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Validation of the Exercise Health Belief Model Scale (EHBMS) among Indonesian students

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ABSTRACT

Background: Indonesian university students are vulnerable to health risks due to sedentary lifestyles and low physical activity, yet participation in exercise remains low and there is no culturally adapted, psychometrically validated instrument to assess exercise-related health beliefs.

Purpose: This study aimed to culturally adapt and evaluate the psychometric properties of the Exercise Health Belief Model Scale (EHBMS) for use among Indonesian university students.

Method: A total of 500 university students from various institutions across Indonesia participated. Psychometric evaluation included content validity assessment using Aiken's V, item discrimination analysis, internal consistency testing using Cronbach's alpha, and Confirmatory Factor Analysis (CFA).

Results: The EHBMS-ID demonstrated strong psychometric properties. Content validity indices ranged from .95 to 1.00. CFA indicated acceptable model fit (RMSEA = .078; SRMR = .061; CFI = .932; TLI = .923; GFI = .990; NFI = .912), with factor loadings ranging from .289 to 1.484 and item-total correlations from .373 to .830. Internal consistency was excellent (Cronbach's alpha = .939).

Conclusion: The EHBMS-ID demonstrates acceptable validity and internal consistency among Indonesian university students, though additional model refinement may be warranted. The instrument may serve as an initial assessment tool to support the development of contextually grounded health promotion strategies in higher education.

KEYWORDS
Exercise health beliefs; scale adaptation; psychometric evaluation.

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Introduction

Health is a dynamic condition marked by a balance between physical, mental, and social well-being, free from disease or disability (Kemenkes, 2021). To achieve and maintain optimal health, engaging in preventive behaviors such as regular physical activity is essential. Physical exercise not only supports cardiovascular and musculoskeletal health but also plays a significant role in mental and emotional well-being. According to the World Health Organization (2022), physical inactivity is among the leading risk factors for global mortality, contributing to the development of non-communicable diseases such as diabetes, cancer, and cardiovascular disorders. Therefore, promoting exercise as a preventive health behavior is a public health priority.

Regular physical activity is widely recognized as a key preventive behavior that supports both physical and psychological well-being. However, despite its established benefits, exercise adherence among students remains relatively low (Herbert, 2022). Factors such as academic demands, limited time, low motivation, and lack of health awareness contribute to sedentary lifestyles and increased health risks in this group (Castro et al., 2020; Whatnall et al., 2020). With over 7.8 million students actively enrolled in higher education in Indonesia (BPS, 2023), understanding the determinants of exercise behavior in this population is a public health priority.

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To examine the determinants of exercise behavior, the Health Belief Model (HBM) provides a widely used and empirically supported theoretical framework. The model posits that engagement in health-promoting behaviors is influenced by individuals' cognitive evaluations of health-related risks and benefits, including perceived susceptibility to health problems, perceived severity of potential consequences, perceived benefits of preventive actions, and perceived barriers that may hinder such actions (Jones et al., 2015). These cognitive appraisals are further shaped by cues to action and general health motivation, which together guide decision-making processes related to preventive behaviors such as regular physical activity (Perchtold-Stefan et al., 2020; Rodrigues et al., 2023). Within the context of exercise, the HBM offers a structured approach to understanding why individuals choose to adopt or avoid physically active lifestyles.

Building on this theoretical framework, empirical research has emphasized the importance of translating health belief constructs into measurable psychological indicators. In the context of exercise behavior, such measurement is essential to capture how individuals perceive health risks, evaluate the benefits of physical activity, and negotiate perceived barriers within their daily routines (Ma et al., 2023). The Exercise Health Belief Model Scale (EHBMS) was developed to operationalize these constructs by providing a multidimensional assessment of exercise-related health beliefs. By quantifying theoretically grounded dimensions, the EHBMS enables researchers to systematically examine the psychological mechanisms underlying engagement in physical activity. Building on the Health Belief Model described above, the EHBMS serves as a psychometric instrument designed to measure health belief constructs specifically in relation to physical activity, without redefining the theoretical framework itself.

The EHBMS was specifically designed to assess beliefs about the benefits of planned physical activity in Mexico, a country with one of the world's highest rates of overweight and obesity (Díaz-Zavala et al., 2019). Villar et al. (2017) validated this scale through exploratory factor analysis, yielding two main dimensions: (1) perceived health threat, and (2) perceived preventive behavior. The perceived health threat factor comprises three indicators general health values (α = .84), perceived susceptibility (α = .67), and perceived severity (α = .90). The preventive behavior factor includes beliefs that physical activity reduces health threats (α = .90), and that its benefits outweigh the time and cost for disease prevention (α = .85). The scale showed acceptable psychometric properties, with factor loadings between .31 and .92, and internal consistency values between .67 and .91.

Several instruments have been developed to assess health beliefs. For example, Champion's Health Belief Model Scale (Champion, 1999) has been widely used in the context of breast cancer prevention, while the Exercise Benefits/Barriers Scale (Sechrist et al., 1987) focuses on perceptions of the advantages of and obstacles to exercise. Although these tools have contributed valuable insights, they remain limited in scope. Generic HBM scales often concentrate on specific diseases rather than exercise behavior, whereas the EBBS do not comprehensively address core HBM dimensions such as perceived susceptibility and perceived severity.

Accurate and culturally relevant measurement tools are essential for assessing exercise-related health beliefs across diverse populations. Although the Exercise Health Belief Model Scale (EHBMS) was originally developed in English, its direct application in the Indonesian context may be limited due to linguistic differences and sociocultural variations that influence how health beliefs are understood, interpreted, and expressed. Health-related perceptions, attitudes, and behavioral intentions are shaped by contextual factors such as cultural norms, health literacy, and educational environments; therefore, instruments developed in one setting may not automatically maintain their conceptual and measurement equivalence in another. As emphasized by Arafat et al. (2016), adapting a psychological scale involves more than direct translation; it requires a

systematic process to ensure conceptual, semantic, and contextual alignment with the target population. In addition to linguistic adaptation, empirical evaluation through statistical procedures is necessary to examine whether the factor structure, item performance, validity, and reliability of the instrument remain adequate within the new cultural context. Accordingly, the present study followed the cross-cultural adaptation guidelines proposed by (Beaton et al., 2000), including forward translation, synthesis, back translation, expert committee review, and pretesting, complemented by psychometric analyses such as content validity assessment, confirmatory factor analysis, and reliability testing. This combined approach was undertaken to ensure that the adapted scale not only reflects linguistic equivalence but also demonstrates acceptable statistical and conceptual robustness for use among Indonesian university students.

Given the limited availability of validated Indonesian instruments designed to assess exercise-related health beliefs, this study aimed to adapt and validate the Exercise Health Belief Model Scale (EHBMS) into Bahasa Indonesia. The process involved linguistic translation, cultural adaptation, and psychometric evaluation. Confirmatory Factor Analysis (CFA) and reliability testing were conducted to examine the factorial structure and internal consistency of the adapted scale. The Indonesian version of the EHBMS is expected to serve as a reliable and valid instrument for assessing students' exercise-related health beliefs and to support future research, educational initiatives, and health promotion programs targeting physical activity among Indonesian university students.

Method

Research Design

This study employed a quantitative methodology. According to Azwar (2017), quantitative research involves the use of numerical data analyzed through statistical procedures. The primary objective of this study was to evaluate the validity and reliability of the Indonesian adaptation of the Exercise Health Belief Model Scale (EHBMS). The research was conducted in two phases. Phase 1 focused on cross-cultural adaptation based on Beaton's framework, while Phase 2 involved psychometric testing to examine the construct validity and reliability of the adapted instrument. A convenience sampling technique was applied, allowing respondents to be selected based on accessibility (Sugiyono, 2021).

The Exercise Health Belief Model Scale (EHBMS) is grounded in the Health Belief Model (HBM), which proposes that health-related behaviors are influenced by individuals' perceptions of susceptibility, severity, benefits, and barriers (Perchtold-Stefan et al., 2020; Rodrigues et al., 2023). In the context of exercise behavior, the EHBMS operationalizes these constructs by measuring individuals' beliefs regarding the risks associated with physical inactivity, the seriousness of its potential consequences, the perceived benefits of engaging in exercise, and the perceived barriers that may impede participation (Faghih et al., 2024). The original instrument was developed using a Likert-type response format to capture these multidimensional beliefs, with higher scores reflecting stronger endorsement of exercise-related health beliefs. Given that the original scale was developed in a different linguistic and cultural context, cross-cultural adaptation was necessary prior to its application in Indonesia. Cross-cultural adaptation is a methodological process undertaken when applying measurement instruments across different cultures, countries, and languages to ensure conceptual and contextual equivalence (Zhao et al., 2024). In the present study, the EHBMS was culturally adapted into Indonesian (EHBMS-ID) following established adaptation procedures before undergoing psychometric evaluation.

Cross-cultural adaptation is a methodological process used when applying measurement instruments across different cultures, countries, and languages (Zhao et al., 2024). This process

ensures that the adapted construct accurately represents the cultural context of the target population, which increases the relevance and applicability of research results (Arafat et al., 2016). Beaton et al. (2000) proposed a six-step adaptation process: (1) Forward Translation, (2) Synthesis, (3) Back Translation, (4) Expert Committee Review, (5) Pretesting, and (6) Submission. This study applied a modified version incorporating an initial preparation stage and psychometric testing. The overall adaptation procedure implemented in this study is illustrated in Figure 1 to provide a clear visual representation of the sequential stages undertaken.

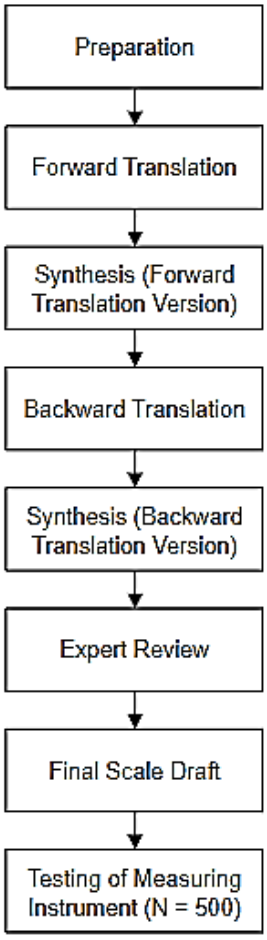

Figure 1. Adaptation Process

The scale adaptation process followed several sequential stages as illustrated in Figure 1. Initially, permission to use the original instrument was obtained from the copyright holders. At the preparation stage, experts familiar with the psychological construct and the Indonesian cultural context were consulted to evaluate the relevance of the items and to minimize potential cultural and linguistic bias. The forward translation was then conducted by two bilingual translators, one with a psychology background and one without, to ensure both conceptual accuracy and natural language use. The two translated versions were subsequently synthesized into a single version through discussion and consensus with the research team.

The synthesized version was then back-translated into English by two independent translators who were blinded to the original instrument to ensure semantic equivalence. Following this, an expert committee consisting of psychologists, linguists, and public health professionals reviewed all versions to ensure semantic, idiomatic, experiential, and conceptual equivalence, resulting in a pre-final version of the instrument. Finally, the instrument was

pretested among the target population to assess clarity and cultural relevance. Feedback was collected, and psychometric evaluations, including content validity, item discrimination, factor structure, and internal consistency, were conducted to ensure the reliability and validity of the adapted scale.

Participants

A non-probability sampling technique, specifically convenience sampling, was employed, in which participants were recruited based on accessibility and willingness to participate. Data were collected through an online questionnaire distributed via Google Forms through social media platforms and peer-to-peer digital networks, enabling broad geographic coverage across both public and private universities. All participants were proficient in the Indonesian language and voluntarily completed the survey.

Inclusion criteria required participants to be actively enrolled as university students within the specified age range, while exclusion criteria included individuals with significant reading difficulties, intellectual impairments, or limitations in using online survey tools. Prior to participation, all respondents were provided with detailed information regarding the study objectives, procedures, confidentiality, and their right to withdraw at any time. Electronic informed consent was obtained from all participants before completing the questionnaire. This study involved 500 university students from various higher education institutions across Indonesia, aged between 18 and 30 years. Detailed demographic characteristics are presented in Table 1.

Table 1.
Participant Demographics

Category	n	%
Gender		
Male	253	50.6%
Female	247	49.4%
Age		
18-22	299	59.8%
23-26	198	39.6%
27-30	3	0.6%
Educational Background		
Undergraduate	467	93.4%
Master's Degree	24	4.8%
Diploma	9	1.8%
Doctoral	0	0%
Region Of Origin		
Kepulauan Bangka Belitung	6	1.2%
Maluku	16	3.2%
Bali & Nusa Tenggara	33	6.6%
Kalimantan	71	14.2%
Others	3	0.6%

A summary of the participants' demographic characteristics is presented in Table 1. In general, the sample reflects a relatively balanced gender composition and includes respondents from a wide range of geographic regions across Indonesia. This distribution suggests that the data were not concentrated within a single subgroup, but rather capture variation across different contexts of Indonesian higher education. Such diversity provides a reasonable basis for

considering the findings as relevant to the broader population of university students in Indonesia, particularly in terms of contextual applicability.

Nevertheless, several characteristics of the sample should be taken into account when interpreting the results. The participants were largely dominated by undergraduate students, which may restrict the extent to which the findings can be generalized to individuals at more advanced educational levels. In addition, most respondents fell within the younger age categories, indicating that the results are more representative of individuals in early adulthood. These patterns highlight the importance of exercising caution when extending the conclusions of this study to more heterogeneous populations. Following the description of the sample characteristics, the next stage of the study involved the cultural adaptation of the instrument. The adaptation process of the Exercise Health Belief Model Scale (EHBMS) into Indonesian (EHBMS-ID) involved a systematic sequence of procedures, including context, content, and linguistic adjustments. The cultural adaptation followed the guidelines proposed by Beaton et al. (2000), ensuring conceptual and semantic equivalence between the original and translated versions.

Instrument

The Indonesian version of the Exercise Health Belief Model Scale (EHBMS-ID) was used to assess exercise-related health beliefs based on the Health Belief Model framework. The scale employs a five-point Likert-type response format and consists of multiple factors representing distinct theoretical dimensions of exercise-related health beliefs. Items 1 to 19 are rated using the response options “Not at all,” “Very little,” “Little,” “Quite a lot,” and “Very much,” whereas Items 20 to 25 use the response options “Very unlikely,” “Unlikely,” “Likely,” “Very likely,” and “Definitely.”

The Indonesian version of the Exercise Health Belief Model Scale (EHBMS-ID) is scored at the factor level rather than by calculating a single total score. Each factor represents a distinct construct of exercise-related health beliefs derived from the Health Belief Model framework. Factor scores are obtained by summing item responses within each factor and dividing by the number of items, resulting in mean scores for each dimension. Higher factor scores indicate stronger endorsement of the corresponding health belief construct. This factor-level scoring approach allows for a more precise interpretation of the multidimensional structure of the EHBMS-ID and is consistent with the theoretical foundation of the Health Belief Model, as well as the confirmatory factor analysis conducted in this study.

Prior to data collection, the study procedures and research instruments were reviewed by the academic supervisor to ensure methodological rigor, clarity of content, and adherence to general ethical research principles. The study was designed as a minimal-risk survey and did not involve medical intervention, vulnerable populations, or the collection of sensitive or personally identifiable information. Institutional approval for this study was obtained in the form of an official research permit issued by the Faculty of Psychology, Satya Wacana Christian University. Based on joint consideration between the researcher and the academic supervisor, this form of institutional authorization was considered appropriate for the nature and scope of the study.

Data Analysis

This study includes descriptive analysis, item discrimination testing, validity assessment, and reliability evaluation. Respondents were selected due to their representativeness and relevance in assessing health related beliefs about exercise. The recommended sample size adhered to the standard ratio of 6 to 10 participants per item (White, 2022), ensuring statistical adequacy. Content validity was assessed using Aiken’s V formula, based on expert evaluations from two psychologists, two health professionals, and one linguist. Experts rated item relevance

on a 5-point scale, and values of Aiken's V above .80 were interpreted as indicating very high validity. This step ensured that all items appropriately reflected the theoretical constructs intended to be measured.

Item discrimination analysis was conducted by calculating item-total correlation coefficients, with a threshold of ≥ .30 used to identify items with adequate discriminatory power (Marianti et al., 2023). Reliability testing was performed using Cronbach's Alpha to evaluate the internal consistency of each factor, with a minimum acceptable value of .70 and an ideal target of .80 or higher (Azwar, 2017; Kalkbrenner, 2023). Construct validity was examined through Confirmatory Factor Analysis (CFA) using JASP software (version 0.19.1), based on the factor structure proposed by Villar et al. (2017). The Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity confirmed data suitability for factor analysis (KMO > .70; p < .05). Model fit was evaluated using indices such as RMSEA and SRMR (< .08), and GFI, CFI, TLI, NFI (> .90), aligning with Niemand and Mai (2018). Factor loadings ≥ .40 were deemed acceptable (Jordan & Spiess, 2019).

Result

Cross-cultural adaptation

The results obtained from the forward and backward translation procedures, followed by comparability–similarity evaluation and content validity assessment conducted by experts, resulted in a set of adapted items for the EHBMS-ID. A summary of these adapted items is presented in Table 2. The finalized version of the EHBMS-ID consisted of adapted items derived through the translation and expert review process. It should be noted that the items presented in Table 2 represent selected samples for illustrative purposes. Following the finalization of the adapted scale, the study proceeded with content validity evaluation. The content validity testing of the Exercise Health Belief Model Scale Indonesian version (EHBMS-ID) involved a panel of five experts: two psychologists, two health professionals, and one linguist. These experts assessed the relevance and representativeness of each item in relation to the construct being measured. The evaluation utilized Aiken's V formula (Aiken, 1985), which quantifies the degree of expert agreement for each item. The purpose of this step was to ensure that the adapted scale aligns conceptually and contextually with the intended psychological constructs within the Indonesian student population.

The results of the content validity test indicated a high level of agreement among the raters. All items achieved Aiken's V values above the acceptable threshold of .80, with the overall average value reaching .992. The majority of items obtained a perfect agreement score of 1.00, indicating unanimous expert judgment on their relevance to the measured construct. These findings suggest that the experts perceived the scale items as both relevant and representative of health belief constructs, reinforcing the cultural and theoretical appropriateness of the adapted instrument. Furthermore, establishing strong content validity provides a solid foundation for subsequent psychometric evaluations, such as factor analysis and construct validity testing, thereby enhancing the robustness of the instrument.

Table 2.

Results of Modification and Translation of the Exercise Health Belief Model Scale

No.	Exercise Health Belief Model Scale (EHBMS).	Exercise Health Belief Model Scale (Modification Version)	Exercise Health Belief Model Scale (Indonesian version)

1	How much interest do you have for your health?	How much interest do you have in your own health?	*Seberapa besar minat Anda terhadap kesehatan diri sendiri?*
2	How much do you think about your health?	How much care do you give to your own health?	*Seberapa besar perhatian Anda terhadap kesehatan anda?*
3	How much do you care about your health?	How important is your health to you?	*Seberapa besar kepedulian Anda terhadap kesehatan diri sendiri?*
4	How serious is it to suffer a heart attack?	How high is the risk of experiencing a heart attack?	*Seberapa serius risiko terkena serangan jantung?*
5	How serious is it to suffer a stroke?	How high is the risk of having a stroke?	*Seberapa serius risiko menderita stroke?*
6	How serious is it to get cancer?	How severe is the risk of suffering a cancer?	*Seberapa serius risiko menderita kanker?*
7	How much do you think exercise will help you prevent having high blood pressure?	How much do you think exercise will help you prevent having high blood pressure?	*Seberapa besar keyakinan Anda bahwa olahraga dapat mencegah terjadinya tekanan darah tinggi?*

Following the content validity evaluation, a readability test was conducted. Results from the readability test showed a high level of clarity, with a mean score of 2.91 out of a maximum of 3.00. All participants confirmed that the items were easy to understand and did not provide further suggestions or corrections, indicating that the instrument was ready for use in the main data collection phase. Linguistic and cultural adjustments during adaptation followed Beaton et al. (2000) guidelines, involving preparation, forward translation, synthesis, backward translation, expert review, pre-test, and submission. While no substantial semantic changes were made, grammatical and diction-level modifications were implemented to suit the Indonesian student population. Overall, the adaptations encompassed language (linguistic), target population (person), and content (values and norms) dimensions, as recommended by Ambuehl and Inauen (2022).

Construct validity

In this study, construct validity and reliability were assessed using Confirmatory Factor Analysis (CFA) to examine how well the observed variables (indicators) represent the latent constructs of the Exercise Health Belief Model Scale Indonesian version (EHBMS-ID). The analysis was conducted using JASP. The results of the goodness-of-fit evaluation for the EHBMS-ID measurement model are presented in figure 2 and summarized in Table 3.

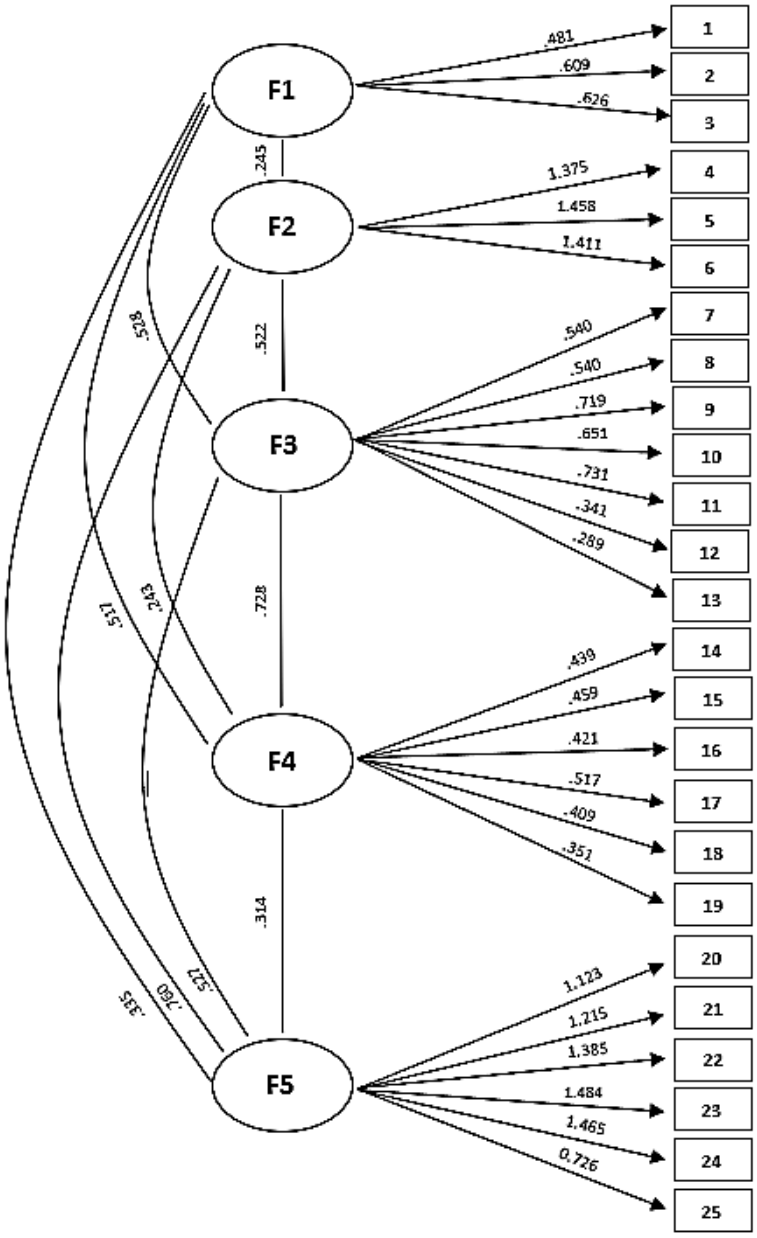

Figure 2. Confirmatory Factor Analysis (CFA) model of the EHBMS-ID

Table 3.
CFA Analysis Results

CFA Indicators	Value	Recommended Value
Chi-Square/df	4.03	>3.0
RMSEA	.078	≤.08
CFI	.932	≥ .90
GFI	.990	≥ .90
SRMR	.061	≤ .08
NFI	.912	≥ .90
TLI	.923	≥ .90

The overall model fit was assessed using multiple goodness-of-fit indices recommended in the structural equation modeling literature, including the chi-square to degrees of freedom ratio (χ^2/df), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Goodness-of-Fit Index (GFI), the Standardized Root Mean Square Residual (SRMR), the Normed Fit Index (NFI), and the Tucker-Lewis Index (TLI). The results of the CFA fit evaluation are summarized in Table 3.

As presented in Table 3, the chi-square to degrees of freedom ratio (χ^2/df = 4.03) slightly exceeded the commonly recommended threshold of 3.0, a condition frequently observed in studies with large sample sizes due to the sensitivity of the chi-square statistic. The RMSEA value of .078 remained within the acceptable range (≤ .08), indicating an adequate approximation of model fit to the observed data. Similarly, the SRMR value of .061 met the recommended criterion, further supporting the presence of an acceptable level of residual fit. In terms of incremental fit indices, the CFI (.932), NFI (.912), and TLI (.923) all exceeded the suggested threshold of .90, indicating that the proposed five-factor model provides a better fit to the data compared to the baseline model. In addition, the GFI reached a notably high value of .990, surpassing the recommended criterion and reflecting a substantial proportion of variance in the data explained by the model.

Taken together, the CFA findings demonstrate that the proposed five-factor measurement model shows an acceptable level of fit across multiple evaluation criteria. The consistency of fit indices, including RMSEA, CFI, GFI, SRMR, NFI, and TLI, within their respective acceptable ranges supports the adequacy of the model structure. These results indicate that the 25-item instrument is capable of representing the underlying constructs as theorized, providing a sufficient basis for further analysis within the structural modeling framework.

Discussion

The results of the Confirmatory Factor Analysis (CFA) indicate that the measurement model demonstrates an acceptable level of fit across multiple indices. Although the chi-square statistic was significant, this finding is consistent with previous studies highlighting its sensitivity to large sample sizes, which may lead to model rejection despite adequate model fit (Cangur & Ercan, 2015; Hair et al., 2019). Therefore, the evaluation of model fit in this study was based on a combination of fit indices, all of which met the recommended thresholds.

The factor loading results further indicate that the measurement model is adequately supported. The majority of items exhibited standardized loadings above the recommended threshold, suggesting that they contribute meaningfully to their respective latent constructs. Nevertheless, one item (Item 13) showed a comparatively low loading. Despite this, the item was retained given its theoretical importance in capturing perceived severity, a central component of the Health Belief Model. As explained by Clark and Watson (2019) and Lambert and Newman (2023), retaining conceptually important items, even with lower weights, can maintain the breadth and content validity of the construct. This finding emphasizes the importance of preserving theoretical coherence alongside statistical adequacy in instrument validation.

In addition, several items exhibited loadings exceeding 1.0, with Item 23 showing the highest value, which can be identified as a potential Heywood case. Such occurrences may arise due to high inter-item correlations or specific sample characteristics and do not necessarily indicate model misspecification, particularly when other fit indices remain within acceptable ranges (Clark & Bowles, 2018). Furthermore, all indicators were found to load significantly onto their respective latent constructs, with consistently high z-values, indicating strong statistical support for the measurement structure.

When examined at the factor level, the results indicate noticeable variation in the magnitude of item contributions across the different dimensions of the model. In particular, Factor 2 and Factor 5 exhibited relatively higher factor loadings compared to the other factors, suggesting that these dimensions may have a more substantial role in accounting for the variance in exercise-related health beliefs. Conversely, several items associated with other factors showed comparatively lower loading values. Despite this, all items remained statistically significant, indicating that they still contribute to the overall construct, although with relatively smaller effect sizes, as has been observed in some previous HBM studies (Han et al., 2024; Wang et al., 2025; Wu et al., 2020).

These findings collectively reinforce the structural validity of the EHBMS-ID and support the adequacy of its five-factor model in representing exercise-related health beliefs. The observed pattern of relationships among the five dimensions of the Extended Health Belief Model (EHBM) reflects a coherent and theoretically grounded structure, consistent with prior conceptualizations of the model. This interconnected pattern highlights the dynamic interplay between cognitive evaluations and motivational processes in shaping individual health beliefs and behavioral intentions (Jones et al., 2015). Moreover, the consistency across dimensions suggests that the instrument is capable of capturing the multidimensional nature of health belief constructs within the Indonesian student context.

The analysis indicated a positive relationship between Perceived Susceptibility and Perceived Severity, suggesting that individuals who recognize their vulnerability to potential health risks are also more likely to perceive those risks as serious. This relationship reflects a complementary cognitive process in which awareness of risk is accompanied by an evaluation of its potential consequences. Together, these constructs form a critical foundation for health motivation, as they enhance individuals' sensitivity to health threats and encourage a more proactive orientation toward preventive behavior. Such alignment between perceived risk and seriousness is essential in fostering readiness to adopt and maintain health-promoting actions (Carico et al., 2020).

Meanwhile, the positive association between Perceived Benefits and both Perceived Susceptibility and Perceived Severity highlights an important cognitive linkage within the Health Belief Model. As suggested by Ocak (2025), individuals who become more aware of their vulnerability to health risks and the seriousness of their consequences tend to assign greater value to the potential benefits of preventive actions. This pattern indicates that risk awareness does not operate in isolation but actively shapes how individuals evaluate the usefulness of health-promoting behaviors, ultimately strengthening their motivation to engage in actions that support better health outcomes.

In contrast, Perceived Barriers demonstrated negative associations with the other dimensions, reflecting the inhibiting role of various constraints in shaping health-related decisions. As highlighted by Thapaliya et al. (2022) and Wang et al. (2022), increasing psychological, financial, or social obstacles can reduce both the perceived value and practical feasibility of engaging in health-promoting behaviors. This inverse relationship suggests that even when individuals recognize health risks and benefits, the presence of substantial barriers may weaken their intention to act. Consequently, perceived barriers function as a critical limiting factor that can hinder the translation of health beliefs into actual behavior.

A distinct pattern emerges in the role of Cues to Action and Self-Efficacy, which appear to function as key activating mechanisms within the EHBM framework. Their strong positive association with Perceived Benefits, coupled with a moderate inverse relationship with Perceived Barriers, suggests that individuals are more likely to act when they both recognize the advantages

of a behavior and feel capable of performing it. In line with findings from Liao et al. (2025) and Zewdie et al. (2024), this combination of motivational triggers and self-belief facilitates the translation of health-related perceptions into concrete behavioral engagement.

Taken together, the pattern of intercorrelations among all factors suggests the presence of a dynamic and reciprocal system within the EHBM framework. Rather than operating independently, these dimensions interact in a way that allows cognitive appraisals of health threats to strengthen the perceived value of preventive actions and enhance individuals' readiness to act. In this process, motivational components play a crucial role in translating cognitive appraisals into actual behavior. As emphasized by Saghafi-Asl et al. (2020) and Taflinger and Sattler (2024), such interconnected mechanisms are fundamental in shaping consistent and goal-directed health-related decision-making.

The five-factor structure of the EHBMS-ID aligns with the theoretical framework of the Health Belief Model, confirming that exercise-related health beliefs among Indonesian students can be meaningfully categorized into health values, perceived susceptibility, perceived severity, perceived benefits, and cost–benefit evaluation. This structure is largely consistent with previous validation studies (Villar et al., 2017), although minor variations in factor loadings were observed. For instance, the relatively lower loading of Item 13 may reflect contextual or cultural differences in how the severity of not exercising is perceived among Indonesian students.

The EHBMS-ID's five-factor structure mirrors the theoretical framework of the Health Belief Model (HBM), confirming that exercise-related health beliefs among Indonesian students can be meaningfully grouped into health values, vulnerability, severity, preventive benefits, and cost–benefit evaluation. This structure is largely consistent with the findings of (Villar et al., 2017), who validated the original EHBMS in Mexico, though minor variations in factor loadings were observed. For example, the weaker loading of Item 13 in the Indonesian version may indicate cultural differences in how students perceive the severity of not exercising.

The decision to retain theoretically important items despite relatively lower factor loadings highlights the need to balance statistical criteria with conceptual coherence in scale development. Rather than relying solely on numerical thresholds, this approach ensures that essential dimensions of the construct remain adequately represented. In line with previous findings, the psychometric performance of the EHBMS-ID demonstrates comparable levels of reliability and validity to those reported by Lei et al. (2022). This consistency suggests that the instrument maintains its measurement quality across cultural contexts, supporting its applicability for assessing exercise-related health beliefs in diverse populations.

Implications and limitations

The findings of this study offer several important implications for both research and practice. From a theoretical perspective, the validation of the EHBMS-ID reinforces the applicability of the Health Belief Model in explaining exercise-related beliefs within the Indonesian context, highlighting the relevance of cognitive and motivational dimensions in shaping health behavior. From a practical standpoint, the availability of a culturally adapted and psychometrically sound instrument enables practitioners, educators, and health professionals to more accurately assess students' health beliefs and identify key psychological factors influencing physical activity engagement. This, in turn, provides a foundation for designing targeted intervention programs that address specific belief components, such as enhancing perceived benefits, reducing perceived barriers, and strengthening self-efficacy. Moreover, the instrument can be utilized as an evaluative tool to monitor changes in health beliefs following intervention

efforts, thereby supporting evidence-based health promotion strategies in higher education settings.

Despite the strengths of this study, several limitations should be acknowledged. First, the use of a convenience sampling technique may limit the generalizability of the findings, as the sample may not fully represent the broader population of Indonesian university students. Second, the data were collected trough self-report measures administered through an online survey, which may be subject to response bias, including social desirability and varying levels of participant attention. Third, although the sample size was adequate for factor analysis, certain statistical characteristics, such as the presence of a potential Heywood case and variation in factor loadings, suggest that further refinement of the model may be beneficial. Future studies are encouraged to validate the EHBMS-ID using more diverse and representative samples, as well as to examine its stability through additional procedures such as test–retest reliability and cross-validation across different populations.

Conclusion

The Indonesian version of the Exercise Health Belief Model Scale (EHBMS-ID) was successfully developed through a comprehensive process of cultural adaptation and psychometric evaluation. The adaptation procedure followed established cross-cultural guidelines, ensuring linguistic, conceptual, and contextual equivalence between the original scale and the Indonesian version. The findings indicate that the EHBMS-ID demonstrates strong evidence of validity and reliability for assessing exercise-related health beliefs among Indonesian university students.

Psychometric evaluation supported the construct validity and internal consistency of the EHBMS-ID, confirming that the instrument appropriately captures key dimensions of health beliefs related to physical activity. The scale effectively reflects students' perceptions of health risks, benefits of exercise, perceived barriers, and motivational factors associated with engagement in regular physical activity. These results suggest that the EHBMS-ID is a robust tool for measuring psychological factors underlying exercise behavior within the Indonesian context.

The EHBMS-ID can be utilized both as a research instrument to examine exercise-related beliefs and as a practical self-assessment tool to enhance awareness and motivation toward regular physical activity (Wu et al., 2020). Its application may contribute to the development of evidence-based interventions and health promotion programs targeting university students by providing insights into belief-driven determinants of exercise behavior.

Despite these strengths, the findings should be interpreted with caution. Certain statistical characteristics observed during model estimation may indicate potential limitations related to sample-specific effects or model complexity. Future research is therefore encouraged to further examine the stability and generalizability of the EHBMS-ID across more diverse populations and settings. Additional validation studies using different samples, as well as further reliability assessments such as test–retest procedures, are recommended to strengthen the long-term applicability of the instrument in health promotion and behavioral research.

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