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Construct Validity of Posttraumatic Growth Inventory in the Context of the COVID-19 Pandemic

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Abstract

Research that examines the construct validity of Posttraumatic Growth Inventory in the context of the COVID-19 pandemic has never been conducted. This study aimed to test the construct validity of Posttraumatic Growth Inventory (PTGI) on the five dimensions to see the consistency of the PTGI dimensionality structure. Data collection was carried out on 135 COVID-19 survivors, aged 18–40 in Indonesia. Analysis was carried out by confirmatory factor analysis (CFA) and measurement invariance (MI). The results of the analysis proved that PTGI is a measuring instrument that tends to be multidimensional and reliable to be used in Indonesia. All model fit indices met the parameters based on the values of SRMR (<.06), RMSEA (<.10), CFI (>.85), and TLI (>.85). Factor loadings ranged from 0.616 to 0.839 except for item 6 and item 9, which were below 0.6. These low loading factors in item 6 and item 9 were caused by the choice of translated words which tend to be less precise with the dimension being measured. Recommendations related to changes in translated words were explained further in the article as a follow-up to the adjustment of the item statement. Other factors such as personality characteristics, level of self-esteem, and social stigma were also found to be associated with the results of the analysis. MI testing showed that the PTGI model was not influenced by gender in the study sample group.

Keywords: construct validity, confirmatory factor analysis, measurment invariance, posttraumatic growth, COVID-19

Abstrak

Penelitian yang menguji validitas konstruk Posttraumatic Growth Inventory *pada konteks pandemi COVID-19 belum pernah dilakukan. Penelitian ini bertujuan untuk menguji validitas konstruk* Posttraumatic Growth Inventory *(PTGI) pada kelima dimensi untuk melihat konsistensi struktur dimensionalitas PTGI. Pengambilan data dilakukan terhadap 135 penyintas COVID-19 berusia 18 – 40 tahun di Indonesia. Analisis dilakukan dengan analisis faktor konfirmatori (CFA) dan invariansi pengukuran (MI). Hasil analisis membuktikan bahwa PTGI merupakan alat ukur yang cenderung multidimensi dan reliabel untuk digunakan di Indonesia. Semua indeks ketepatan model memenuhi parameter berdasarkan nilai SRMR (<.06), RMSEA (<.10), CFI (>.85), dan TLI (>.85). Bobot faktor berkisar antara 0,616 hingga 0,839 kecuali bobot faktor butir 6 dan butir 9 yang di bawah 0,6. Bobot faktor yang rendah pada butir 6 dan butir 9 disebabkan oleh pemilihan diksi yang cenderung kurang tepat dengan aspek yang diukur. Rekomendasi terkait perubahan kata terjemahan dijelaskan lebih lanjut sebagai tindak lanjut penyesuaian pernyataan butir dengan aspek yang hendak diukur. Faktor lain seperti karakteristik kepribadian, tingkat harga diri, dan stigma sosial juga ditemukan berkaitan dengan hasil analisis. Pengujian MI menunjukkan model PTGI tidak dipengaruhi oleh jenis kelamin yang terdapat pada kelompok sampel penelitian.*

Kata kunci: *validitas konstruk, analisis faktor konfirmatori, invariansi pengukuran,* posttraumatic growth*, COVID-19*

Introduction

Psychology as a science that studies behavior and mental processes requires an instrument that can reveal the psychological aspects of a person. The instrument is prepared on the basis of empirical evidence so it is feasible to use and the results are reliable. This instrument is also known as a psychological instrument, psychological test, or psychological scale (Azwar, 1996). A psychological instrument is developed systematically to achieve validity and reliability (Suryabrata, 2005). The process passes the standards issued by several institutions such as the *Standards for Educational and Psychological Testing* (Plake et al., 2014). The development of psychological instrument needs to be adjusted to the intended context if it is to be used in various languages. Adjustment of context and language is known as the adaptation of psychological instrument.

The process of developing psychological instrument is quite challenging and time-consuming, so some researchers turn to the adaptation process. Adaptation of psychological instrument is done by analyzing the dimensions, indicators, and items of the instruments so they can be used in the context of the intended language. The process is faster than developing a new psychological instrument even though the process is very iterative to produce valid and reliable instruments without changing the basic concept of psychological instruments. The results of adapting valid and reliable psychological instrument will make it easier for scientists, practitioners, and stakeholders to provide new insights, empirical evidence, and individual improvement.

Individual changes are certainly influenced by various factors including major and/or traumatic events such as the coronavirus disease (COVID-19) pandemic. The impact of COVID-19 is an interesting topic to study, especially regarding individual psychological conditions. A number of researchers have developed some instruments related to the psychological impacts of COVID-19 such as the *Coronavirus Anxiety Scale* (Lee, 2020), *Fear of COVID-19 Scale* (Ahorsu et al., 2020), *COVID Stress Scales* (Taylor et al., 2020), *Covid-19 Peritraumatic Distress Index* (Qiu et al., 2020), *COVID-19 Public Stigma Scale* (Nochaiwong et al., 2021), dan *Zoom Exhaustion & Fatigue Scale* (Fauville et al., 2021). These various instruments have their own measurement objectives, such as measuring anxiety, fear, stress, stigma, and fatigue due to lifestyle changes (i.e. work from home or study at home).

Based on the measurement objectives of several instruments developed, the COVID-19 pandemic evaluates an individual's psychological condition towards a negative impact. Long before the COVID-19 pandemic, Tedeschi and Calhoun (2004) stated that positive developments after experiencing a traumatic event were somehow neglected. They highlighted this issue by stating that stress has a negative impact along with positive development. Individuals who experience difficult conditions experience significant changes that are considered positive changes (Tedeschi & Calhoun, 2004). The concept of posttraumatic growth described by Tedeschi and Calhoun (2004) can be used to determine the positive changes experienced by individuals, especially in the setting of the COVID-19 pandemic. These positive changes can be measured using the Posttraumatic Growth Inventory (PTGI) which was developed by Tedeschi and Calhoun (2004).

The validity of PTGI was tested by several researchers to determine the suitability of the empirical data with the model theory. For example, the issues were conducted by da Silva et al., 2018; Palmer et al., 2012; and Rahayu et al., 2018. Based on those three studies, it can be concluded that the model generated from the empirical data is in accordance with the five-factor PTGI structure proposed by Tedeschi and Calhoun (2004). Other findings suggested that the three-factor structure is more appropriate in explaining the PTGI model (Anderson, W. P. & Lopez-Baez, 2008; Powell et al., 2003; Rodríguez-Rey et al., 2016; Weiss & Berger, 2006). A number of other factors were also found to be more suitable in the PTGI model with one factor (Joseph et al., 2005; Sheikh & Marotta, 2005) and four factors (Ho et al., 2004; Taku et al., 2007).

Various kinds of findings in previous studies are the main considerations why validity testing, especially regarding the PTGI structure, needs to be carried out continuously. In addition to the influence of context,

changes in the construction of an instrument are very likely to occur due to the times, including major events experienced globally such as the COVID-19 pandemic. So far, researchers know that the PTGI testing model in the context of the COVID-19 pandemic in Indonesia has never been carried out. Therefore, research on the construct validity of PTGI is needed to determine the appropriate domains for the needs and objectives of the measurement.

Posttraumatic Growth Inventory (PTGI)

Individual changes are influenced by developments that have occurred since conception and continue throughout human life. All individuals have their own uniqueness even though they go through similar paths of change in their development period (Santrock, 2014). The path of change is influenced by various factors such as family, environment, and major events experienced. One of the major events in recent years is the coronavirus disease (COVID-19) pandemic.

The prevalence of depression and anxiety, which are referred to as psychological disorders, had the highest increase in children and adolescents globally during the COVID-19 pandemic (Racine et al., 2021). Dawel et al. (2020) also add that impairments in work and social functioning experienced by adults are associated with an increased prevalence of depression and anxiety. The increasing prevalence of depression and anxiety is an indication that the COVID-19 pandemic is not only a major event but also a traumatic event. Individual responses to traumatic events vary, ranging from negative responses such as posttraumatic stress disorder (Cougle et al., 2012) or positive responses such as posttraumatic growth (Tedeschi & Calhoun, 2004).

Tedeschi and Calhoun (2004) define posttraumatic growth as an individual's tendency to experience a positive change as a result of struggling through traumatic events or life crises that occur. Individuals who experience posttraumatic growth will grow into individuals who have a better perception of life, more meaningful relationships, and a more mature life philosophy after experiencing a traumatic event. Posttraumatic growth is not a return to the individual's initial state before the traumatic event but a deep and meaningful psychological improvement after experiencing a traumatic event. Posttraumatic Growth Inventory (PTGI) is one of the measuring instrument developed to determine the increase in these psychological conditions.

PTGI was developed by Tedeschi dan Calhoun (1996) based on posttraumatic growth theory. PTGI is a self-report instrument where the assessment is based on what is felt and it best describes the condition of the individual in the last few years after experiencing a crisis. There are five dimensions of PTGI:

1. *Relating to Others*, is defined as a condition where individuals will feel closer to their families and experience an increase in making friendships and living life more confidently.
2. *New possibilities*, is the individual's desire to change the purpose of life and become individuals who focus on the here and now.
3. *Personal strength*, is where the individual feels stronger, confident, open, empathetic, creative, mature, and has a sense of humanity when able to overcome and rise from trauma.
4. *Spiritual change*, is a condition where individuals experience growth in spiritual and existential matters.
5. *Appreciation to life*, is when individuals begin to reflect deeply on life, death, spirituality, and the purpose of life.

The COVID-19 pandemic is an event that causes a crisis in most individuals. It is possible that the COVID-19 pandemic actually directs individual changes to positive things, so the existence of COVID-19 is considered not only as a horrible event but also as an event that can direct to self-development. Therefore, researchers are interested in adapting PTGI in the context of the COVID-19 pandemic in Indonesia. The

adaptation hopefully aims to allow scientists, practitioners, and stakeholders to use a valid and reliable psychological instrument to obtain individual growth data, especially during the COVID-19 pandemic. The valid and reliable data can be a strong basis in recommending ideas, interventions, and policies to improve the psychological well-being of the Indonesian people.

Construct Validity

Most of the variables in psychological research are something we can barely see for real. Variables are latent constructs that are developed to be more operational in an instrument. Measurement of the extent to which operational measures can describe latent constructs is called construct validity (Netemeyer et al., 2003). Construct validity testing is not measured directly but based on evidence in the form of interpreted numbers. Furr and Bacharach (2013) stated that construct validity is influenced by other validity evidence such as content validity which looks at the extent to which the test content is in accordance with the construct to be measured. Content validity is important for ambiguous or complex constructs. The relationship between the construct and the content is known as construct-irrelevant content (Furr & Bacharach, 2013).

The construct validity of a measuring instrument can be tested through factor analysis which is divided into confirmatory factor analysis (CFA) and exploratory factor analysis (EFA). EFA is a test conducted to see the dimensionality of the construct based on grouping items on several factors. The basic assumption of EFA is that researchers do not have an idea about the number of dimensions that make up a measuring instrument model (Netemeyer et al., 2003). EFA is different from CFA which tests the accuracy of a psychological instrument model based on empirical evidence. In other words, researchers already have an overview of the model in terms of the number of factors, factor structure, and the relationship between factors in a psychological instrument. The loading factor is a parameter of item accuracy in measuring the latent construct, while the overall model accuracy (i.e. model fit) is determined by several model fit indices. Brown (2015) recommends the model fit parameter or goodness of fit (see Table 1).

Table 1. Model Fit Parameter (Goodness of Fit).

Model Fit Index	Level of Accuracy
Absolute Fit Model	
Standardized Root Mean Square Residual (SRMR)	The values range from 0 to 1. A value of 0 indicates a perfect fit model.
Parsimony Correction Model	
Root Mean Square Error of Approximation (RMSEA)	The values range from 0 to 1. A value of 0 indicates a perfect fit model.
Comparative Fit Model	
Comparative Fit Index (CFI)	The values range from 0 to 1. A value above 0.9 indicates a good fit model, while a value ranging from 0.8 to 0.9 indicates a marginal fit model.
Tucker Lewis Index (TLI)	The values range from 0 to 1. A value above 0.9 indicates a good fit model, while a value ranging from 0.8 to 0.9 indicates a marginal fit model.

Sources: Santoso (2018) and Wijanto (2008)

The model fit in two different groups was also carried out in this study. The comparison of the models between the two groups is known as the measurement invariance (MI). MI is part of a multigroup confirmatory factor analysis (multigroup CFA). Şekercioğlu (2018) states that measurement invariance is important in the development of psychological instruments because it is evidence of the accuracy of an instrument model in various groups in the population. MI is tested hierarchically based on its type, starting

from the model with few restrictions (less constrained) to the model with many restrictions (many constrained) (Gregorich, 2006; Netemeyer et al., 2003).

The first model is the dimensional invariance which can be done through exploratory factor analysis (EFA). The second model is configural invariance with the limitation of the number of factors and the same item composition between groups. Configural invariance can be performed using confirmatory factor analysis (CFA). The third model is metric invariance, which requires that there are similarities in the number of factors, item composition, and loading factors between groups. The limitation of the model is added by the mean value of the same factor between groups in the strong factorial model. The fourth model is strict factorial invariance with the same limitations as the strong factorial model plus the similarity of residual variance values between groups.

Methods

Research Data

The data in this study were primary data taken from October 28 to December 5, 2021. The data used in this study were the result of measuring posttraumatic growth in 135 COVID-19 survivors, aged 18–40 years in Indonesia.

Instrument

This study used Posttraumatic Growth Inventory (PTGI) which contains five dimensions with a total of 21 items. All the items contained in PTGI are favorable. PTGI was developed by Tedeschi and Calhoun (1996) based on the theory of posttraumatic growth. Lenz et al. (2020) stated that PTGI has a high reliability value (α=.941) based on the results of a meta-analysis related to the psychometric properties of PTGI.

Data Analysis Procedure

The data obtained in this study were analyzed using confirmatory factor analysis (CFA) because PTGI uses posttraumatic growth theory as the basis for its development. Posttraumatic growth theory emphasizes the existence of five dimensions in measuring individual posttraumatic growth. Thus, the main priority in testing the model fit is a multidimensional model, although a comparison will be made with a unidimensional model. The assumption of the multidimensional model is that each dimension measures attributes that are less related to one another or are independent. The model fit indices were SRMR, RMSEA, CFI, and TLI with the expected value above 0.9 (see Table 1).

Measurement invariance was performed after CFA. The measurement invariance models used are configural invariance, metric invariance, strong factorial or scalar invariance, and strict factorial invariance. The test was carried out hierarchically and ended on a model which showed a difference in the accuracy of the model ($p<.05$). The data analysis procedure was carried out using Jamovi software version 2.2.3 for Windows 64-bit.

Results and Discussion

Results

The Posttraumatic Growth Inventory consists of five factors with a total of 21 items. Table 2 shows the blueprint of the measurement scale.

Descriptive Analysis

The data showed that there were 36 male participants (M=28.4, SD=5.81) and 99 female participants (M=24.7, SD=4.54). The data were not normally distributed based on the Shapiro-Wilk normality analysis ($p<.05$). The results of the descriptive analysis showed that the average answer pointed to

number 3 ("I have experienced quite a change as a result of the crisis (COVID-19 pandemic) that I have been through"). The average answer that pointed to number 3 was found in all the items of the measuring instrument except for item 7 and item 9 which pointed to number 2 ("I have experienced a slight change as a result of the crisis (COVID-19 pandemic) that I have been through").

The reliability coefficient was high (α=.955) with various item-total correlation coefficients (or also known as corrected item-total correlation) (see Table 2). The reliability coefficient was quite high in every aspect, namely Relating to Others (α=.855), New Possibilities (α=.862), Personal Strength (α=.833), Spiritual Change (α=.768), and Appreciation of Life (α=.832). Table 3 shows the lowest item-total correlation coefficient in item 6A (α=.455). The highest item-total correlation coefficient was in item 2E (α=.816).

Table 2. Blueprint of the Posttraumatic Growth Inventory.

Factors	Indicators	Items*
I: Relating to Others (A)	Changes related to closer, intimate, and meaningful relationship with others	6, 8, 9, 15, 16, 20, 21
II: New Possibilities (B)	Personal identification related to many different and new life possibilities	3, 7, 11, 14, 17
III: Personal Strength (C)	Changes related to the improvement of strength within self	4, 10, 12, 19
IV: Spiritual Change (D)	Changes related to spiritualism and existentialism	5, 18
V: Appreciation of Life (E)	Changes related to the most important things in life which influence the self-esteem	1, 2, 13

*All items are favorable

Table 3. Item-Total Correlation Coefficient.

Item-Total Correlation	
1E	0.675
2E	0.816
3B	0.604
4C	0.754
5D	0.665
6A	0.455
7B	0.707
8A	0.659
9A	0.577
10C	0.718
11B	0.808
12C	0.715
13E	0.788
14B	0.714
15A	0.720
16A	0.602
17B	0.799
18D	0.620
19C	0.657
20A	0.780
21A	0.747

Source: Personal data (2021)

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Model Fit Testing

The results of the confirmatory factor analysis (CFA) with a five-factor structure showed that the multidimensional model was fit (p<.001). The SRMR and RMSEA values were close to 0, meaning that they were almost perfect fit; the CFI and TLI values were between 0.8 and 0.9, thus classified as marginal fit (Santoso, 2018; Wijanto, 2008). The results of the analysis of the one-factor structure was also fit (p<.001). The conclusion of the unidimensional model fit was also the same as the conclusion found in the multidimensional model. The results of the analysis of the two models are shown in Table 4. The error correlation (residual covariance) between items was also carried out to increase the accuracy of the model without deleting items according to the original scale (see Table 5).

Table 4. Model Fit Testing Result (N = 135).

Model	χ^2	df	SRMR	RMSEA	CFI	TLI
Multidimensional (5 factors)	393	179	0.0548	0.0941	0.888	0.868
Unidimensional (1 factor)	421	189	0.0566	0.0953	0.878	0.865

Source: Personal data (2021)
Note: All values are significant (p<.001).

Table 5. Model Fit Testing Result after Residual Covariances.

Model	χ^2	df	SRMR	RMSEA	CFI	TLI
Multidimensional (5 factor)	227	154	0.0397	0.0594	0.961	0.947
Unidimensional (1 factor)	246	165	0.0412	0.0601	0.958	0.946

Source: Personal data (2021)
Note: All values are significant (p<.001).

Loading Factors Comparison

The results of the confirmatory factor analysis (CFA) in the multidimensional model showed that item 2 in factor E (Appreciation of Life) had the highest loading factor. Overall, the loading factors in the multidimensional model ranged from 0.621 to 0.839 except for item 6 and item 9 in factor A (Relating to Others). The two items had the lowest loading factors, namely 0.482 and 0.572, respectively. The unidimensional model showed that item 11 had the highest loading factor (0.828). The lowest loading factors in the unidimensional model were the same as those in the multidimensional model, namely item 6 and 9 with loading factors of 0.462 and 0.568, respectively. The loading factors in the multidimensional model and unidimensional model can be seen in Table 6 and Table 7.

Table 6. Loading Factors of the Multidimensional Model.

	Items	Loading Factor	Standard Error	p-value
Relating to Others	6A	0.482	0.1131	< .001
	8A	0.677	0.1009	< .001
	9A	0.572	0.1177	< .001
	15A	0.754	0.0956	< .001
	16A	0.634	0.1116	< .001
	20A	0.812	0.0917	< .001
	21A	0.783	0.0937	< .001
New Possibilites	3B	0.621	0.1254	< .001
	7B	0.708	0.1173	< .001
	11B	0.830	0.0913	< .001
	14B	0.745	0.0975	< .001
	17B	0.811	0.0999	< .001
Personal Strength	4C	0.770	0.1070	< .001
	10C	0.756	0.0963	< .001
	12C	0.767	0.0967	< .001
	19C	0.693	0.0953	< .001
Spiritual Change	5D	0.818	0.1105	< .001
	18D	0.762	0.1122	< .001
Appreciation of Life	1E	0.700	0.1019	< .001
	2E	0.839	0.1010	< .001
	13E	0.822	0.0912	< .001

Source: Personal data (2021)

Table 7. Loading Factors of the Unidimensional Model.

Items	Loading Factor	*Standard Error*	*p-value*
1E	0.697	0.1004	< .001
2E	0.823	0.1003	< .001
3B	0.622	0.1238	< .001
4C	0.762	0.1065	< .001
5D	0.677	0.1078	< .001
6A	0.462	0.1121	< .001
7B	0.710	0.1170	< .001
8A	0.675	0.0996	< .001
9A	0.568	0.1167	< .001
10C	0.743	0.0951	< .001
11B	0.828	0.0911	< .001
12C	0.749	0.0952	< .001
13E	0.818	0.0906	< .001
14B	0.745	0.0974	< .001
15A	0.738	0.0954	< .001
16A	0.616	0.1107	< .001
17B	0.811	0.0994	< .001
18D	0.636	0.1100	< .001
19C	0.687	0.0935	< .001
20A	0.808	0.0911	< .001
21A	0.762	0.0933	< .001

Source: Personal data (2021)

Measurement Invariance

Measurement invariance analysis was carried out on the multidimensional and unidimensional models. The configural invariance in PTGI was carried out with the assumption that the factors had the same number of factors and the same composition of the items . The configural invariance was the same as the baseline model in the confirmatory factor analysis (CFA), so the model was classified as appropriate between gender included in both models (see Table 8). The significance on metric invariance showed that there was no difference in the model between men and women, assuming the same number of factors, item composition, and loading factors in both the multidimensional model ($\chi^2(16) = 17.6$, $p=0.346$) and the unidimensional model (χ^2). (20) = 20.5, p=0.425). The analysis continued on the strong factorial invariance model assuming the same number of factors, item composition, loading factors, and intercept. The significance on the strong factorial invariance showed that there was no difference in the models between men and women in both the multidimensional model ($\chi^2(37) = 31.1$, $p=0.742$) and the unidimensional model ($\chi^2(41) = 37.7$, $p=0.616$). The results of the strong factorial invariance were also found in strict factorial invariance, where there was no difference in the model between men and women assuming the same number of factors, item composition, loading factors, intercept, and residual variance in the multidimensional model ($\chi^2(58) = 53.6$, $p = 0.641$) and the unidimensional model ($\chi^2(62) = 63.2$, $p=0.432$).

Table 8. Measurement Invariance Testing based on Gender.

Model		χ^2	df	SRMR	RMSEA	TLI	p
Configural invariance	Multidimensional	2510	420	0.072	0.129	0.809	<.001
	Unidimensional	2510	420	0.073	0.128	0.800	<.001
Metric invariance	Multidimensional	17.6	16	0.088	0.126	0.807	0.346
	Unidimensional	20.5	20	0.093	0.125	0.799	0.425
Strong factorial invariance	Multidimensional	31.1	37	0.089	0.124	0.808	0.742
	Unidimensional	37.7	41	0.094	0.122	0.800	0.616
Strict factorial invariance	Multidimensional	53.6	58	0.092	0.122	0.803	0.641
	Unidimensional	63.2	62	0.096	0.120	0.795	0.432

Source: Personal data (2021)

Discussion

This study aimed to determine the domains that are in accordance with the needs and objectives of the measurement, evident in the construct validity of PTGI. The results of the analysis showed that PTGI was a reliable psychological instrument based on a high reliability coefficient of 0.955. This shows that the items contained in the instrument were classified as consistent in measuring the constructs. The reliability of each aspect can be said to be quite high with a coefficient range of 0.768 to 0.862. The lowest reliability coefficient was found in the Spiritual Change aspect which was probably due to the very small number of items, i.e., two items (item 5 and item 17). Overall, it can be concluded that the items contained in the measuring instrument tend to consistently measure the intended aspect or dimension.

On average, the answer was number 3 (*"Saya mengalami cukup perubahan sebagai dampak dari krisis (pandemi COVID-19) yang telah saya lalui"*). This shows that, on average, the participants agreed that the COVID-19 pandemic changed their lives. This change may be due to the experience of suffering from COVID-19 because the participants involved in this study were COVID-19 survivors. In contrast to the other items, number 2 (*"Saya mengalami sedikit perubahan sebagai dampak dari krisis (pandemi COVID-19)*

yang telah saya lalui") was the average answer in item 7 and item 9. This indicates the participants did not experience any significant changes in terms of setting a new path for life (item 7) as well as freedom to express feelings (item 9).

Furthermore, Tedeschi and Calhoun (1996) state that personality characteristics are related to an individual's ability to capture the benefits of a traumatic experience. The aspects of New Possibilities and Relating to Others are said to be related to individuals who have optimistic and extraverted personality characteristics. The average answer in item 7 and 9 did not change significantly, possibly because the participants did not have optimism and they tended to be introverted. A low level of individuals' openness to new experiences also affects the mindset of individuals, so traumatic events can provide benefits for a better life. Agreeableness is also mentioned to affect the individual's relationship with others as stated in point 9. It can be concluded that personal characteristics have a role in the level of individual posttraumatic growth.

Subsequent testing through confirmatory factor analysis (CFA) showed that the PTGI multidimensional model was appropriate and supported by data. This conclusion is based on the results of the model fit testing which showed the SRMR and RMSEA values below 0.08 and the CFI and TLI values above 0.8 (see Table 4 and Table 5). The results of the analysis are in accordance with the findings of previous researchers using a multidimensional model with various samples (da Silva et al., 2018; Palmer et al., 2012; Rahayu et al., 2018). When a comparison was made with the unidimensional model, the model fit on the multidimensional model tended to be better with lower SRMR and RMSEA values and higher CFI and TLI values. Although the difference in values was not significant , it can be said that the multidimensional model was better at explaining the factor structure contained in PTGI.

The treatment of error correlations (residual covariances) was also carried out to see the increase in the accuracy in both multidimensional and unidimensional models. Residual covariances were treated to avoid deletion of the items of the measuring instrument because this study did not focus on modifying but on testing the accuracy of the original psychological instrument model. Although the results of the analysis showed that the accuracy of the model increased after the residual covariances were addressed in both the multidimensional and unidimensional models, indicating that there were still many items that measured other constructs outside the intended latent construct. Item statement analysis needs to be done to avoid treatment of residual covariances. Error correlation was found quite a lot in the multidimensional and unidimensional models, so the item statement analysis started with a comparison of loading factors.

The results of the confirmatory factor analysis (CFA) showed that item 6 and item 9 had the lowest loading factors in both the multidimensional and unidimensional models. Item 6 and item 9 measured the aspect of Relating to Others. With a low loading factor, it can be said that item 6 and item 9 were less able to explain the aspect of Relating to Others. The result of the translation of item 6, i.e., *"Saya lebih sadar bahwa saya dapat mengandalkan orang lain ketika sedang mengalami masa yang sulit"* did not yet represent the original point ("I more clearly see that I can count on people in times of trouble"). If viewed from the aspect of Relating to Others, item 6 should be able to explain the condition of individuals who feel closer to their families, have increased friendships, and are confident in living their lives. It seems that the word *"mengandalkan"* in the translated item did not match the word "count on" in the original item because it seems as if the individual becomes dependent on others. It is possible that item 6 of this translation measured other things such as dependence on others. It is suggested to replace the word *"mengandalkan"* to *"meminta bantuan"* in item 6.

The result of the translation in item 9 (*"Saya lebih leluasa mengungkapkan perasaan"*) had to be revised to represent the original item ("I am more willing to express my emotion"). It seems that the word *"leluasa"* in the translation item is more about *"kebebasan"* and even tends to be *"sesuka hati"* even though

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the original item uses the word "more willing". The word *"leluasa"* may not be considered as an activity carried out with other people according to the aspect being measured (i.e. Relating to Others). The word *"leluasa"* is more accurately interpreted as an impact on oneself, so the translation of item 9 is likely to measure other things outside of Relating to Others. If it is reviewed further, the translation of item 9 is more appropriate to enter the Personal Strength aspect which shows the strength, confidence, and openness of individuals to rise from trauma. A suggestion that can be considered to improve the statement in item 9 is the replacement of the word *"leluasa"* to *"lebih bersedia"*.

Low loading factors on the two items of Relating to Others were also found in a similar study in Indonesia. Rahayu et al. (2018) stated that building relationships with other people is a challenge for individuals who have experienced traumatic events, especially survivors of domestic violence. Self-assessment which is considered different from others is one of the causes of individual doubts to establish relationships with other people. This statement is supported by the results of research by Budiarto et al. (2021) that COVID-19 survivors tend to experience situational low self-esteem where there is a feeling of fear of failing in social relationships because they experience changes that make them different from others.

The low loading factor in item 6 was also possible because of the social stigma against COVID-19 survivors in Indonesia. In accordance with the results of research by Kurniawan and Susilo (2021), the participants experienced social stigma with different forms of treatment at home and kept away from colleagues. Indirectly, this external treatment affects the individual's tendency to be open and willing to express feelings and thoughts as stated in item 9. The subjective experience of COVID-19 survivors can be explored further in similar studies to determine the factors behind the individual's posttraumatic growth rate.

The diversity of the sample groups in this study was a consideration for conducting the measurement invariance (MI) test. The results of the MI analysis in terms of gender showed that there was no difference between the multidimensional model and the unidimensional model for men and women. The test was carried out with few restrictions (configural invariance) to many restrictions (strict factorial invariance). The absence of these differences indicates that the gender dichotomy or gender differences do not affect the model fit. The results of the measurement invariance test on PTGI enrich the references related to the PTGI measurement invariance even though it has previously been done by Amiri et al. (2020) through the short version (PTGI-SF) with the same result.

Conclusion

Based on the research conducted, it can be concluded that PTGI is a psychological instrument that tends to be multidimensional because of the better model fit with a five-factor structure like the original instrument. PTGI is a reliable psychological instrument for use in the context of the COVID-19 pandemic in Indonesia. The research findings also showed that the PTGI model was not influenced by gender diversity in the study sample group. Further research can be done with a larger and more balanced number of samples, especially between men and women. Changes in item statements can be considered according to the proposal in this study to avoid low loading factors and residual covariances. Measurement invariance testing can be done with other groups such as differences in traumatic events (Purc-Stephenson, 2014; Ramos et al., 2016) to enrich references related to measuring instrument models.

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Conflict of Interest

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Appendix

The Posttraumatic Growth Inventory Scale could be shared with interested readers upon direct request to the corresponding author.