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Title

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Abstract

Provide a structured abstract with about 200 words maximum.

Background:

Methods:

Results:

Conclusion:

Keywords

List ten keywords specific to the article yet reasonably common within the subject discipline. Keywords must contain four parts: the discipline of the study, concepts investigated, method/process, and geographic location of study.

INTRODUCTION

A Physical Fitness Test is a formal, standardized test that measures a person's overall physical fitness, as well as functional ability, in major components of fitness including cardiovascular endurance, muscular strength and endurance, flexibility, power, speed, and body composition. They are used to assess a person's health-related or performance-related fitness, instruct training or rehabilitation programs, track progress, and pinpoint strengths and weaknesses. They find widespread application in schools, sports, the military, clinical, and wellness environments. The most significant problem in fitness testing in the Philippines is the absence of localized normative values, which limits the accuracy and relevance of test interpretations for Filipino populations (Villanueva-Uy et al., 2022; Grimmer et al., 2005; Kosonen, 2005).There is a notable dearth of literature and studies discussing the contextualization of fitness test normative values in the Philippines, which poses a major limitation in accurately assessing the physical fitness of Filipino individuals; while some sources acknowledge the need for culturally appropriate standards, few provide concrete frameworks or localized data, highlighting a significant research gap in this area (Villanueva-Uy et al., 2022; Grimmer et al., 2005; Kosonen, 2005; Petrigna et al., 2019; Hackett et al., 2018; Phillips, 2006; Miller, 2023).

Contextualizing fitness testing scoring procedures or normative values is important because it ensures that results are interpreted accurately and fairly based on an individual's cultural background, physical characteristics, environment, and functional needs—thereby improving the validity, relevance, and equity of assessments (Phillips, 2006; Petrigna et al., 2019).

Body composition refers to the relative percentages of fat, lean mass, bone, and water in the body, and can be assessed using various techniques such as bioelectrical impedance analysis (Kyle et al., 2004). Body composition tests such as BIA and DXA are used in clinical, athletic, and nutritional settings to assess fat and muscle distribution, with normative values for body fat typically ranging from 10–20% in men and 18–28% in women (Moya-Amaya & Rojano-Ortega, 2025). Each body composition assessment technique presents unique limitations due to variability in hydration status (BIA), operator skill (skinfolds), radiation exposure (CT), calibration issues (DXA), and cost or accessibility (MRI/ADP), impacting their precision and clinical utility (Holmes & Racette, 2021).Contextualization helps mitigate the limitations of body composition tests by integrating individual characteristics such as age, sex, ethnicity, clinical status, and functional capacity into the interpretation, thereby transforming generalized norms into clinically meaningful, personalized insights (Prado, 2013). In summary, the sources shows that body composition testing has developed into a customized diagnostic test, where combining contextual variables such as age, sex, and health status improves the accuracy and clinical applicability of approaches such as BIA and DXA, even with their inherent shortcomings.

Cardiorespiratory endurance is the capacity of the heart, lungs, and muscles to sustain prolonged physical activity, commonly assessed through VO$_2$max tests, step tests, and PACER runs depending on the setting and population (Anderson et al., 2025). Cardiorespiratory endurance tests like VO$_2$max and the 6-minute walk test are used to evaluate aerobic capacity in clinical and fitness settings, with normative VO$_2$max values typically ranging from 42–46 mL/kg/min for healthy men aged 20–29 and 33–37 mL/kg/min for healthy women of the same age, while 6-minute walk distances average 572 ± 61 m for men and 538 ± 59 m for women (Moretz et al., 2008; Anderson et al., 2025). Cardiorespiratory endurance tests like VO$_2$max, PACER, 6MWT, and the Bruce protocol face limitations ranging from safety and cost (VO$_2$max), pacing and space dependency (PACER), to population suitability and physical demands (Bruce, 6MWT), all of which can influence accuracy and interpretation (Bonikowske et al., 2024). Contextualization helps address the limitations of cardiorespiratory endurance tests by adapting interpretation and test selection based on individual characteristics—such as age, health status, functional limitations, and fitness level—thereby ensuring that results are both accurate and clinically meaningful (Bonikowske et al., 2024). From the cited studies, we've learned that Cardiorespiratory endurance testing has evolved into a context-driven practice where tools like VO$_2$max, 6MWT, PACER, and Bruce protocol are chosen and interpreted based on individual characteristics, each test has inherent limitations, contextualization enhances their accuracy, safety, and clinical applicability across diverse populations.

Arm and abdominal muscular strength and endurance reflect the ability to produce and sustain force in the upper body and core, commonly assessed through tests like push-ups, sit-ups, planks, and bench press, depending on whether dynamic or isometric evaluation is needed (Brown & Weir, 2001). Arm and abdominal strength and endurance tests such as the push-up and sit-up are widely used in fitness and clinical settings, with normative values indicating that healthy men aged 20–29 should complete at least 30 push-ups and 36–44 sit-ups per minute, while women in the same age range should achieve 15-20 push-ups and 30–38 sit-ups per minute (Bianco et al., 2015; Peterson et al., 2019). Muscular fitness tests like push-ups, sit-ups, planks, and flexed arm hangs are limited by factors such as anthropometric bias, technical variability, core isolation challenges, and test-specific fatigue, which can affect their validity and generalizability across populations (Bianco et al., 2015; Peterson et al., 2019; Behm et al., 2022; McGuire, 2021). Contextualization helps address the limitations of arm and abdominal strength and endurance tests by tailoring test selection and result interpretation to an individual's age, sex, training background, biomechanics, and functional goals—ensuring fairer, safer, and more meaningful assessment outcomes (Behm et al., 2022; Peterson et al., 2019). Testing for arm and abdominal strength and endurance has become more customized, and research has shown that taking into consideration individual characteristics like age, sex, and body mechanics enhances the precision, equity, and utility of tests like push-ups and sit-ups in clinical and fitness contexts.

Flexibility refers to the ability of joints and soft tissues to move through their full range of motion and is commonly assessed through tests like the sit-and-reach, trunk lift, and goniometry depending on the joint and purpose of evaluation (Ayala et al., 2012).Flexibility tests such as the sit-and-reach are widely used in clinical, athletic, and school settings to evaluate hamstring and lower back flexibility, with normative values indicating that healthy men aged 20–29 should reach ≥33 cm and women ≥35 cm, while values of <21 cm (men) and <23 cm (women) suggest poor flexibility (Erkan & Telci, 2025). Flexibility tests such as the sit-and-reach and goniometry are commonly used but face limitations like limb length bias, inter-rater variability, and difficulty isolating specific joints or muscle groups, which can compromise their validity and consistency (López-Miñarro & Sainz de Baranda, 2008; Phillips, 2006; Miller, 2023). Contextualization helps address the limitations of flexibility tests by interpreting results in light of individual factors—such as age, limb length, joint history, activity level, and functional needs—thereby improving accuracy, fairness, and clinical relevance (Phillips, 2006; Miller, 7indicate that while tests such as the sit-and-reach and goniometry are commonly used, they become much more accurate when results are given in terms of individual factors such as age, limb length, and functional requirements.

Muscular power refers to the ability to exert force quickly, typically measured through vertical jump, sprint, and medicine ball throw tests, which assess explosive strength in both upper and lower body movements (Hackett et al., 2018). Power tests like the vertical jump, 30-meter sprint, and medicine ball throw are widely used in sports and clinical contexts to assess explosive strength, with normative values indicating, for example, vertical jump heights of 50–60 cm in athletic males and medicine ball throws of 4.5–6.5 m in adolescent boys (Hackett et al., 2018; Bayraktar et al., 2014). Power tests like the vertical jump, sprint, and medicine ball throw face limitations related to technique sensitivity, measurement inconsistency, and external factors, which can impact their accuracy in evaluating true explosive performance (Petrigna et al., 2019; Hackett et al., 2018; Stockbrugger & Haennel, 2001). Contextualization helps address the limitations of power tests by adapting test selection, execution, and interpretation to individual factors like age, training experience, body composition, surface conditions, and test familiarity—ensuring more accurate, equitable, and functionally relevant outcomes (Petrigna et al., 2019; Hackett et al., 2018). In short, power testing is now more individualized and context-specific, and the research cited here indicates that although tests such as the vertical jump, sprint, and throw with a medicine ball are useful for evaluating explosive strength, they become much more accurate and equitable when made specific to variables such as age, training status, and test conditions

Baumgartner et al. (2016) have referred to speed as being able to move the body or a part of it quickly. Speed tests, usually administered in Physical Education and sports testing, are normally on flat surfaces such as tracks, with 40-meter sprint normative values of 6.5-7.2 seconds for 13-14-year-old males and 4.5-5.5 seconds for university athletes (Baumgartner et al., 2016; NASPE, 2016). Typical issues that arise in speed tests are inaccurate timing because of human error, non-standardization of test conditions, environmental circumstances such as weather, and individual factors such as tiredness or injury, which can affect outcomes' reliability (Baumgartner et al., 2016). Contextualization enhances speed testing by accounting for personal circumstances and the surroundings, producing more accurate and trustworthy findings. In summary, contextualization improves the validity and reliability of speed tests by resolving problems like environmental conditions, personal conditions, and variability in test conditions, ultimately yielding a more equitable and valid measure.

Agility is the ability to rapidly change direction with speed and control, commonly assessed through field-based tests such as the Illinois Agility Test, T-Test, 505 Agility Test, and Shuttle Run to evaluate coordination, balance, and reaction time (Sheppard & Young, 2006; Pauole et al., 2000). **Agility tests such as the Illinois Agility Test, T-Test, 505 Test, and Shuttle Run are widely employed in schools, sports academies, and fitness assessments to measure change-of-direction ability, with normative values indicating that elite athletes typically score 15.2-18.1 seconds (Illinois), 8.6-10.4 seconds (T-Test), and 2.2-2.6 seconds (505 Test), depending on sport, age, and gender** (Lockie et al., 2019; Tatlıcıoğlu et al., 2020; Marzouki et al., 2023). **While widely used for assessing agility, the Illinois, T-Test, 505, and Shuttle Run are limited by factors such as test structure rigidity, learning effects, surface and footwear inconsistencies, and their reduced ecological validity in simulating sport-specific movements** (Lockie et al., 2019; Orr et al., 2019; Kozinc & Šarabon, 2022). **Contextualizing agility assessments through sport-specific modifications and reactive environments helps overcome traditional test limitations by enhancing ecological validity, improving skill transfer, and capturing decision-making dynamics more reflective of real-game scenarios** (Steel et al., 2021; Kozinc & Šarabon, 2025; Guevara-Araya et al., 2024).In summary, agility refers to the capacity for swift change of direction with control, usually evaluated by standardized testing such as the Illinois and T-Test, although more sports-specific, reaction tests are growing in popularity as more realistic and effective measures.

Body composition significantly influences physical balance and motor control in physical education settings, with assessment tools like BIA, DXA, and the Berg Balance Scale commonly used to evaluate fitness and functional stability (Smee et al., 2016; Panjan & Šarabon, 2010; Heyward, 2001). Body composition and balance tests—such as DXA, BIA, skinfolds, Berg Balance Scale, and One-Leg Stance—are widely used in physical education, clinical, and athletic contexts to assess fitness, detect risks, and guide interventions, with established normative values varying by age, sex, and activity level (Ackland et al., 2012; Heyward, 2001; Vehrs & Hager, 2006; Mocanu et al., 2022; Smee et al., 2016).Many body composition and balance assessment tests face limitations such as hydration and fluid balance affecting BIA accuracy, inconsistent calibration or positioning in DXA and skinfolds, and reliability issues in balance tests due to subjective scoring, learning effects, and individual variability (Ackland et al., 2012; Goran, 1998; Panjan & Šarabon, 2010; Lukaski & Raymond-Pope, 2021).Contextualization enhances the validity and relevance of body composition and balance assessments by aligning test conditions with real-life settings, thereby reducing measurement bias and improving interpretability and decision-making (Messick, 1995; Nimphius et al., 2018; Oakleaf, 2008).Contextualizing body composition and balance assessments enhances their validity and applicability by reducing measurement biases, aligning procedures with real-life demands, and allowing more accurate, meaningful interpretation of fitness data.

Reaction time refers to the interval between the presentation of a stimulus and the initiation of a motor response, and it is commonly assessed in physical education using visual or auditory tests like the ruler drop test or computerized tasks (Invernizzi et al., 2022). Reaction time tests are used in **school physical education**, **athletic training**, and **clinical rehabilitation settings** to evaluate sensorimotor function, with normative values indicating that for simple visual reaction time, typical values range from **200–250 ms** in healthy young adults and are slightly slower in children and older adults (Lempke et al., 2023).Common problems in reaction time testing include inconsistent reliability, instrumentation errors, environmental distractions, lack of standardization, individual sensory differences, cognitive fatigue, random error, limited test sensitivity, and biases related to age or motor skill levels (Harper, Shiraishi, & Soangra, 2022; Pagaduan, 2014; Rikli, 2000). Contextualization improves the validity, reliability, and engagement of reaction time tests in physical education by aligning assessments with realistic, sport-specific scenarios that better reflect cognitive demands and motor responses in authentic settings (Invernizzi et al., 2022; Lievens & Sackett, 2017; Ambuehl & Inauen, 2022). Synthesizing findings from recent studies, we learn that contextualizing reaction time tests in physical education enhances their ecological validity, reliability, and sensitivity by aligning assessments with real-world motor and cognitive demands, leading to more accurate and meaningful measurements of performance.

Body composition is the quantitative assessment of fat mass and fat-free mass in the human body, commonly measured using methods such as bioelectrical impedance analysis, dual-energy X-ray absorptiometry (DXA), skinfold thickness, and air displacement plethysmography (Kyle et al., 2004). Body composition assessments are utilized in clinical, fitness, and athletic settings to monitor health, disease risk, and performance, with normative body fat percentages typically ranging from 10–25% for men and 18–35% for women depending on the method used, such as DXA, BIA, or skinfold calipers (Holmes & Racette, 2021; Ward & Noland, 2020).

Paragraph 13.

Sentence 1. What theory or concept will better explain and support the study's procedure? Cite the proponent of the theory or concept.

Sentence 2. How is this theory or concept relevant in our study?

Sentence 3. Cite studies or literature that used the same theory/concept in explaining studies like ours.

Sentence 4. Provide a sample vivid interplay of the variables of the study through this theory/concept.

Sentence 5. You may synthesize the cited sources and what is it now? What did we learn from these studies (ones you cited)?

Messick's theory of validity best supports the study's procedure, as it emphasizes that test interpretations must be meaningful, contextually relevant, and considerate of the consequences of assessment use (Messick, 1995). Ensuring that the interpretation and use of physical fitness test results are valid, fair, and contextually appropriate for the Filipino population aligns with Messick's emphasis on meaningful, relevant, and consequence-aware assessment use.

Paragraph 14.

The purpose of this study is to establish contextualized normative values and scoring procedures for physical fitness assessments specific to Filipino college learners aged 19-50 in Cagayan de Oro City. It addresses the critical gap in localized normative fitness data in the Philippines, as most existing benchmarks are based on foreign populations, limiting their accuracy and cultural relevance for Filipinos (Villanueva-Uy et al., 2022; Grimmer et al., 2005; Kosonen, 2005). The results of this study will benefit physical education instructors, fitness professionals, policymakers, and college students by providing culturally appropriate benchmarks to guide fitness programming, assessment, and health interventions tailored to the Filipino context. Specifically, this study seeks to answer the following research questions: What are the current fitness levels of Filipino college learners aged 19-50 in Cagayan de Oro based on standardized fitness tests? How do these levels compare to existing international norms? What new percentile-based normative values can be established for this population? And are there significant differences in fitness performance based on sex and age groups?

METHODS

This study utilized a descriptive-normative cross-sectional design. Descriptive-normative cross-sectional research involves collecting data at a single point in time to describe current performance levels and establish normative values for a specific population (Tambalis et al., 2016). In this study, a cross-sectional design will be employed by administering a series of standardized physical fitness tests—such as shuttle runs, sit-ups, and flexibility measures—to a representative sample of Filipino learners at one time point (Tambalis et al., 2016). The cross-sectional component will allow the researchers to capture a snapshot of physical fitness across different age and sex groups, enabling comparisons within the cohort based on these demographic factors. The descriptive-normative aspect will be addressed by comparing the collected performance data to existing normative values—such as the percentile rankings established in national fitness surveys—to evaluate how the Filipino learners align with or deviate from these benchmarks (Hoffmann et al., 2019; Tomkinson et al., 2018). In summary, this study utilizes a descriptive-normative cross-sectional design to both measure and contextualize Filipino learners' fitness levels, establishing performance norms relative to existing standards.

The participants in this study comprised 500 PATHFIT 2 students (260 males, 240 females) recruited from one private college and one government-funded higher education institution in Cagayan de Oro City. A simple random sampling procedure based on Slovin's formula ($n = N / [1 + Ne^2]$) was used to ensure representativeness (Bostley Muyembe Asenahabi & Ikoha, 2023). Inclusion criteria required participants to be actively enrolled as PATHFIT 2 students aged 19–50 years, while exclusion criteria disqualified those with acute injuries, chronic conditions, or incomplete consent or test records. From the initial pool, all 500 students met the criteria, with none excluded—confirming that sampling aligned with study objectives and population scope. The study is thus delimited to PATHFIT 2 students aged 19–50 attending selected institutions in Cagayan de Oro, ensuring that normative values and scoring procedures developed are strictly contextualized to this demographic and setting.

The city under study is classified as a highly urbanized area within Northern Mindanao, boasting a population of approximately 728,402 residents as of the 2020 census, making it the region's most populous city and the tenth-largest in the Philippines (Philippine Statistics Authority, 2021). It leads the Northern Mindanao economy, accounting for 28 % of the region's GRDP in 2022, with a local GDP of approximately PHP 261.78 billion at constant 2018 prices (PSA, 2023). As of 2023, the city recorded the highest per-capita GDP in Mindanao, reaching about PHP 358,879, topping even larger urban centers in the region (PSA, 2024). These metrics—demographic scale, economic magnitude, and metropolitan reach—establish a robust socio-economic backdrop that frames the present study contextually.

The data collection process for this study began with the formal submission of the research proposal to the Research and Publication Office on January 8, 2025, followed by the release of the Research Ethics Certificate on January 22, 2025, signifying full ethical clearance and adherence to institutional research protocols. Immediately after, on January 24, 2025, informed consent forms were distributed to all prospective participants from both institutions. Alongside the consent forms, a Health Declaration Form and a Physical Activity Readiness Questionnaire (PAR-Q) were provided to ensure that students were medically cleared to perform the physical fitness activities. By February 5, 2025, all students had submitted the required documents, confirming their eligibility and willingness to participate in the study.

On February 10, 2025, the instructor-researchers conducted an orientation session to discuss the research background, rationale, and purpose, ensuring that all participants had a clear understanding of the study objectives. This was followed by a fitness test demonstration and practice session on February 14, 2025, during which participants were introduced to the mechanics and safety protocols of each physical fitness test. Students were given time to practice under supervision, allowing them to familiarize themselves with the procedures. Pre-testing officially commenced on February 18, 2025, and included a comprehensive battery of physical fitness assessments: Body Mass Index (BMI), waist circumference, waist-to-height ratio, waist-to-hip ratio, zipper test, V split-sit-and-reach, push-up test, plank hold, chalk jump, hexagon jump, 20-meter dash, ruler drop test, stork stand test, 3-minute Harvard step test, and the basketball pass test.

Upon completion of testing by March 15, 2025, participants submitted their individual results to the researchers for encoding. These results were systematically uploaded to the designated research data bank between March 16 and March 20, 2025, ensuring secure storage and accessibility. From April 1 to May 10, 2025, the research team reviewed, screened, and consolidated the collected data. This final phase focused on organizing the raw scores and computing new sets of normative values specific to Filipino learners' physical fitness levels. The entire process was completed by May 20, 2025, marking the conclusion of the study's implementation phase and the establishment of context-specific benchmarks for future physical fitness assessment.

To analyze the data collected from the descriptive-normative cross-sectional study, a series of appropriate statistical tools were employed to establish reliable and valid normative values contextualized to Filipino learners. Descriptive statistics, including mean, standard deviation, minimum, maximum, and frequency counts, were initially used to summarize participants' performance across all physical fitness test components. To create normative reference values, percentile ranks (e.g., 10th, 25th, 50th, 75th, and 90th percentiles) were computed, allowing for performance classification across a wide range of fitness indicators. Additionally, Z-scores were calculated to standardize individual test scores and identify deviations from the mean. To examine potential variations across sex and age groups, independent samples t-tests and one-way ANOVA were also performed where appropriate. The resulting data were used to generate normative tables specific to the Filipino context, offering a benchmark for interpreting physical fitness performance among learners aged 19 to 50. All analyses were conducted using IBM SPSS Statistics, ensuring accuracy in data processing and interpretation. These statistical procedures collectively supported the construction of evidence-based scoring standards tailored to the physical and cultural characteristics of the Filipino population.

Prior to data collection, written informed consent was obtained from all participants, ensuring that each student fully understood the research purpose, procedures, and scope of participation. The consent process included a clear explanation that involvement in the study was entirely voluntary, with no academic penalties or consequences for non-participation. Participants were encouraged to ask questions and were assured that their decision to join or decline would be respected. In addition, students were informed that they had the right to withdraw from the study at any point, even after submitting partial data. Should any participant decide to discontinue, their personal data would be immediately removed from the records and securely destroyed, upholding ethical standards and protecting their autonomy throughout the study.

In full adherence to the Data Privacy Act of 2012 (Republic Act No. 10173), the research team ensured that all personal information and health-related data collected from participants were treated with the highest level of confidentiality. No identifying information such as names or student IDs was used during data encoding or analysis. Instead, an anonymous coding system was implemented, where participants were assigned unique alphanumeric identifiers (e.g., S001, S002) to ensure privacy without compromising the integrity of the data. All data were stored securely in password-protected digital files, accessible only to the researchers. This strict confidentiality protocol aimed to protect participants' identity and ensure compliance with national data protection laws throughout the research process.

The physical fitness assessments included in this study posed minimal risk to participants, as all test items were age-appropriate, non-invasive, and aligned with standard physical education activities. Prior medical screening through health declaration forms helped to ensure participants' readiness and safety. The primary benefit for student participants was the opportunity to become more aware of their physical health through guided testing and feedback. Furthermore, the study aimed to contribute to the advancement of physical education in the Philippines by producing normative fitness values specific to Filipino learners, which may be used by educators and policymakers in curriculum development. By participating, students also contributed to research that promotes a culturally relevant and data-driven approach to fitness education.

RESULTS

Tables should be submitted as editable text and not as images. All tables and figures should be numbered sequentially based on their order of appearance in the text.

Table 1. *Title*

Title 1	**Title 2**	**Title 3**
entry 1	data	data
entry 2	data	data
entry 3	data	data

** Tables may have a footer.*

Figure 1. *Title*

DISCUSSION

CONCLUSION

The conclusion should briefly answer the objectives of the study. They are not repetitions of the discussions but are judgments of the results obtained.

Author Contributions

For papers with several authors, specify the individual contributions made you may refer to the CRedit Taxonomy (https://credit.niso.org/) for the term explanation. The following statement should be used "**Author 1**: Conceptualization, Methodology, Software; **Author 2**: Data curation, Writing- Original draft preparation; **Author 3**: Visualization, Investigation; **Author 4:** Supervision; **Author 5**: Software, Validation; **Author 6**: Writing-Reviewing and Editing."

Funding

Please add standard statements like: *“This research received no external funding”* OR *“This research was funded by FUNDER’S NAME, Grant Number."* Provide the proper name of the funding organization if that is applicable.

Ethical Approval

If applicable, the Ethical approval statement (NAME OF INSTITUTE, protocol code and date of approval) should be provided including statements regarding consent, *"Informed consent was obtained from all subjects involved in the study"* OR state *"Not applicable."*

Competing interest

Declare conflicts of interest or state *“The authors declare no conflicts of interest.”*

Data Availability

This can be stated as: *“Data will be made available by the corresponding author on request.”*

Declaration of Artificial Intelligence Use

Authors must disclose the use of generative AI and AI-assisted technologies in the writing process. *“In this work, the author(s) utilized artificial intelligence (AI) tools and methodologies, [NAME TOOL/SERVICE] to [REASON]. After using this tool/service, the author(s) evaluated and revised the content as necessary and take(s) full responsibility for the published content.”*

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