italian lockdown (9–19 July 2020), a period of better control of the pandemic in which all restrictions were lifted. The second was conducted when the number of new COVID-19 cases started to increase again but with no corresponding restrictions (9–19 October 2020). For the purposes of this study we refer to these two assessment points as Time 1 and Time 2, respectively. These assessments were chosen as they tapped the proximal effects of the first lockdown. Evidence indicates that psychological distress in the general population was higher in the first two months of the pandemic, the first exponential spread of COVID-19, with a steady reduction during the third and fourth months (which corresponded with better control of the pandemic and the easing of restrictions), and a return to levels that were close to pre-pandemic by the end of the fifth month (i.e., Daly & Robinson, 2021). Hence, our Times 1 and 2 assessments likely tapped the effects of the first COVID-19 restrictions on PTS and PTG and are consistent with findings from one longitudinal study showing that PTG levels out at about 6 months after trauma (Frazier, Conlon, & Glaser, 2001). The sample was recruited through social media and a snowballing approach, whereby participants invited friends and acquaintances to participate in the study. At each assessment, participants completed an online questionnaire, which took 15–20 min to complete. Inclusion criteria were ≥ 18 years old and being resident in Italy. This study was approved by the Ethics Committee of the University of Bologna and informed consent was obtained from all participants.

The sample consisted of 382 participants (77.49% female; Time 1 $M_{age} = 40.50$, $SD_{age} = 13.69$). Most participants were native Italian (98.43%), had a bachelor's degree (74.35%), were employed (66.49%), and reported to be in the middle socioeconomic class (81.68%; i.e., participants indicated whether they were below, average or above the mean income of the population). Half of the respondents were either married or living with a partner (50.26%), with most of the remainder being single (42.93%). A total of 17.54% and 18.06% of participants reported pre-existing mental and physical health problems, respectively (i.e., participants indicated 'yes/no' as to whether they currently suffered from a mental health problem [e.g., anxiety, depression, alcohol/substance use], or a physical health problem [e.g., cancer, diabetes, physical disability]). Key sample socio-demographics were compared to the Italian Census Data (ISTAT, 2020) and showed that the present sample had an overrepresentation of females (77.49 vs. 51.3%), people with a bachelor's degree (74.35 vs. 14.50%), and individuals from the middle socio-economic class (81.68 vs. 59.7%). Finally, the age-standardized estimate of mental health problems in Italy in 2019 was 21.61% (Institute for Health Metrics and Evaluation, n. d.), while participants in the current sample reported a smaller percentage of pre-pandemic mental health problems (i.e., 17.54%).

Participants responded 'yes/no' to questions about COVID-19 and lockdown contextual factors. A total of 20.68% reported having lost work or being in receipt of a lockdown redundancy fund. At Time 1, 28.27% of participants declared COVID-19 infection, while 15.97%, 5.76% and 3.93% reported having a family member infected by COVID-19, hospitalized, and death due to COVID-19, respectively. At Time 2, an

additional 7.36% reported COVID-19 infection, while 6.28%, 2.36% and 1.57% declared having a family member infected by COVID-19, hospitalized, and death due to COVID-19, respectively.

Of the total sample, 81.94% of participants completed both Times 1 and 2 assessments. To examine attrition, we conducted a series of ANOVAs and Chi-square tests which compared respondents who completed both assessments with those who only completed Time 1 assessment. The two groups did not differ on any sociodemographic variables (i.e., gender, $\chi^2 [1, 381] = 0.24, p = 0.64$; age, $F [1, 381] = 0.84, p = 0.36$; education, $\chi^2 [1, 381] = 0.01, p = 0.93$; marital status, $\chi^2 [3, 379] = 3.00, p = 0.39$; employment, $\chi^2 [2, 380] = 0.80, p = 0.67$; socio-economic status, $\chi^2 [2, 380] = 1.19, p = 0.55$; nationality, $\chi^2 [1, 381] = 0.01, p = 0.93$; pre-existing mental illness, $\chi^2 [1, 381] = 0.10, p = 0.75$; pre-existing physical illness, $\chi^2 [1, 381] = 0.03, p = 0.87$), or Time 1 COVID-19 and lockdown context variables (i.e., lost work receiving a lockdown redundancy fund, $\chi^2 [1, 381] = 0.80, p = 0.37$; infected by COVID-19, $\chi^2 [1, 381] = 0.24, p = 0.63$; family member infected, $\chi^2 [1, 381] = 1.19, p = 0.28$; family member hospitalized, $\chi^2 [1, 381] = 0.01, p = 0.94$; family member death, $\chi^2 [1, 381] = 0.07, p = 0.80$).

2.2. Measures

Psychological flexibility was evaluated at Time 1, while PTS and PTG were assessed at both Time 1 and Time 2 with the following measures.

Psychological Flexibility. The 30-item psychological flexibility scale of the Italian validated version (Landi, Pakenham, Giovannetti, et al., 2021) of the Multidimensional Psychological Flexibility Inventory (MPFI; Rolffs, Rogge, & Wilson, 2018) was used to measure psychological flexibility at Time 1. This scale measures the six psychological flexibility processes. Respondents rated the extent to which they agreed with each item on a 6-point scale (1 = *never true* to 6 = *always true*). The MPFI has good psychometric properties (Landi, Pakenham, Crocetti et al., 2021; Rolffs et al., 2018). The observed Cronbach's alpha for the total score was $\alpha = 0.96$, while the observed range for the sub-processes were 0.91–0.94.

Post-traumatic stress symptoms. Post-traumatic stress symptoms associated with the COVID-19 pandemic were evaluated with the Italian validated version (Craparo, Faraci, Rotondo, & Gori, 2013) of the Impact of Event Scale–Revised (IES-R; Weiss & Marmar, 1997). The IES-R assesses the severity of PTS symptoms in the past seven days in response to a specific traumatic event. The word "event" was replaced with "COVID-19 pandemic". The IES-R is composed of three subscales: intrusion (i.e., intrusive images or thoughts, nightmares, and dissociative-like re-experiencing), avoidance (i.e., numbing of responsiveness, tendency to avoid feelings, thoughts, or reminders about the event), and hyperarousal (i.e., anger, irritability, hypervigilance, lack of concentration, and heightened startle). Items are rated on a 5-point scale (0 = *not at all* to 4 = *extremely*). Scores are summed (range 0–88), with higher scores indicating higher PTS. The optimal cut-off for clinically significant PTS symptoms is 33 (Creamer, Bell, & Failla, 2003). The IES-R has good psychometric properties (Creamer et al., 2003). The observed Cronbach's alphas were $\alpha = 0.91$ and $\alpha = 0.93$ at Time 1 and Time 2, respectively.

Post-traumatic growth. Post-traumatic growth associated with the COVID-19 pandemic was assessed with the Italian validated version (Prati & Pietrantonio, 2014) of the short-form of the Post-traumatic Growth Inventory (PTGI-SF; Cann et al., 2010). The PTGI-SF is derived from the parent inventory (PTGI; Tedeschi & Calhoun, 1996) and consists of 10 items assessing perceived growth and positive changes related to adverse life events. Instructions were modified for the current study such that "as a result of my crisis" was replaced with "as a result of the COVID-19 pandemic." The scale retains two items from each of the five domains of the original PTGI: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life. Participants rated on a 6-point scale (0 = *I did not experience this change* to 5 = *I*

experienced this change to a great deal) the extent of positive change they had experienced over the course of the COVID-19 pandemic. Items are summed (range 0–50), with higher scores reflecting greater perceived positive change. Different cut-off points have been used for the original PTGI (Tedeschi & Calhoun, 1996; Zoellner & Maercker, 2006), and there are no established norms for the PTGI-SF. Nevertheless, in line with studies by Jansen, Hoffmeister, Chang-Claude, Brenner, and Arndt (2011) and Asmundson et al. (2021), the prevalence of moderate-to-high PTG was operationalized as a mean score of ≥ 3 on each PTGI-SF domain. The observed Cronbach’s alphas were $\alpha = 0.88$ and $\alpha = 0.90$ at Time 1 and Time 2, respectively.

2.3. Data analysis approach

Preliminary analyses (i.e., descriptive statistics, reliabilities, and correlations among study variables) were conducted in IBM SPSS 24. All other analyses were carried out in Mplus 8.3 with the robust maximum likelihood estimator (MLR; Muthén & Muthén, 1998-2018). The overall percentage of missing data was 1.51%. Little’s (1988) Missing Completely at Random test on the variables of interest yielded a normed χ^2 (χ^2/df) of 0.88. According to guidelines by Bollen (1989), this index, which can be used to correct for sensitivity of the χ^2 for large samples, is low and suggests that data are missing completely at random. Therefore, the Full Information Maximum Likelihood estimator was used to handle missing data.

To interpret the significance of correlations, we referred to Cohen’s (1988) criteria: small (0.10), moderate (0.30) and large (0.50). Based on the IES-R cut-off score, two PTS groups were identified at Time 2: low PTS (i.e., score < 33) and high PTS (i.e., score ≥ 33 indicating clinically significant PTS). Following identification of these two groups, moderation analyses were conducted. Specifically, we tested for the presence of a significant interaction between the low and high PTS groups in the link between psychological flexibility and its sub-processes (the predictors) and PTG (the outcome). We examined this interaction to test our hypothesis that the size of the relationship between psychological flexibility and its sub-processes and PTG would be conditional on levels of PTS and that high PTS creates the opportunity for (i.e., potentiates) psychological flexibility and its sub-processes to promote PTG.

Psychological flexibility scores were mean centered in order to reduce potential problems related to high multicollinearity and to improve interpretation of the coefficient in the interaction (see Aiken & West, 1991). Moderation analyses were conducted controlling for Time 1 PTS and PTG, and socio-demographics or COVID-19 and lockdown context variables significantly correlated with PTG at Time 2 (i.e., age and COVID-19 infected, see Table 1). To provide a visual summary of the significant moderations, the links between psychological flexibility and its sub-processes and PTG were inspected with two separate lines at high PTS and at low PTS. Values of high (one SD above the mean) and low (one SD below the mean) psychological flexibility and its sub-processes were identified and the associations between these predictors and PTG were estimated in Mplus in the high and low PTG groups, and final plots of significant interactions were created using the jamovi software (The jamovi project, 2021).

3. Results

3.1. Preliminary analyses

Correlations. Descriptive statistics and Pearson’s correlations for all study variables are reported in Table 1. Time 1 psychological flexibility displayed a small and negative association with Time 1 PTS, and was not significantly related to Time 2 PTS. Time 1 psychological flexibility displayed significant but small positive correlations with both Time 1 and Time 2 PTG. Of the psychological flexibility sub-processes, defusion and committed action were negatively correlated with both Time 1 and Time 2 PTS, whereas acceptance, self-as-context, and values evinced

Table 1
Descriptive data and correlations among study variables (N = 382).

	M (SD)	Range	%	1	1a	1b	1c	1d	1e	1f	2	3	4	5
1. Time 1 Psychological flexibility	3.61 (0.91)	1–5.39		–										
1a. Acceptance	2.85 (1.20)	1–6		0.60***	–									
1b. Present Moment Awareness	3.50 (1.22)	1–6		0.76***	0.52***	–								
1c. Self-as-context	3.50 (1.20)	1–6		0.81***	0.47***	0.58***	–							
1d. Defusion	3.39 (1.25)	1–6		0.79***	0.34***	0.45***	0.60***	–						
1e. Values	4.23 (1.19)	1–6		0.78***	0.20***	0.46***	0.51***	0.58***	–					
1f. Committed Action	4.18 (1.21)	1–6		0.76***	0.17***	0.41***	0.51***	0.59***	0.76***	–				
2. Time 1 Post-traumatic stress	18.01 (13.36)	0–66		–0.14**	0.00	0.04	–0.09	–0.30***	–0.09	–0.18**	–			
3. Time 1 Post-traumatic growth	12.19 (9.06)	0–48		0.15**	0.20***	0.09	0.15**	0.06	0.13*	0.08	0.15**	–		
4. Time 2 Post-traumatic stress	14.86 (12.86)	0–75		–0.12	–0.02	0.02	–0.04	–0.23***	–0.06	–0.20**	0.69***	0.15*	–	
5. Time 2 Post-traumatic growth	11.23 (9.12)	0–48		0.13*	0.14*	0.09	0.13*	0.04	0.12*	0.06	0.13*	0.67***	0.20***	–
6. Gender (female)			77.49	0.00	–0.13*	–0.04	–0.02	0.06	0.11*	0.08	–0.13*	–0.10*	–0.06	–0.11
7. Age			26.01	0.30	–0.19***	–0.02	–0.05	0.14*	0.14**	0.12*	–0.03	–0.09	0.67	–0.15**
8. COVID-19 infected		19.21–73.34		0.03	–0.01	0.02	–0.01	0.10	0.03	0.02	–0.12*	–0.16**	–0.90	0.17**

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Pearson’s correlation is reported for continuous variables and Spearman’s correlation for categorical variables. COVID-19 infected = 1, Not infected = 0.

positive associations with both Time 1 and Time 2 PTG.

Time 1 PTS displayed a strong correlation with Time 2 PTS, and small correlations with Time 1 and Time 2 PTG. Time 1 PTG exhibited a significant small correlation with Time 1 PTS and a strong correlation with Time 2 PTG. Time 2 PTS was significantly and positively correlated with Time 2 PTG. Being older was negatively correlated with Time 2 PTG, while being infected with COVID-19 over the study period was positively associated with Time 2 PTG.

Identification of the high and low PTS groups. Based on the IES-R cut-off score of 33, we identified the two PTS groups at Time 2. A total of 90.46% of the sample ($n = 346$) scored below the cut-off and constituted the low PTS group ($M = 12.00, SD = 8.33$). A total of 9.54% of the sample ($n = 36$) scored above the cut-off indicating clinically significant PTS ($M = 44.33, SD = 11.06$) and constituted the high PTS group.

Mean scores on the PTGI-SF domains and the percentage of participants reporting moderate-to-high PTG (i.e., scoring ≥ 3 on each domain) in the low and high PTS groups are reported in Table 2. Mean PTG domain scores were reflective of low PTG levels in the low PTS group, with mean domain scores ranging from 0.54 ($SD = 0.98$) to 1.70 ($SD = 1.18$). Higher PTG scores emerged in the high PTS group, although the levels of PTG were relatively low with mean domain scores ranging from 0.64 ($SD = 1.00$) to 2.44 ($SD = 1.42$). Most (69.01%) participants did not report moderate-to-high PTG in any domain in the low PTG group, while in the high PTG group 53.14% and 28.14% reported growth on at least one or two PTGI-SF domains, respectively. In the high PTS group, the two PTGI-SF domains with the highest levels of growth were appreciation of life and personal strength whereby moderate-to-high PTG was endorsed by 53.13% and 21.88% of participants, respectively.

3.2. Interaction between psychological flexibility and low and high post-traumatic stress groups in predicting post-traumatic growth

Results of the moderation analyses are reported in Table 3. They revealed a significant interaction between the two PTS groups and

Table 2
Domain mean scores on the short form of Post-traumatic Growth Inventory and percentage of participants reporting moderate-to-high post-traumatic growth in the low and high PTS groups.

PTG Domain	Low PTS Group		High PTS Group	
	<i>M (SD)</i>	% reporting moderate-to-high PTG	<i>M (SD)</i>	% reporting moderate-to-high PTG
Relating to Others	0.99 (1.09)	8.31	1.17 (1.45)	18.75
New Possibilities	1.06 (1.11)	8.63	1.22 (1.13)	9.38
Personal Strength	1.27 (1.26)	15.97	1.36 (1.52)	21.88
Spiritual Change	0.54 (0.98)	5.11	0.64 (1.00)	6.25
Appreciation of Life	1.70 (1.18)	19.49	2.44 (1.42)	53.13
	Low PTS Group	%	High PTS Group	%
Percentage reporting moderate-to-high PTG in at least one domain				
No moderate-to-high PTG in at least one domain	69.01		46.88	
Moderate-to-high PTG in at least 1 domain	30.98		53.14	
Moderate-to-high PTG in at least 2 domains	14.37		28.14	
Moderate-to-high PTG in at least 3 domains	7.34		18.76	
Moderate-to-high PTG in at least 4 domains	4.15		9.38	

Table 3

Interaction between psychological flexibility at Time 1 and low and high post-traumatic stress groups at Time 2 in predicting post-traumatic growth at Time 2.

Effects	Post-traumatic Growth at Time 2		
	Unstand Coeff (SE)	Stand Coeff (SE)	Stand 95% CI
Post-traumatic stress groups at Time 2	2.140 (1.721)	0.068 (0.054)	-0.022, 0.157
Psychological flexibility at Time 1	0.134 (0.477)	0.013 (0.046)	-0.063, 0.089
Interaction	4.755** (1.384)	0.130** (0.044)	0.058, 0.201
Age	-0.055* (0.028)	-0.086* (0.043)	-0.157, -0.014
COVID-19 infected	-0.696 (0.943)	-0.033 (0.045)	-0.107, 0.041
Post-traumatic stress at Time 1	0.012 (0.040)	0.017 (0.057)	-0.076, 0.110
Post-traumatic growth at Time 1	0.658*** (0.056)	0.641*** (0.043)	0.570, 0.713
$R^2/\Delta R^2$	0.473***/0.014**		

Notes. Unstand. Coeff. = unstandardized coefficient; Stand. Coeff. = standardized coefficient; SE = standard error; Stand. 95% CI = 95% confidence interval of standardized model results. Low PTS group = 0, High PTS group = 1. COVID-19 infected = 1, Not infected = 0. Psychological flexibility was mean centered. Significant moderations are displayed in bold. R^2 = total variance explained by the model, ΔR^2 = unique variance explained by the interaction. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

psychological flexibility in predicting PTG (unstandardized coefficient = 4.755, $SE = 1.384, p < 0.01$; standardized coefficient = 0.130, $SE = 0.044, p < 0.01$). As predicted, among those in the high PTS group, higher Time 1 psychological flexibility was significantly associated with higher Time 2 PTG (unstandardized coefficient = 4.890, $SE = 1.699, p < 0.01$; standardized coefficient = 0.133, $SE = 0.07, p < 0.01$). In contrast, among those in the low PTS group, there was no significant relationship between Time 1 psychological flexibility and subsequent Time 2 PTG (unstandardized coefficient = 0.134, $SE = 0.485, p > 0.05$; standardized coefficient = 0.060, $SE = 0.13, p > 0.05$). The full model predicted 47.3% of the variance in Time 2 PTG, whereas the interaction predicted 1.4% of the variance. The moderation is displayed in Fig. 1.

To further explore the effects of psychological flexibility on each PTG domain in the high and low PTS groups, we repeated the analyses on each of the PTGI-SF subscales. Results of these additional moderation analyses are reported in Supplementary Materials 1. Findings indicated that all interactions of Time 1 psychological flexibility with Time 2 PTS groups were significant in predicting all five PTGI-SF domains (i.e., relating to others, new possibilities, personal strength, spiritual change, and appreciation for life) and that Time 1 psychological flexibility was associated with higher PTG at Time 2 in those with high PTS but not in those with low PTS.

3.3. Interaction between psychological flexibility sub-processes and low and high post-traumatic stress groups in predicting post-traumatic growth

Results of analyses that examined each of the six psychological flexibility processes as single predictors (see Table 4) indicated that significant interactions were evinced for present-moment awareness, defusion, values, and committed action. Significant moderations are reported in Fig. 2. For each significant moderation effect, present-moment awareness, defusion, values, and committed action fostered PTG at Time 2 in those with high PTS but not in those with low PTS. The full models predicted between 45.7 and 47.0% of the variance in Time 2 PTG, whereas the significant interactions predicted between 1.1 and 1.4% of the variance.

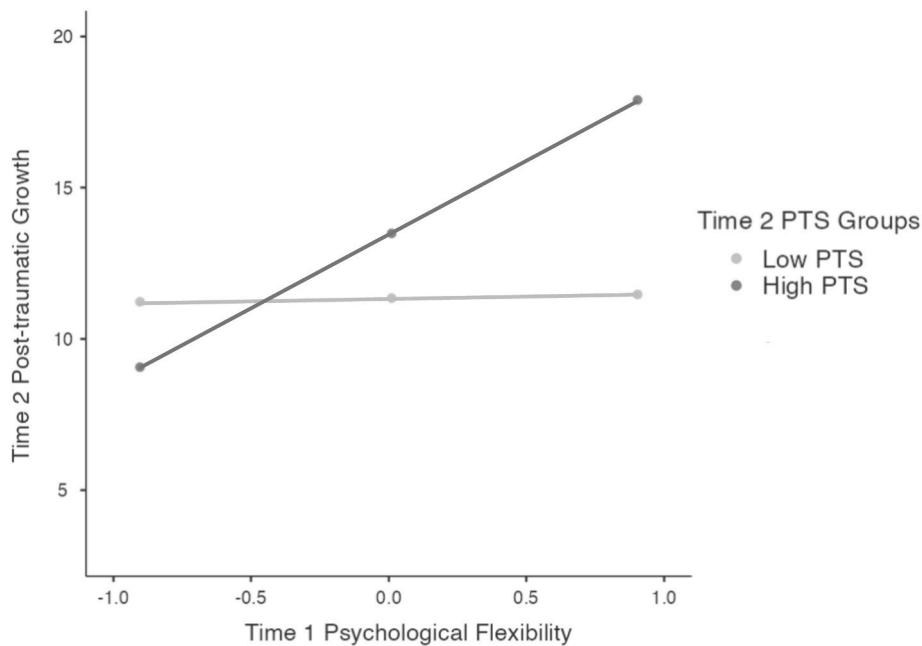


Fig. 1. Interaction between Psychological Flexibility at Time 1 and Post-traumatic Stress Groups at Time 2 in Predicting Post-traumatic Growth at Time 2. Notes. PTS= Post-traumatic Stress. Psychological Flexibility was Mean Centered.

4. Discussion

This short-term longitudinal study examined the protective role of psychological flexibility and its sub-processes in fostering PTG in people with high PTS related to COVID-19 as compared to people with low PTS. As expected, higher psychological flexibility at Time 1 and four of its sub-processes (present moment awareness, defusion, values, committed action) were associated with higher PTG at Time 2 among people in the high PTS group, whereas psychological flexibility and its sub-processes were not significantly related to PTG at Time 2 among people in the low PTS group. Importantly, the same pattern of results was observed for the total psychological flexibility score in all five PTG domains indicating that the beneficial effects of psychological flexibility emerge across the personal growth dimensions of relating to others, new possibilities, personal strength, spiritual change, and appreciation for life.

As predicted, results indicated that a significant association between higher psychological flexibility and higher PTG only emerged in the high PTS group. This finding is in line with those of other studies showing that the favorable impacts of psychological flexibility are most apparent at high levels of stress (Gloster et al., 2017; Landi, Pakenham, Benassi, et al., 2021). The significant associations between PTG and present-moment awareness, defusion, values, and committed action, suggest that the positive effects of psychological flexibility are likely to occur via three pathways which align with the three pillars of psychological flexibility: open (defusion and acceptance), centered (self-as-context and present moment awareness) and engaged (values and committed action) (Hayes et al., 2012). First, present moment awareness or mindfulness is a psychological flexibility process that fosters the ability to stay grounded in ‘the here and now’, which is likely to elicit strategies that help individuals with high PTS expose themselves to and process their pandemic trauma-related thoughts, emotions, and images. Consistent with this proposal, mindfulness is related to greater PTG after trauma (Hanley, Garland, & Tedeschi, 2017). Second, defusion (observing mental and emotional activity) is likely to help individuals notice and accept their pandemic trauma-related reactions and thereby help people with high PTS take decentered flexible perspectives on their responses to the pandemic. A study conducted on a sample of individuals exposed to childhood abuse showed that lower cognitive defusion mediated the link between distress tolerance and lower PTG

(Basharpoor, Mowlaie, & Sarafrazi, 2021). Third, values and committed action are related psychological flexibility processes that involve the contextually sensitive pursuit of personal values that accommodate the realities of past and ongoing trauma while remaining engaged with values-based goals. This pathway aligns with exploring new meaningful possibilities and priorities, an important aspect of personal growth following trauma (Tedeschi & Calhoun, 1996). Strategies closely associated with these three psychological flexibility pillars have been shown to be associated with PTG following a variety of traumas (Cole & Lynn, 2010; Park, 2010; Shang et al., 2020) and to better adjustment to the COVID-19 pandemic (Park et al., 2021).

The link between lower psychological flexibility and lower PTG among participants who reported high PTS reflects the unfavorable effects of psychological inflexibility in the context of trauma. This is likely to be due to a greater reliance on strategies that involve avoidance of trauma-related inner experiencing. Supporting this view is evidence showing that lower scores on the psychological flexibility processes are related to higher experiential avoidance (Rolffs et al., 2018), which in turn plays a key role in the development and maintenance of PTS (Orsillo & Batten, 2005), and reduces the potential for finding positives in adversity (Kashdan & Kane, 2011).

The significant positive association between PTS and PTG is consistent with the PTG theoretical proposal that an adverse event must evoke critical levels of trauma to trigger PTG (Tedeschi & Calhoun, 2004), and empirical data showing that higher PTS is related to greater PTG in the context of COVID-19 (Hamam et al., 2021; Tomaszek & Muchacka-Cymerman, 2020). Findings from this study revealed that, even in the presence of high PTS, people with high psychological flexibility were able to identify positive personal changes associated with their experience of the pandemic.

Our findings show that a small but significant proportion of adults experience clinically significant pandemic-related PTS. In fact, the high PTS group, which reported clinically significant rates of PTS (≥ 33 cut-off IES-R score) related to COVID-19 six months after the end of the first lockdown, was composed of only 9.54% of the sample. However, their mean PTS score was 44.33 and studies indicate that a PTS score of ≥ 37 on the IES-R is associated with immune system suppression (e.g., Kawamura, Kim, & Asukai, 2001). A recent umbrella review of systematic reviews and meta-analyses reported a wide range of prevalence

Table 4
Interaction between psychological flexibility sub-processes at Time 1 and post-traumatic stress groups at Time 2 in predicting post-traumatic growth at Time 2.

Effects	Post-traumatic Growth at Time 2																	
	Acceptance			Present-Moment Awareness			Self-as-Context			Defusion			Values			Committed Action		
	Unstand Coeff (SE)	Stand Coeff (SE)	Stand 95% CI	Unstand Coeff (SE)	Stand Coeff (SE)	Stand 95% CI	Unstand Coeff (SE)	Stand Coeff (SE)	Stand 95% CI	Unstand Coeff (SE)	Stand Coeff (SE)	Stand 95% CI	Unstand Coeff (SE)	Stand Coeff (SE)	Stand 95% CI	Unstand Coeff (SE)	Stand Coeff (SE)	Stand 95% CI
Post-traumatic stress groups at Time 2	1.278 (1.911)	0.040 (0.060)	-0.059, 0.139	0.188 (1.712)	0.006 (0.054)	-0.083, 0.095	1.168 (1.839)	0.037 (0.058)	-0.058, 0.132	2.784 (1.754)	0.088 (0.055)	-0.003, 0.179	2.158 (1.841)	0.068 (0.058)	-0.027, 0.163	2.963 (1.856)	0.094 (0.059)	-0.003, 0.190
Psychological flexibility sub-process at Time 1	0.035 (0.376)	0.005 (0.049)	-0.076, 0.085	0.028 (0.357)	0.004 (0.047)	-0.074, 0.082	0.174 (0.364)	0.022 (0.047)	-0.055, 0.100	-0.178 (0.364)	-0.024 (0.050)	-0.106, 0.057	0.425 (0.353)	0.053 (0.044)	-0.019, 0.125	-0.001 (0.352)	0.000 (0.045)	-0.074, 0.074
Interaction	-0.169 (1.569)	-0.005 (0.051)	-0.089, 0.078	2.992** (0.977)	0.115** (0.041)	0.047, 0.182	1.494 (1.214)	0.060 (0.049)	-0.021, 0.141	2.902*** (0.862)	0.134*** (0.045)	0.060, 0.207	2.079* (0.917)	0.088* (0.042)	0.019, 0.157	3.250** (1.090)	0.136** (0.051)	0.052, 0.220
Age	-0.047 (0.030)	-0.074 (0.046)	-0.149, 0.002	-0.053 (0.028)	-0.082 (0.044)	-0.154, 0.009	-0.047 (0.028)	-0.073 (0.044)	-0.146, 0.000	-0.053 (0.029)	-0.083 (0.044)	-0.156, 0.010	-0.059* (0.029)	-0.092* (0.045)	-0.166, -0.018	-0.056* (0.028)	-0.086* (0.043)	-0.158, -0.015
COVID-19 infected	-0.030 (0.967)	-0.026 (0.046)	-0.102, 0.050	-0.766 (0.947)	-0.036 (0.045)	-0.111, 0.038	-0.655 (0.958)	-0.031 (0.046)	-0.106, 0.044	-0.609 (0.954)	-0.029 (0.046)	-0.104, 0.046	-0.525 (0.957)	-0.025 (0.046)	-0.100, 0.050	-0.555 (0.955)	-0.026 (0.046)	-0.101, 0.049
Post-traumatic stress at Time 1	0.003 (0.042)	0.004 (0.058)	-0.092, 0.100	0.008 (0.040)	0.011 (0.056)	-0.081, 0.103	0.007 (0.042)	0.010 (0.058)	-0.086, 0.105	0.008 (0.041)	0.011 (0.057)	-0.083, 0.106	0.009 (0.041)	0.012 (0.057)	-0.082, 0.106	0.010 (0.040)	0.014 (0.056)	-0.079, 0.106
Post-traumatic growth at Time 1	0.672*** (0.058)	0.655*** (0.043)	0.583, 0.726	0.666*** (0.057)	0.649*** (0.043)	0.578, 0.720	0.666*** (0.057)	0.648*** (0.043)	0.577, 0.720	0.666*** (0.057)	0.649*** (0.044)	0.577, 0.721	0.663*** (0.057)	0.646*** (0.044)	0.574, 0.718	0.660*** (0.057)	0.643*** (0.043)	0.572, 0.714
R ² /ΔR ²	0.457***/0.000			0.469***/0.011*			0.461***/0.003			0.470***/0.013**			0.469***/0.012**			0.471***/0.014**		

Notes. Unstand. Coeff. = unstandardized coefficient; Stand. Coeff. = standardized coefficient; Stand. 95% CI = 95% confidence interval of standardized model results. Low PTS group = 0, High PTS group = 1. COVID-19 infected = 1, Not infected = 0. Psychological flexibility sub-processes were mean centered. Significant moderators are displayed in bold. R² = total variance explained by the model, ΔR² = unique variance explained by the interaction. *p < 0.05, **p < 0.01, ***p < 0.001.

rates for clinically significant PTS during the pandemic (i.e., ranging from 9 to 33%; Bower et al., 2022) with previous meta-analyses including studies conducted during the acute phase of the pandemic reporting higher prevalence rates (i.e., 15–28%; Qiu et., 2021; Zhang, Pan, et al., 2021). The prevalence of clinically significant PTS in our study is within the range reported by the recent umbrella review. This may be explained by the fact that we collected data six months after the end of the first lockdown and data from previous pandemics and public health emergencies that show rates of clinically significant PTS tend to decrease over time (Allan et al., 2020; Zhou et al., 2021).

As for levels of PTG in the overall sample, the mean levels of PTG reported in this study – i.e., 14.86 (SD = 12.86) and 11.23 (SD = 9.12) at Time 1 and Time 2, respectively – are lower than the mean PTG reported in another study that used the PTGI-SF (i.e., M = 17.54, SD = 12.54) (Celdrán et al., 2021). However, that study assessed PTG in a sample of older adults in Spain immediately after the first lockdown, while the present sample consisted of participants aged ≥18, and levels of PTG were not assessed immediately after the first lockdown but 3–6 months later. Furthermore, most individuals in the low PTG group in the present study did not report moderate-to-high PTG in any domain. Similarly, a cross-sectional multicenter study using an Italian community sample (N = 13,889) during the initial phase of the COVID-19 pandemic found that most participants (67%) from the total sample did not report significant improvement in any PTG domain (Menculini et al., 2021). Interestingly, in the high PTS group in our study, 53.14% and 28.14% reported growth in at least one or two PTGI-SF domains, respectively.

Results of this study advance our understanding of the protective role of psychological flexibility and its sub-processes in trauma reactions and pandemic-related mental health adjustment. Conversely, findings also show that lower psychological flexibility is associated with less PTG among those with high PTS and that this subgroup is likely to be particularly vulnerable to mental health problems. In view of the adverse mental health effects of the ongoing COVID-19 pandemic (Kan et al., 2021; Xiong et al., 2020), it is paramount that effective public health interventions are implemented to promote PTG and decrease mental health problems in people reporting high PTS (Holmes et al., 2020). Given the findings from this and other studies (e.g., Landi, Pakenham, Crocetti, Tossani, & Grandi, 2022; Pakenham et al., 2020) that support the protective role of psychological flexibility in the COVID-19 pandemic, mental health promotion interventions should target this resource. ACT is an empirically supported intervention approach that fosters psychological flexibility (Gloster, Walder, Levin, Twohig, & Karekla, 2020). Evidence supports the efficacy of ACT-based interventions for trauma and stress-related disorders (e.g., Meyer et al., 2018; Ramirez et al., 2021). ACT informed mental health promotion interventions have been successfully implemented across diverse contexts using flexible modes of delivery including group (Giovannetti et al., 2020), online (Viskovich & Pakenham, 2020), and mobile app (Levin, Haeger, Pierce, & Cruz, 2017). In view of the social restrictions used to manage the COVID-19 pandemic, flexible delivery is critical for the wide dissemination of mental health interventions (Moreno et al., 2020).

ACT-based interventions could be delivered on two levels to prevent or reduce PTS and increase PTG during the pandemic. First, universal widely disseminated public health digital self-help ACT-based interventions could be delivered. Second, people with clinically significant PTS symptoms could be identified using the IES-R clinical cut-off score and targeted with more intensive interventions which focus on the psychological flexibility sub-processes (present-moment awareness, defusion, values, and committed action) identified in this study as likely potent mechanisms for managing PTS and enhancing PTG during the pandemic. These high PTS focused interventions could be delivered in groups and or individually via on-line self-assessment and self-help programs.

Results of this study should be interpreted in the context of the following limitations. First, the generalizability of findings is limited due

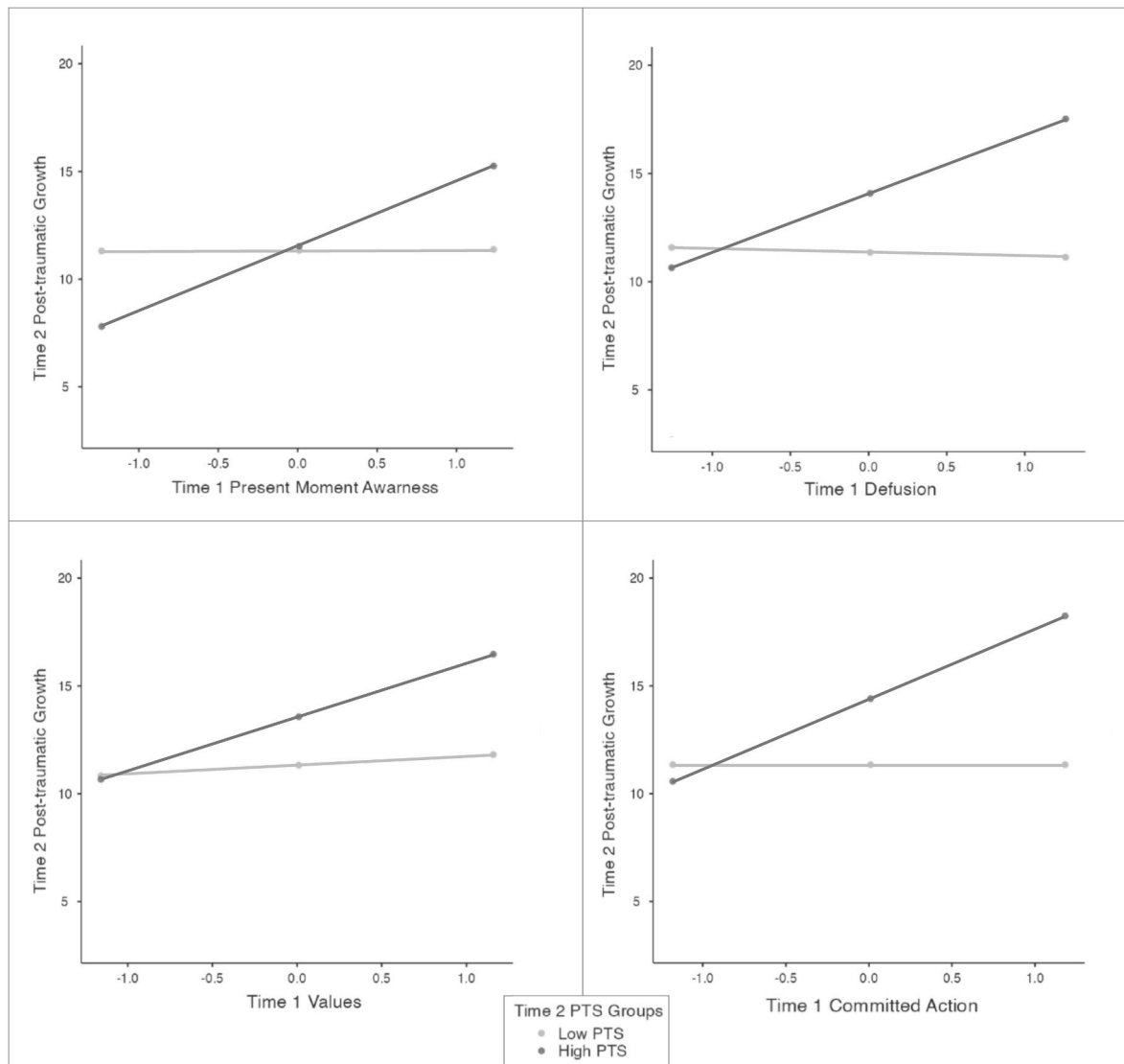


Fig. 2. Interactions between psychological flexibility sub-processes at Time 1 and post-traumatic stress groups at Time 2 in predicting post-traumatic growth at Time 2.

to convenience sampling and a bias towards participants who were female, highly educated, employed and with slightly less pre-pandemic mental health problems. Second, the relatively low PTG and PTS scores suggest that most participants may not have experienced the pandemic as sufficiently severe to trigger the processes (e.g., meaning making) inherent in driving personal growth in a trauma context. Nevertheless, as lower levels of PTG and PTS in the present sample would have served to weaken our findings (by restricting the ranges of these key variables), it is likely that the current results represent an underestimation of the moderations examined. Thus, future studies might examine our hypotheses in populations with greater levels of trauma exposure and PTS (likely with correspondingly higher amounts of PTG) to determine the 'true' strength of psychological flexibility in fostering PTG. Third, given that we did not assess the intensity and duration of trauma, our models did not control for trauma exposure, only PTS. Rather than using PTS as a proxy for trauma exposure, future research should directly assess all dimensions of the direct trauma experience. Forth, all data were collected by self-report questionnaires which raises the risk of common method variance. Fifth, we did not measure the extent to which self-deception may have contributed to reports of PTG. It has been proposed that some self-reported PTG might reflect self-deceptive illusions that help people counterbalance the

psychological distress from challenging life circumstance and constitute a defense coping strategy aimed at avoiding processing the traumatic experience (e.g., Asmundson et al., 2021; Gower, Pham, Jouriles, Rosenfield, & Bowen, 2022). Sixth, the large number of analyses conducted increases the risk of Type I error, however a finding countering this is that the results of all hypothesis testing primary analyses using the total psychological flexibility score were significant at $p < 0.01$. Finally, although we employed a longitudinal design, we only assessed PTS and PTG at two time points, precluding the use of cross-lagged longitudinal analyses which enable testing of the direction of effects over time. Future studies should further examine the longitudinal relationship between PTS and PTG and explore the protective role of psychological flexibility in sustaining an adaptive trajectory during and beyond the pandemic.

5. Conclusion

This short-term longitudinal study examined the protective role of psychological flexibility and its sub-processes in relation to PTG in people reporting high PTS related to COVID-19 as compared to those with low PTS. As predicted, higher psychological flexibility and four of its sub-processes (present moment awareness, defusion, values,

committed action) were associated with higher PTG in those with high PTS, whereas psychological flexibility and its sub-processes were unrelated to PTG in those with low PTS. Importantly psychological flexibility was associated with PTG in those with high PTS across all five personal growth domains measured. These findings are notable given that this is the first published study examining the link between psychological flexibility and its sub-processes and PTG within groups of people with low and high PTS. Results build on prior studies that have investigated the relationship between PTG and psychological inflexibility or experiential avoidance (e.g., Kashdan & Kane, 2011). This is also the first published study to examine the association between psychological flexibility and PTG longitudinally. The psychological flexibility sub-processes associated with higher PTG reflect three potential intervention pathways (mindfulness, defusion, and values-based behavior change) that could foster PTG and assist with managing PTS given their inclusion in some trauma treatment protocols (e.g., Meyer et al., 2018). The emergence of new COVID-19 variants suggests the pandemic is likely to continue for some years, hence, preventive public mental health interventions should be delivered that target psychological flexibility, especially in people reporting high PTS. These interventions should harness evidence-based approaches like ACT that have been shown to increase psychological flexibility and improve mental health outcomes in the context of health adversities.

Declaration of competing interest

The authors declare no conflict of interest.

Acknowledgments

We thank the Associate Editor, Dr. Ronald Rogge, for providing substantial supportive guidance in shaping the final version of this manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jcbs.2022.08.008>.

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