Adaptation and Validation of Mental Toughness-8 Measurement Tool in Indonesian Language: Confirmatory Factor Analysis (CFA) Study on College Students

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Abstract

At present, the mental toughness construct is attracting increasing attention as a measure of a person's resilience in facing pressure. One of the initiators of the mental toughness construct was Gucciardi and his team in 2015, who based it on existing mental toughness theories. This study was conducted to develop the mental toughness construct developed by Gucciardi and his team in the Indonesian context. This study was conducted using a quantitative method, with data collected via a questionnaire. A total of 114 people (87.7% women), with an average age of 22 years, who are currently studying at college, participated in this study. The collected data were analyzed using confirmatory factor analysis (CFA). Based on the CFA analysis, CFI = 0.956 and RMSEA = 0.071, indicating a mental toughness construct with a total of 8 good- and fit items in Indonesian. In addition, all the construct items are reliable, as the Cronbach's alpha is 0.786 (≥ 0.70). It can be concluded that the Indonesian adaptation of the one-factor MT-8 model is a psychometrically sound and suitable instrument for evaluating mental toughness.
Keywords: adaptation, CFA, mental toughness, reliability, validation

Abstrak

Di masa saat ini konstruk mental toughness sedang menjadi daya tarik baru dalam mengukur resiliensi seseorang dalam menghadapi sebuah tekanan. Salah satu penggagas konstruk mental toughness adalah Gucciardi dan tim di tahun 2015 yang didasari dengan teori-teori mental toughness yang sudah ada sebelumnya. Penelitian ini dilakukan dengan tujuan untuk mengembangkan konstruk mental toughness milik Gucciardi dan tim kedalam konteks bahasa Indonesia. Penelitian ini dilakukan dengan metode kuantitatif yang pengumpulan datanya menggunakan kuesioner. Sebanyak 114 orang (87.7% perempuan) dengan rata-rata usia 22 tahun dan sedang menempuh pendidikan di perguruan tinggi menjadi partisipan penelitian ini lalu data yang terkumpul kemudian dianalisis menggunakan confirmatory factor analysis (CFA). Berdasarkan analisis CFA menunjukkan bahwa CFI = 0.956, RMSEA = 0.071 yang dapat diartikan konstruk mental toughness dengan total 8 item bagus dan fit dalam bahasa indonesia. Selain itu, keseluruhan item-item konstuk reliabel sebab skor Cronbach Alpha sebesar 0.786 (≥ 0.70). Dapat disimpulkan apabila model MT-8 satu faktor berbahasa Indonesia bagus dan cocok untuk digunakan dalam mengukur mental toughness.
***Keywords**: adaptasi, CFA, ketangguhan mental, reliabilitas, validitas*

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INTRODUCTION

Mental health issues are important in the era of BANI World and Society 5.0, both terms of which emerged after the COVID-19 pandemic. Ling (2023) said BANI World's explanation is as follows: Brittle is a structure that was once strong but will suddenly collapse. Many large, strong companies went bankrupt, and there were massive layoffs. Anxious about the speed of change and the flood of information, people feel uneasy about the present and the future. Non-linear events and changes occur unpredictably and incomprehensibly. The changes that occur are not easy to understand or control quickly, so decision-making is often done by groping in the dark. Society 5.0 is a human-centered era expected to solve various social challenges and problems through technology and innovation. Individuals are expected to be able to provide quick solutions to the obstacles or issues they face by using the latest technology, for example, AI (artificial intelligence) (Mishra & Pandey, 2023). To answer the challenges of this increasingly complex phenomenon, various positive variables such as hardiness, resilience, and mental toughness are explored to develop and improve individual mental strength in this increasingly complex world (Naden et al., 2023).

Resilience is one approach that can be used to cope with various forms of pressure. It is a positive trait that enables individuals to confront adverse and challenging situations and to respond adaptively (Chu et al., 2024). In psychology, resilience has long been a subject of significant discussion and development, particularly as modern life becomes increasingly complex. A specific form of resilience that has garnered increasing attention among researchers is mental toughness. Mental toughness (MT) is regarded as an attribute that influences an individual's likelihood of thriving in demanding and adverse situations. According to Clough & Strycharczyk (2012) mental toughness is understood as a quality that determines how effectively an individual can manage challenges, respond to stressors, and endure pressure, regardless of external circumstances. Encountering difficulties and challenges is a normal part of life. In their research findings, Li et al. (2020) they posit that mental toughness is a pivotal psychological factor in mitigating emotional exhaustion among university students. However, conceptually, mental toughness differs slightly from resilience. While resilience emphasizes recovery from setbacks, mental toughness focuses on maintaining consistent performance even under high pressure.

The attributes of Mental Toughness (MT) have been widely explored and emphasized across various domains, including education, occupational settings, and military contexts that inherently demand high performance. In light of this, Gucciardi and colleagues became interested in developing a more refined construct of Mental Toughness. The MT construct proposed by Gucciardi, Hanton, Gordon, Mallett, and Temby in 2015 aligns with existing theories related to mental toughness. Mental Toughness is defined as a positive response to situations that require endurance and a refusal to yield under intense pressure (Thelwell et al., 2005). It also represents an individual’s capacity to overcome setbacks and poor performance, maintain focus, and prevent adverse circumstances from undermining one’s overall functioning. According to Liew et al. (2019), mental toughness refers to a set of psychological characteristics used to attain optimal performance, with the primary objective of achieving success. Furthermore, the meaning of mental toughness can be understood through the term's etymology. In addition, Coulter et al. (2010) states that Mental Toughness (MT) is the presence of a set of values developed through experience and inherently embedded within the individual. In processing, responding to, and evaluating pressure, MT involves an

interplay of emotional, cognitive, attitudinal, and behavioral components. The impact of these components is reflected in the individual's interpretation of the pressure encountered in pursuing goals, whether positive or negative. According to the Oxford English Dictionary, mental pertains to aspects of the mind, whereas toughness refers to the strength to endure adverse conditions or the ability to withstand hardship or pain.

Based on these interpretations, a core theory of Mental Toughness (MT) was established, which posits that MT refers to an individual's capacity to consistently deliver high levels of subjective performance (personal goals and efforts) or objective performance (outcomes), even in the face of daily stress, challenges, and significant adversity (Gucciardi et al., 2015). Following the development of this core theory, Mental Toughness was further conceptualized into seven primary dimensions: 1) Generalized self-efficacy, defined as a general belief in one's own ability to succeed in achieving goals or personal targets. 2) Buoyancy, the capacity to effectively utilize necessary skills and processes in responding to everyday life challenges and pressures. 3) Success mindset, the aspiration to achieve success coupled with the ability to act in pursuit of that goal. 4) Optimistic style, a tendency to expect positive future outcomes and to attribute causes and consequences of life events in a positive manner. 5) Context knowledge, awareness and understanding of performance-related contexts and the ability to apply such knowledge to achieve success or accomplish goals. 6) Emotion regulation, the awareness and ability to utilize emotionally relevant processes to facilitate optimal performance in goal attainment. 7) Attention regulation, the ability to focus on relevant information while minimizing distractions from inaccurate or irrelevant stimuli. According to St Clair-Thompson & London (2024) the commitment, emotional regulation, life control, self-confidence, and interpersonal trust are essential components in developing robust mental toughness, which, in turn, facilitates the attainment of happiness or a positive state.

Based on the explanations above, it can be concluded that the concept of Mental Toughness (MT) has been extensively explored and that valid measurement attributes are essential. Therefore, there is a need to expand the scope of MT assessment tools across various cultural and linguistic contexts. One such context is the Indonesian language. Accordingly, this study aims to adapt the Mental Toughness (MT) measurement instrument developed by Gucciardi and colleagues for use in the Indonesian language context. This study hypothesizes that the adapted MT-8 scale will meet the criteria for validity and reliability within the Indonesian context. This research is expected to contribute to the field by providing a useful tool for future researchers seeking to measure resilience, particularly in the domain of individual mental toughness.

METHOD

This study utilized an adapted version of the MT-8 mental toughness scale, initially developed by Gucciardi et al. (2015) as the primary measurement instrument. In the process of adaptation, the procedures follow the five-stage framework proposed by Beaton et al. (2000). These stages include:

1. The first stage in adapting a measurement instrument is the translation phase. In this stage, the original instrument is translated into the target language by at least two independent translators who are fluent in both the source and target languages. The purpose of using two translators is to identify differences in word meaning and detect any potentially difficult or ambiguous terms. By employing two perspectives, this stage allows for the comparison of translations and the resolution of discrepancies through a more comprehensive and balanced interpretation.

2. Following the initial translation phase, the next step is synthesis. During this stage, a comparison is made between the original questionnaire and the translated versions to identify and reconcile discrepancies. The result is a single, harmonized version of the translated instrument, which will then proceed to the next stage.
3. Based on the synthesized version, the instrument is then back-translated into the questionnaire's original language. This step is carried out to assess the translation's validity and ensure the translated version accurately reflects the content and meaning of the original items.
4. The next stage involves assessing cross-cultural equivalence through evaluations by professionals in both the measurement instrument domain and language. The expert committee consists of two psychometricians and one language expert. These professionals consolidate all versions of the questionnaire, both the original and the translated versions, and evaluate whether any modifications or refinements are necessary before arriving at the final version of the instrument.
5. The final stage in the adaptation process is the pilot testing phase. The final version of the questionnaire is administered to a sample that reflects the target population of the measurement. Ideally, this pilot study involves approximately 30 to 40 participants. In addition to completing the questionnaire, a brief interview is recommended to explore whether each item is readable and whether the respondents clearly understood its meaning.

In this study, the participants consisted of both male and female Indonesian citizens who were actively enrolled university students across various academic levels, including diploma, undergraduate, and postgraduate programs. The sampling method employed was non-probability sampling, specifically purposive sampling, which involves selecting participants based on predetermined criteria relevant to the study's aims (Sugiyono, 2013). Participants were selected based on their active student status and ability to communicate in Indonesian. Following data collection, a total of 114 participants were obtained, of which 87.7% were female and 12.3% were male. The mean age of participants was 22 years, with the youngest 18 and the oldest 54. This study received ethical approval from several universities on the island of Java, and informed consent was obtained from all participants before their participation.

The research instrument used in this study was the Mental Toughness scale, which had been adapted into the Indonesian language context. The scale consisted of 8 statement items. It employed a 4-point Likert scale with the following response options: "Strongly Disagree," "Disagree," "Agree," and "Strongly Agree." The questionnaire was distributed digitally via Google Forms.

In this study, data analysis included construct validation via Confirmatory Factor Analysis (CFA) and reliability testing using Cronbach’s Alpha, both conducted in JAMOVI. For the CFA, model fit is considered acceptable when the RMSEA and SRMR values are < 0.08, and the CFI and TLI values are both 0.90 and 0.95 (Chirumbolo et al., 2017; Hooper et al., 2008). In addition to factor analysis, reliability testing was performed, and the data were considered reliable if Cronbach’s Alpha was≥ 0.70 (DeVellis, 2016).

RESULT AND DISCUSSION

Result

In this section, the adaptation process carried out in the first to third stages included translation into Indonesian, synthesis, and back-translation. The English-to-Indonesian translation was performed by two individuals proficient in English. The following presents the results of the first to third stages of the instrument adaptation process:

Table 1.
Translation tage

Original Item	Translate 1	Translate 2
I believe in my ability to achieve my goals	Aku yakin atau percaya diri dengan kemampuanku, menggapai cita-citaku	Aku percaya dengan kemampuanku untuk mencapai tujuanku
I am able to regulate my focus when performing tasks	Aku mampu untuk focus atau konsentrasi manakala sedang mengerjakan tugas	Aku mampu mengatur fokusku (konsentrasi) saat mengerjakan tugas
I am able to use my emotions to perform the way I want to	Aku mampu mengelola emosiku untuk mengambil langkah yang tepat dan benar	Aku mampu menggunakan emosiku untuk melakukan apa yang aku mau
I strive for continued success	Aku berjuang terus untuk menggapai kesuksesan	Aku berjuang untuk kesuksesan yang berkelanjutan
I effectively execute my knowledge of what is required to achieve my goals	Aku akan lebih berhati-hati dalam memanfaatkan pengetahuanku sesuai kebutuhan untuk mencapai cita-citaku	Aku mengeksekusi pengetahuanku secara efektif tentang apa yang dibutuhkan untuk mencapai tujuan-tujuanku
I consistently overcome adversity	Aku yakin mampu menyelesaikan setiap kesulitan	Aku mengatasi kesulitanku secara konsisten
I am able to execute appropriate skills or knowledge when challenged	Aku mampu menentukan keterampilan dan wawasan yang tepat ketika dibutuhkan	Aku dapat melakukan keterampilan atau keahlian atau pengetahuan yang sesuai ketika tertantang
I can find a positive in most situations	Aku mampu memperoleh hal yang positif untuk setiap situasi	Aku bisa menemukan hal positif di hampir setiap situasi

Following the initial translation, the second and third stages of synthesis and back-translation were conducted with the assistance of artificial intelligence (AI), specifically using Google Translate.

Table 2.
Synthesis and Back Translation Stage

Sintesis	Back Translate
Aku percaya dengan kemampuanku untuk mencapai tujuanku	I believe in my ability to achieve my goals
Aku mampu untuk mengatur fokusku saat mengerjakan tugas	I am able to regulate my focus when doing tasks
Aku mampu menggunakan emosiku untuk melakukan apa yang aku mau	I am able to use my emotions to do what I want
Aku berjuang untuk menggapai kesuksesan yang berkelanjutan	I strive to achieve sustainable success
Aku memanfaatkan pengetahuanku secara efektif sesuai kebutuhan untuk mencapai cita-citaku	I utilize my knowledge effectively as needed to achieve my goals.
Aku mampu menyelesaikan kesulitanku secara konsisten	I am able to solve my difficulties consistently
Aku mampu menentukan keterampilan atau wawasan yang sesuai ketika tertantang	I am able to determine appropriate skills or insights when challenged
Aku mampu menemukan hal positif di setiap situasi	I am able to find the positive in every situation

Following the completion of the first three stages, an expert committee review was conducted prior to reaching a final decision. The committee consisted of experts in psychology, particularly those with expertise in psychological measurement instruments. Based on the input and evaluation from the experts, the final version of the item statements was established as follows:

Table 3.
Finale item

Self-Belief (Generalized self-efficacy) 1. Aku percaya dengan kemampuanku untuk mencapai tujuanku
Attention regulation 2. Aku mampu untuk mengatur fokusku saat mengerjakan tugas
Emotion regulation 3. Aku mampu menggunakan emosiku untuk melakukan apa yang aku mau
Success mindset 4. Aku berjuang untuk menggapai kesuksesan yang berkelanjutan
Context knowledge 5. Aku memanfaatkan pengetahuanku secara efektif sesuai kebutuhan untuk mencapai cita-citaku
Buoyancy 6. Aku mampu menyelesaikan kesulitanku secara konsisten 7. Aku mampu menentukan keterampilan atau wawasan yang sesuai ketika menghadapi tantangan
Optimism 8. Aku mampu menemukan hal positif di setiap situasi

Following the adaptation of the instrument into Indonesian, the final version was distributed to assess the structure of the Indonesian-language construct. It is important to note that the Mental Toughness (MT) construct is unidimensional, as described by Gucciardi and colleagues. Therefore, the Confirmatory Factor Analysis (CFA) was conducted using a single-factor model. The results of the CFA are presented in the table below:

Table 4.
Factor Loading Coefficient

Factor	Indicator	Estimate	SE	Z	p
Factor 1	SB	0.375	0.0450	8.33	< 0.001
	AR	0.387	0.0552	7.01	< 0.001
	ER	0.247	0.0642	3.85	< 0.001
	SM	0.260	0.0547	4.74	< 0.001
	CK	0.315	0.0468	6.72	< 0.001
	Bc1	0.367	0.0500	7.36	< 0.001
	Bc2	0.378	0.0492	7.69	< 0.001
	Op	0.293	0.0521	5.62	< 0.001

As shown in the table above, the one-factor model is adequately supported, with all items demonstrating positive factor loadings. Consequently, no items were considered for removal.

Tabel 5.
CFA model fit

Model	χ^2	df	p	CFI	TLI	SRMR	RMSEA
MT-8	27.0	17	0.058	0.956	0.928	0.0501	0.0718 (0.00-0.121)

To achieve a well-fitting model, several residual covariances were set to be correlated, specifically between item 2 and item 3, item 3 and item 8, item 4 and item 5, and item 5 and item 6. The residual correlation between items 2 and 3 suggests that emotion regulation and attentional focus are interrelated in the Indonesian academic context. Similarly, the other correlated items reflect interrelationships among the corresponding dimensions. The results indicate that the unidimensional (single-factor) model of the Indonesian version of the Mental Toughness construct provides a good fit, meeting standard model fit criteria. For instance, the CFI and TLI values were 0.956 and 0.928, respectively (both 0.90 and 0.95), the SRMR was 0.0501 (< 0.08), and the RMSEA was 0.0718 (< 0.08), all of which indicate an acceptable model fit. In addition to factor analysis, reliability testing was also conducted. The overall reliability, as measured by Cronbach's Alpha, was 0.786 (≥ 0.70), indicating that the item set is reliable.

Discussion

After conducting a factor analysis using a single-factor model, as proposed byGucciardi et al. (2015) the CFA model, the CFA results for the Indonesian version of the Mental Toughness construct demonstrated good and acceptable fit. Therefore, the single-factor model is appropriate for measuring mental toughness. However, the model did not achieve a good fit in a single iteration. As previously explained, several residual covariances between related items were added to improve the model fit. The concept of

residual covariance is used to address disturbances or errors among variables that may prevent a CFA model from achieving acceptable fit (Schweizer et al., 2024). Referring back to the primary goal of CFA, Hox (2021) explains that CFA aims to estimate factor loadings, variances, covariances, and the residual error variances of observed variables. Therefore, it can be inferred that this single-factor construct model exhibits certain covariances, which are expected when the construct is measured using a unidimensional model.

For instance, item 2, which reads "aku mampu mengatur fokusku saat mengerjakan tugas" reflects the aspect of attention regulation and is covariantly related to item 3, "aku mampu menggunakan emosiku untuk melakukan apa yang aku mau". This association is indeed justifiable, as attention regulation and emotion regulation are both essential components in managing psychological disturbances, enhancing memory, and reducing psychosocial stress responses (Basso et al., 2019). The covariance between item 4, which represents a success mindset, and context knowledge is also supported by research Kizilcec & Goldfarb (2019), which found that a growth-oriented and progressive mindset can motivate the development of thinking abilities in the context of knowledge acquisition. Lastly, items 3 (emotion regulation) and 8 (optimism) also showed a covariant relationship. This finding aligns with the literature, as the two aspects are negatively correlated, indicating that optimism is a necessary component and may contribute positively to emotion regulation (Kozel et al., 2022).

These findings are consistent with Gucciardi et al. (2015) those of those who stated that Mental Toughness (MT) is a unidimensional construct. This contrasts with the findings of Kawabata et al. (2021), who argued that the shortened 18-item version of the Mental Toughness Questionnaire reflects a multidimensional construct. Furthermore, Denovan et al. (2021) their study found that the adaptation of the Mental Toughness construct into the Russian version differed from the original MTQ-18 model, as the unidimensional structure was not supported by additional variance. Nevertheless, the present study demonstrates that the Indonesian version of the Mental Toughness construct performs well when modeled as a single-factor (unidimensional) structure. This is further supported by previous studies indicating that the Mental Toughness construct can be effectively modeled using a unidimensional approach.

The unidimensional model of the Mental Toughness construct is further supported by similar studies, such as the one conducted by Madrigal et al. (2020), which demonstrated that an eight-item Mental Toughness scale also exhibited unidimensional properties, indicating that a single factor can adequately represent the construct. However, what distinguishes that study from the present research is that the construct was specifically developed for adolescent athletes. Another study Dagnall et al. (2019), which focused on school students, compared two models, MTQ-18 and MTQ-10, and concluded that their similarity supported the superiority of a unidimensional structure. Although a few studies still examine Mental Toughness using a single-factor model, the results of this study, along with previous findings, suggest that a unidimensional model of Mental Toughness is a valid and reliable approach for assessing this psychological construct.

CONCLUSION

This study aimed to adapt and develop the Mental Toughness-8 (MT-8) construct, originally developed by Gucciardi and colleagues, into the Indonesian language context. The adaptation process followed five standard stages: translation by two language experts, synthesis, back translation, expert judgment, and pilot testing. The final product

was a set of Indonesian-language items, which were subsequently field-tested with a sample of university students. The data obtained from participants were analyzed using factor analysis to determine whether the construct fit well within the Indonesian context. The results of the Confirmatory Factor Analysis (CFA) indicated that the MT-8 demonstrated a good, acceptable model fit in Indonesian. Moreover, the factor analysis results suggest that the scale can be used to identify students who may be at risk of academic stress. Future research should consider conducting predictive validation with academic performance variables. It is also expected that, moving forward, the MT-8 construct in the Indonesian context will be further developed and applied to broader target populations.

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