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THROUGHOUT TIME: A SYSTEMATIC REVIEW

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Exploration on the evolution of the purpose of fitness testing throughout time: A systematic review

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Abstract

The purpose of fitness testing has been unclear to Physical Education (PE) teachers and learners. This blurred understanding on the purpose of fitness testing may ripple the effect to problems like wasting allocated time for PE subject, misdirection of learning process, or worst physical injuries. The purpose of this study was to explore the purpose of fitness testing as evolved throughout time. The findings of this study revealed that fitness testing (purpose) served as (1) a component of natural selection – it was used for survival and mating processes, (2) an assessment of one's positionality – to understand strengths and weaknesses, and (3) a progressive assessment in physical education – an inclusive practice to assess health. Therefore, fitness testing is an inevitable component of human development, as human progress holistically, so as the fitness testing. If the demand and the usage change, so is the purpose of fitness testing. Educational agencies should prioritize training, guidelines, and all the support to the PE teachers in understanding the current purpose of fitness testing that is 'a progressive assessment in physical education' and should ensure that teachers promote and promulgate this understanding to the learners to implement fitness testing efficiently.

Keywords: Evolution; fitness testing; natural selection; physical education; positionality; progressive assessment

1. Introduction

The purpose of fitness testing is to assess one's level of fitness in various health- and skill-related components. Fitness testing has gone through the process of evolution where the purpose was intently for survival and mating. Later on, it went through the lenses of health, and inclusivity and accessibility (Colella & Monacis, 2021; Prystupa et al., 2019). However, the purpose is not well understood by its implementers especially in the context of the school. This misunderstanding could lead to ineffective implementation, wasting of time and effort, or worse injuries (Johnson et al., 2023; Simonton et al., 2019; Vaskov, 2022). With these, the researcher is committed to exploring the historical facts and the latest understanding on the purpose of fitness testing.

Apparently, in Singapore, even the structured implementation of fitness testing does not guarantee transfer of understanding on the real purpose of the tests. Though learners enjoy the process, enjoyment does not always mean that the test is effective (Ashley & Kawabata, 2023). In the United States of America, fitness testing fails to improve perceptions of middle schoolers toward physical education, defeating the purpose of having the fitness test the first place (Simonton et al., 2019). Moreover, Finnish schools often have negative connotations in fitness testing, making the test ineffective as it is perceived as risky instead of beneficial (Vaskov, 2022). These studies signify that fitness testing's failure is due to lack of understanding to the purpose and failure to explicitly present the purpose of having one.

In the context of the Philippine educational system for physical education, currently, teachers themselves have misunderstood the purpose of fitness testing. The reason behind this is probably because of the poor

quality or lacking for training how to conduct fitness testing (Tolentino et al., 2022). Moreover, Tolentino et al. (2022) expounded that the lack of training and understanding the purpose of the test resulted to teachers not being able to maximize the potential or benefit of fitness testing. Furthermore, with this misunderstanding on the purpose of the test, it resulted to misinterpretation of the test results and complicating the process of the assessment itself (Aquino, 2023). This made the researcher of the current study to pursue the topic for it is crucial for the mass physical education teachers of the Philippines to understand the purpose of the test, to maximize the potential of fitness testing in helping the learners assess their fitness levels.

Currently, the Philippine educational system is experiencing a 'conceptual gap.' This is about understanding the current purpose of fitness testing. This systematic review aims to unravel the purpose of fitness testing from the prehistory and the modern era. This comprehensive analysis on the literature will allow the researcher to identify not only the changes in fitness testing purposes over centuries but also to verify the forms these purposes have taken in various eras. By providing a broader historical context, this study helps explain the current misunderstandings and misapplications of fitness testing in Philippine schools, offering insights that can guide more effective educational strategies and policies.

1.1. Theory

This study utilized the evolutionary perspective theory, which is known to be popularized by Charles Darwin (Darwin, 1859). The theory explains the development of human behavior and physical traits over time. This process is termed as 'natural selection.' The theory extends to the assumption that the ancestors of the human race were able to survive because of their physical attributes and behaviors evolved, attaining to the demands of the environment. The evolutionary perspective has been applied to a wide range of human behaviors, from social interactions to health initiatives. According to Buss (2019) the human race survived because of its ability to form and select alliances and mates. These behaviors allowed humans to acquire resources, safeguard lives from threats, and reproduce.

In the context of fitness testing, the evolutionary perspective can provide insights into why physical fitness has been valued across different cultures and historical periods. As Lieberman (2021) discusses, physical fitness was crucial for our ancestors' ability to hunt, gather, and protect their communities. These activities required strength, endurance, and coordination, which are often measured in modern fitness tests. In this study, the evolutionary perspective explained the evolution of the purpose of fitness testing in respect to the needs of a certain population. By understanding the evolutionary roots of fitness, teachers especially those in the Philippines can better appreciate why certain fitness standards exist and how they have evolved to meet the changing demands of human societies. This perspective underscores the importance of physical fitness as not only a health measure but also a fundamental aspect of human survival and social organization.

1.2. Research question

This study explored the purpose of fitness testing as evolved throughout time. Specifically, this study sought to answer to these following questions:

How has the purpose of fitness testing evolved throughout time?

2. Methods

This study utilized a systematic review design. A systematic review design is a methodical and comprehensive approach for synthesizing research results to meet specific research questions. This approach involves a rigorous procedure for identifying, selecting, and assessing relevant research, as well as collecting and reviewing data from those studies (Munn et al., 2018; Page et al., 2021). Munn et al. (2018) assert that systematic reviews use clearly stated and methodical procedures, together with a process, to mitigate bias. In this study, the systematic review design was utilized to explore the evolution of the purpose of fitness testing throughout time.

This study delved into the 17 studies and literature about the purpose of fitness testing. Because of the nature of this study to investigate the purpose of fitness testing during the prehistoric era and then the modern era, the reviewed studies and literature ranges from publications happened in 1989 to 2023. The sources of this study were studies from the scientific papers with fields like anthropology, history, or a result of reviews.

This systematic review contains diverse populations from several continents, spanning from ancient eras to the current day. It includes individuals of all age groups, ranging from newborns to seniors, and embraces all genders. This study examines the presence of fitness testing, including both organized and informal methods, across various historical periods such as Prehistory, the Classical Era, the Middle Ages, the Early Modern Era, and the Modern Era. The paper explores the methodologies and principles of fitness testing, analyzing how different civilizations have implemented and established benchmarks according to their own criteria throughout time. The subject matter explores intricate aspects, objects, and diverse types of proof, such as those derived from archaeology, history, art history, epigraphy, numismatics, paleography, paleoanthropology, ethnoarchaeology, carbon dating, and contemporary textbooks. The evidence encompasses fitness criteria pertaining to birth, mating, hunting, working, leadership assignment, survival, conflict, and standardized fitness assessment. The review employs scientific methodologies such as archaeology and paleography to examine the prehistoric to early modern eras. In contrast, data from the contemporary age is derived from textbooks and periodicals.

The theory evolutionary perspective explained how the purpose of fitness testing evolved throughout time in respect to the demands or needs of a certain population. The evolutionary perspective helped explain the three emerging themes in the evolution of fitness testing: it has served as a component of natural selection, an assessment of one's societal position, and a progressive tool in physical education. For instance, fitness testing in the prehistoric era was crucial for survival and mating success (Cannon, 2009), while in modern times, it helps define occupational readiness and educational standards. This perspective highlights how fitness testing has continuously adapted to meet the evolving demands of human societies, emphasizing its role in enhancing physical prowess, societal integration, and health education.

3. Results and Discussion

This exploration is focused on the how has the purpose of fitness testing evolved throughout time. This review is focused on the evidence of the procedures of fitness testing – may it be unstructured or structured during the time of Prehistory, Classical Era, Middle Ages, Early Modern, and Modern Era and of all population. Procedures and concepts are about how people, during the mentioned eras, conduct and set standards on fitness based on society's guidelines. The methodologies and data gathering procedures outlined include systematic historical reviews of ancient documents, cross-cultural data analysis assessing mate preferences across 33 countries, and ethnographic observations alongside historical artifact analysis. Additionally, various physical fitness tests were implemented to evaluate components like cardiorespiratory

endurance and musculoskeletal fitness. Empirical testing and the establishment of performance standards using criterion-referenced outcomes were also conducted in military and educational settings.

The question that needs to be answered is ‘how has the purpose of fitness testing evolved throughout time?’ Upon the investigation of the researcher, it was found that there were three emerging themes based on the scrutinized literature and studies. The three themes are the following: 1) Component of Natural Selection, 2) Assessment of One’s Positionality, and 3) Progressive Assessment in Physical Education.

Table 1 summarizes these themes and the core ideas that emerged from the exploration, providing a structured overview of how the purposes of fitness testing have evolved across different historical periods and societal contexts.

Table 1. Evolution of the Purpose of Fitness Testing Throughout Time

Essential Themes	Core Ideas
Served as a Component of the Natural Selection	Predictor for Survival
	Predictor of Mating Success
Served as an Assessment of One’s Positionality	Determinant of Societal Status
	Assessment for Occupational Performance
Served as a Progressive Assessment in Physical Education	Assessment for fitness levels
	Physical Education’s Prime Mover

Served as a Component of Natural Selection. Fitness testing was found to be a component of natural selection in the human race during the prehistoric era. It is either used for survival or mating success (Cannon, 2009). The former explains that a person is considered fit if he/she has the ability to manipulate or use hunting tools, to hunt food (MacDonald, 2019), and to win fights/wars (Taçon & Chippindale, 1994). The latter explains that a person is considered fit if he/she is preferred by a mating partner or is able to attract others through quality of performance in hunting (Buss, 1989; Cannon, 2009).

Recent studies have provided comprehensive insights into the role of physical and genetic traits in natural selection and sexual selection. Talagala et al. (2024) demonstrated that assortative mating based on body size in fruit flies not only enhances reproductive success but also substantiates the importance of fitness traits in natural selection. Similarly, Okada et al. (2021) showed how natural selection mitigates the adverse effects of sexually selected traits, such as large mandibles in males, which, while attractive, may impair survival, thereby increasing female fitness indirectly. Delph et al. (2022) and Monnahan et al. (2021) further explored the genetic dimensions of this dynamic, revealing that certain male-favored genetic variants can compromise female survival, thus underscoring the complex interplay between genetic traits that benefit male mating success and those that may be detrimental to overall survival, highlighting a fundamental trade-off in evolutionary biology.

Moreover, studies by (Taipale et al., 2022) and Lombard (2021) reveal how innovations in weapon design significantly improved hunting efficiency and survival strategies in Europe and southern Africa, underscoring the direct link between weapon effectiveness and natural selection. Similarly, Lombard and Shea (2021) point out that advanced hunting technologies like spear throwers and darts, used during the Pleistocene in Africa, provided significant evolutionary advantages to those skilled in their use. Swinney and Crawford (2021) further connect the development of hunting skills to combat readiness, illustrating the enduring importance of hunting prowess across different periods and regions.

This theme is explicitly mentioned by several studies like:

“[...] importance of projectile technology is documented by the wide range of lithic, bone, antler and ivory points” (R5)

“[...] fighting is depicted in the rock art of western Arnhem Land... indicative of an increase in the complexity of social organization that began after the end of the last glaciation, between 4000-6000 years ago” (R6)

“[...] large mammal hunting that evidently occurred in California and the Great Basin during the late Holocene... the “show-off hypothesis” and the “efficiency-maximization hypothesis.” (R7)

Served as an Assessment of One’s Positionality. One’s position in the society is determined by the normality of physique or function of person. In the prehistoric era, in Sparta, babies’ physique are assessed during birth. If the baby shows defections, the government will abandon the baby. If the baby is healthy upon birth, then the baby has the opportunity to live and will enter the herd of the Sparta’s army at a legal age. At a legal age, still in Sparta, if the soldier ran away from a fight, seemingly not fit for a war, the soldier and the rest of his family will be humiliated and marginalized in the community (Pomeroy, 2009). In the modern, fitness testing served as an assessment to define one’s occupational position, it could be a role in a group or one’s readiness towards a specific task (Petrachkov & Zhembrovskyi, 2023; Richmond et al., 2008).

This is supported by studies conducted by numerous researchers throughout history. The studies show that physical fitness and qualities continue to influence social roles (Backerra & Edwards, 2021; Scheidel, 2021; Schilling, 2023; Wilke et al., 2022). In pre-modern cultures, status rivalry was based on gender performance and physical ability (Schilling, 2023), highlighting the significance of physical talents in social stratification. Physical health and size, which are seen as indicators of social supremacy, have always had an impact on social status, according to Wilke et al. (2022). Physical and genetic fitness influenced social hierarchies and reproductive success, as Scheidel (2021) delves more into, confirming fitness as a crucial factor in society roles. Furthermore, the importance of one’s physical appearance and behavior during ceremonies in early modern European courts was emphasized by Backerra and Edwards (2021), further demonstrating the function of physically in social status and role.

Additionally, several studies, including those by Orr et al. (2022), Frey-Law et al. (2022), Dicks et al. (2023), and Newman et al. (2022), highlight the critical importance of fitness evaluations in high-risk occupations, such as the police force, firefighters, and the military. Taken as a whole, these studies show how important fitness tests are for gauging potential for a profession, lowering the chance of injury, and keeping oneself healthy in general. These tests include anaerobic power, cardiovascular fitness, and muscular endurance (Orr et al., 2022). As an example, the United States Army and the firefighting services use individualized fitness assessments to determine the overall preparedness of their members and to establish a direct correlation between operational performance and combat readiness and physical ability (Dicks et al., 2023; Frey-Law et al., 2022). Emphasizing the vital importance of fitness in occupational performance and safety across numerous demanding professions, these tests guarantee that only persons who satisfy precise physical criteria are judged competent for particular tasks (Newman et al., 2022).

This theme is explicitly mentioned by several studies like:

“[...] Ancient Greece examined the newborns. The vitality of male infants and their potential as soldiers determined whether they would be raised or abandoned.” (R1)

“[...] the formation of physical readiness of officers to acquire capabilities for performing combat tasks as assigned” (R9)

“[...] Royal Air Force (RAF) has been working towards developing role-related physical tests for use as an operational fitness test (OFT)” (R12)

Served as a Progressive Assessment in Physical Education. In the 21st century and in the field of education, fitness testing has become formal. It was in fact made inclusive. The fitness testing served as an assessment and evaluation on a person’s current fitness level (Blair et al., 1983; Stodden et al., 2009). In this time, there were already numerous forms of fitness testing popularized and developed by prestigious organizations and institutions. It was done to assess the fitness levels of all populations (children, teenagers, adult, senior, and population with special needs) (Langhammer & Stanghelle, 2015; Stodden et al., 2009; Winnick & Short, 2005). Fitness testing also served as one of the major chunks of today’s Physical Education curriculum. Fitness testing has gone the process of evolution and is still evolving to provide opportunities for all in terms of assessing one’s fitness level or determining health statues (Bai, 2016; Plowman et al., 2006; Welk, 2017).

Furthermore, the importance of fitness testing in tracking and improving students' physical ability and health has been highlighted in recent research on its incorporation into educational curriculum. By integrating fitness measurements into evidence-based PE programs, Colella and Monacis (2021) showed that children and adolescents' strength capabilities significantly improved. Correlating biological development with physical fitness and highlighting the significance of frequent assessments, Lutkovskaya et al. (2021) similarly emphasized the essentiality of fitness testing for monitoring the physical and motor skill development of school-aged kids. In order to make sure these assessments are fair and useful for all students, Vaskov (2022) addressed the difficulties of using mobility testing in PE classrooms. In addition, Jungjohann and Gebhardt (2023) explored the function of fitness evaluations in inclusive education frameworks that are used in the classroom. Their goal was to create tools that could be used to evaluate and improve the educational experience for all students, especially those with special needs, and ultimately lead to better learning outcomes for everyone.

This theme is explicitly mentioned by several studies like:

“[...] American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) developed a new fitness test to emphasize health-related physical fitness” (R10)

“[...] physical fitness assessment, activity promotion, and feedback system for students, teachers, and parents to encourage lifelong physical activity and lifetime health-related physical fitness.” (R14)

“[...] conceptual framework for the Brockport Physical Fitness Test (BPFT)... process used for personalizing health-related criterion-referenced physical fitness testing and assessment for youngsters with disabilities.” (R17)

As we continue to improve the role and use of fitness testing, it is important to remember what it was used for in the beginning and how it is changing over time. Fitness testing has been an important part of natural selection and society's structure for a long time, figuring out how fit people are for life, battle, and having children. This historical example shows that fitness tests are still useful in modern times, especially when it comes to finding people who are fit to work in dangerous jobs and in schools. This change is shown by the fact that exercise testing has grown and is now an official and open part of the school curriculum. Adding kids, teens, adults, seniors, and people with special needs to the list of people who can be tested for fitness makes the tests more flexible and better able to give general assessments of physical health and skills. This change not only helps figure out how fit someone is, but it's also very important for supporting physical education and health for life. As time goes on, it is important to keep improving these tests to make sure they are still useful, fair, and able to meet the different needs of all groups. This will help create an environment where fitness testing can lead to better health outcomes and more social integration.

4. Implication and Future Direction

This chapter presents the implications of the results and the future directions of the study. This chapter was based on what the results have prompted and the possible recommendations this study can provide to continue the professional conversation on the topic ‘purpose of fitness testing.’

4.1. Implication

The findings of this study unraveled the purpose of fitness testing throughout time. The purpose of fitness testing 1) served as a component of natural selection, 2) served as an assessment of one's positionality, and 3) served as a progressive assessment in Physical Education.

The first theme, which is fitness testing ‘served as a component of natural selection’ provides information that, originally, physical standards were important aspects of the human race even before. These standards are literal physical prowess and attributes of a person or one's ability to use tools specifically for hunting and

warfare. These made the human race flourish, making 8.1 billion people. Apparently, there is now an on-going world movement about body positivity. This movement helps people, especially those obese, overweight, skinny, and those having issues with their bodies, to accept oneself. This is one of the most beautiful movements out there helping the world to eradicate discrimination like body shaming. However, people should not be confused with this movement to romanticize poor health for one can have body positivity movement towards a healthy body. There should also be a clear line that when talking about healthy body, it does not always mean skinny. Instead, it is about engaging to physical activity to be healthy, balancing diet to maintain and track weight, and having checkups and recommendations from a medical professional. This is to remind everyone that one of the main reasons why people survived up until this day is because of their physical prowess and abilities.

The second theme states that fitness testing 'served as an assessment of one's positionality.' In the past, fitness served as one's entrance ticket to be part of society. This harsh reality can be traced in ancient Sparta where babies with weak physical attributes will be left abandoned. In the modern era, fitness testing serves the same purpose but in a different manner. For instance, before entering the army, one must go through the process of fitness testing to assess whether or not an applicant is ready for the demands of the army training. The same purpose is given to other forces, but fitness testing may be used as role identifier. In normal people, fitness testing is used to position oneself in terms of level of fitness. This provides an idea that fitness testing helps an individual to assess oneself and know the strengths and weaknesses in terms of components of health- and skill-related fitness. With this, an individual is given the opportunity to access the assessment and administer it during their preferred time and place. Though it does not really follow that if you performed well on the tests, you are a healthy individual. One should understand that guidance from the medical experts is still the top source of health assessment.

Finally, the third theme states that fitness testing 'served as a progressive assessment in physical education.' One must understand that one of the core components and a must have in the PE curriculum is fitness testing. Currently, fitness testing is becoming inclusive as there are already existing adaptive tests for those learners or people with special needs. This means that fitness testing is just around the corner. The latest purpose of fitness testing is to 1) help learners know that fitness testing is an accessible assessment that one can administer on one's preferred time and place, 2) help assess one's level in terms of health and sports performance, 3) help learners understand that fitness test is comprised of crucial components that need to be improved and that improvement of these components shall extend even outside the school premise. For teachers, these purposes mean that fitness testing should result to a long-term commitment towards health improvement.

These findings from the study provide an in-depth understanding of how fitness testing has evolved to adapt to changing societal norms and policies. This evolution signifies a pivotal shift towards inclusivity, ensuring that fitness assessments are designed to cater to individuals with diverse needs and circumstances, reflecting a broader societal commitment to accessibility and equity in health-related practices. This approach not only accommodates but also empowers all individuals by recognizing and adapting to varied physical capabilities and conditions, promoting a healthier society overall (Esmonde & Jette, 2021). Furthermore, the study underscores the perennial importance of physical prowess, highlighting how different societies and cultures have historically valued physical fitness not just for survival but also as a significant determinant of social standing and success. This ongoing relevance of physical attributes demonstrates that fitness is not only about personal health but also plays a critical role in societal structures and interactions, influencing social mobility and status (Colella & Monacis, 2021).

Additionally, the advancements in the convenience and accessibility of fitness testing have facilitated more tailored and effective training programs. Modern fitness assessments can now be integrated seamlessly into daily routines, enabling continuous monitoring and immediate feedback. This accessibility helps individuals

and trainers to make informed decisions about training regimens, thereby optimizing training outcomes and enhancing overall physical preparedness over time. The impact of these developments extends beyond individual fitness to influence broader public health strategies, ultimately leading to a more health-conscious society (Ye & Shao, 2022).

4.2. Future direction

For administrative personnel of the Department of Education and of Curriculum Development-Special Curricular Programs Division (BCD-SCPD), the researcher recommends the full and strict implementation of fitness testing to every school. There should be complete guidelines and training for teachers as to how to analyze and report the data gathered from the fitness test. There should be complete materials provided to all PE/MAPEH teachers administering the tests. These materials include but not limited to metronome, measuring tapes, scoring sheet/scorecards, physical activity readiness questionnaire (PAR-Q), health declaration file, push-up sensors, stopwatch, speaker and microphone, printer, and any other relevant materials for fitness testing.

For future researchers, one may look into embracing indigenous materials supporting the administration of fitness testing to improve accessibility of the test. Researchers may explore new testing procedures that are the same in terms of validity and reliability of the current existing tests. Another, researchers may look into the possibilities of making the tests more inclusive through identifying contextualized standards on all special needs/cases. This may also include moderating variables like ages, weights, diet, metabolism, and the like. Researchers from different races should also devise their own contextualized fitness testing without anchoring to the tests of other countries.

For physical education teachers in the Philippines, the researcher recommend that one should devise a strategy on how to present, inculcate, and practice as part of one's routine the purpose of fitness testing. This may also prompt new research on the perceptions of learners on the purpose of fitness testing.

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References

- Aquino, J. M. (2023). Teachers' management in implementation of CHED Memorandum Order (CMO) 39, series of 2021 towards the achievement of students' learning outcomes in physical education. *Physical Education and Sports: Studies and Research*, 2(1), 26–43. <https://doi.org/10.56003/pessr.v2i1.190>
- Ashley, B. B., & Kawabata, M. (2023). Students' perceptions of fitness testing in physical education across primary, secondary, and pre-university school levels: a motivational profiles perspective. *Physical Education and Sport Pedagogy*, 28(1), 76–93. <https://doi.org/10.1080/17408989.2021.1953458>
- Backerra, C., & Edwards, P. (2021). Introduction: Rank and Ritual in the Early Modern Court. *The Court Historian*, 26(1), 1–10. <https://doi.org/10.1080/14629712.2021.1887598>
- Bai, Y. (2016). *School fitness assessment and promotion: state and national evaluations with FITNESSGRAM*. <https://lib.dr.iastate.edu/etd/15142>
- Blair, S. N., Falls, H. B., & Pate, R. R. (1983). A new physical fitness test. *Physician and Sportsmedicine*, 11(4), 87–95. <https://doi.org/10.1080/00913847.1983.11708510>
- Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, 12(1), 1–14. <https://doi.org/10.1017/S0140525X00023992>

- Cannon, M. (2009). When Should We Expect to See Hunting as Mating Effort? *California Archaeology*, 1(1), 79–91. <https://doi.org/10.1179/cal.2009.1.1.79>
- Colella, D., & Monacis, D. (2021). Assessing the Evolution of Physical Fitness in Children and Adolescents for Evidence-Based Teaching. *Advances in Physical Education*, 11(02), 183–194. <https://doi.org/10.4236/ape.2021.112014>
- Darwin, C. (1859). *On the origin of species: facsimile of the first edition*.
- Delph, L. F., Brown, K. E., Ríos, L. D., & Kelly, J. K. (2022). Sex-specific natural selection on SNPs in *Silene latifolia*. *Evolution Letters*, 6(4), 308–318. <https://doi.org/10.1002/evl3.283>
- Dicks, N. D., Brin, H. N., Perumal, M. D., Hutcheson, E. L., Kopp, S. R., Walch, T. J., Carper, M. J., & Barry, A. M. (2023). Customized Occupational-Specific Graded Exercise Test for Structural Firefighters. *Journal of Occupational & Environmental Medicine*, 65(1), 29–33. <https://doi.org/10.1097/JOM.0000000000002650>
- Esmonde, K., & Jette, S. (2021). ‘We are Not a Nation of Softies, But We Could Become One’: Exploring the Materiality of Fitness Testing in the President’s Council on Youth Fitness. *Somatechnics*, 11(3), 395–412. <https://doi.org/10.3366/soma.2021.0367>
- Frey-Law, L. A., Bhatt, R., Schneider, R., Laguna Mosqueda, G., Tena Salais, M., Evans, L., & Abdel-Malek, K. (2022, August 23). Modeling ability to perform common soldier tasks based on the Army Combat Fitness Test dead lift. *Proceedings of the 7th International Digital Human Modeling Symposium -*. <https://doi.org/10.17077/dhm.31784>
- Horowitz, B. N. (2020). Daniel E. Lieberman Exercised: Why Something We Never Evolved to do Is Healthy and Rewarding. In *Evolution, Medicine, and Public Health* (Vol. 2020, Issue 1). Routledge. <https://doi.org/10.1093/emph/eoaa040>
- Johnson, A. M., Kroshus, E., Hafferty, K. R., Senturia, K., Garrett, K. A., & Tandon, P. S. (2023). Improving Use of Physical Fitness Testing Data in Middle Schools to Inform Equitable School-wide Physical Activity Practices: A Mixed-methods Approach. *American Journal of Health Education*, 54(1), 50–61. <https://doi.org/10.1080/19325037.2022.2142340>
- Jungjohann, J., & Gebhardt, M. (2023). Dimensions of Classroom-Based Assessments in Inclusive Education. *International Journal of Special Education (IJSE)*, 38(1), 131–144. <https://doi.org/10.52291/ijse.2023.38.12>
- Langhammer, B., & Stanghelle, J. K. (2015). The Senior Fitness Test. *Journal of Physiotherapy*, 61(3), 163. <https://doi.org/10.1016/j.jphys.2015.04.001>
- Lieberman, D. (2021). *Exercised: Why something we never evolved to do is healthy and rewarding*. Vintage.
- Lombard, M. (2021). Variation in hunting weaponry for more than 300,000 years: A tip cross-sectional area study of Middle Stone Age points from southern Africa. *Quaternary Science Reviews*, 264, 107021. <https://doi.org/10.1016/j.quascirev.2021.107021>
- Lombard, M., & Shea, J. J. (2021). Did Pleistocene Africans use the spearthrower-and-dart? *Evolutionary Anthropology: Issues, News, and Reviews*, 30(5), 307–315. <https://doi.org/10.1002/evan.21912>
- Lutkovskaya, O., Minenok, E., Antipin, N., Spashchanskaya, V., Prokopkina, S., & Yushchenko, A. (2021). 21st Century: Physical Fitness of School Age Students. *BIO Web of Conferences*, 29, 01015. <https://doi.org/10.1051/bioconf/20212901015>
- MacDonald, K. (2019). *Strong Differences Between Neanderthals and AMHs Cannot Be Inferred from Ethnographic Evidence for Skill and Learning in Hunting*. 149–158. https://doi.org/10.1007/978-981-13-8980-1_10
- Monnahan, P. J., Colicchio, J., Fishman, L., Macdonald, S. J., & Kelly, J. K. (2021). Predicting evolutionary change at the DNA level in a natural *Mimulus* population. *PLOS Genetics*, 17(1), e1008945. <https://doi.org/10.1371/journal.pgen.1008945>
- Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, 18(1), 143. <https://doi.org/10.1186/s12874-018-0611-x>
- Newman, A., Armonda, A., & Braun, B. (2022). Evaluation of Two Training Programs Designed to Enhance Performance on the Army Combat Fitness Test Among ROTC Cadets. *Military Medicine*, 187(9–10), e1030–e1036. <https://doi.org/10.1093/milmed/usac015>
- Okada, K., Katsuki, M., Sharma, M. D., Kiyose, K., Seko, T., Okada, Y., Wilson, A. J., & Hosken, D. J. (2021). Natural selection increases female fitness by reversing the exaggeration of a male sexually selected trait. *Nature Communications*, 12(1), 3420. <https://doi.org/10.1038/s41467-021-23804-7>
- Orr, R. M., Lockie, R., Milligan, G., Lim, C., & Dawes, J. (2022). Use of Physical Fitness Assessments in Tactical Populations. *Strength & Conditioning Journal*, 44(2), 106–113. <https://doi.org/10.1519/SSC.0000000000000656>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, n71. <https://doi.org/10.1136/bmj.n71>
- Petrachkov, O., & Zhembovskiy, S. (2023). The Peculiarities of Physical Fitness Test System of the British Armed Forces. *Scientific Journal of National Pedagogical Dragomanov University. Series 15. Scientific and Pedagogical Problems of Physical Culture (Physical Culture and Sports)*, 6(6(166)), 126–131. [https://doi.org/10.31392/npu-nc.series15.2023.6\(166\).27](https://doi.org/10.31392/npu-nc.series15.2023.6(166).27)
- Plowman, S., Sterling, C., Corbin, C., Meredith, M., Welk, G., & Morrow, J. (2006). The History of FITNESSGRAM ® FITNESSGRAM ® FITNESSGRAM. *Journal of Physical Activity and Health*, 3. <https://doi.org/10.1123/jpah.3.s2.s5>
- Pomeroy, S. B. (2009). *A Brief History of Ancient Greece: Politics, Society, and Culture*. <http://ci.nii.ac.jp/ncid/BA90420663>
- Prystupa, E., Chekhovska, L., Zhdanova, O., & Chekhovska, M. (2019). Genesis and content of fitness: theoretical and methodological analysis. *Sport i Turystyka. Środkowoeuropejskie Czasopismo Naukowe*, 2(1), 147–161. <https://doi.org/10.16926/sit.2019.02.09>
- Richmond, V. L., Rayson, M. P., Wilkinson, D. M., Carter, J. M., Blacker, S. D., Nevill, A., Ross, J. Du, & Moore, S. (2008). Development of an operational fitness test for the Royal Air Force. *Ergonomics*, 51(6), 935–946. <https://doi.org/10.1080/00140130801939725>
- Scheidel, W. (2021). Fitness and Power: The Contribution of Genetics to the History of Differential Reproduction. *Evolutionary*

- Psychology*, 19(4), 147470492110665. <https://doi.org/10.1177/14747049211066599>
- Schilling, C. (2023). Gender and Status in Competition in Pre-Modern Societies ed. by Martha Bayless, Jonas Lilequist and Lewis Webb (review). *Parergon*, 40(1), 237–238. <https://doi.org/10.1353/pgn.2023.a905422>
- Simonton, K. L., Mercier, K., & Garn, A. C. (2019). Do fitness test performances predict students' attitudes and emotions toward physical education? *Physical Education and Sport Pedagogy*, 24(6), 549–564. <https://doi.org/10.1080/17408989.2019.1628932>
- Stodden, D., Langendorfer, S., & Robertson, M. A. (2009). The Association Between Motor Skill Competence and Physical Fitness in Young Adults. *Research Quarterly for Exercise and Sport*, 80(2), 223–229. <https://doi.org/10.1080/02701367.2009.10599556>
- Swinney, R., & Crawford, S. (2021). Medieval Hunting as Training for War Insights for the Modern Swordsman. *Acta Periodica Duellatorum*, 2(1), 179–194. <https://doi.org/10.36950/apd-2014-006>
- Taçon, P., & Chippindale, C. (1994). Australia's Ancient Warriors: Changing Depictions of Fighting in the Rock Art of Arnhem Land, N.T. *Cambridge Archaeological Journal*, 4(2), 211–248. <https://doi.org/10.1017/S0959774300001086>
- Taipale, N., Chiotti, L., & Rots, V. (2022). Why did hunting weapon design change at Abri Pataud? Lithic use-wear data on armature use and hafting around 24,000–22,000 BP. *PLOS ONE*, 17(1), e0262185. <https://doi.org/10.1371/journal.pone.0262185>
- Talagala, S., Rakosy, E., & Long, T. A. F. (2024). Sexual selection and the nonrandom union of gametes: retesting for assortative mating by fitness in *Drosophila melanogaster*. *Evolution*, 78(1), 26–38. <https://doi.org/10.1093/evolut/qpad191>
- Tolentino, J. C., Gregorio, J. D., Dimaricut, A. L., & Uy, G. L. (2022). Fitness status of visually impaired learners in the Philippines: A sequential explanatory analysis. *International Journal of Multidisciplinary: Applied Business and Education Research*, 3(8), 1589–1599. <https://doi.org/10.11594/ijmaber.03.08.22>
- Vaskov, Y. (2022). Improving Physical Fitness Assessment through Movement Tests: Overcoming Implementation Challenges in General Educational Schools. *Physical Culture, Recreation and Rehabilitation*, 1(2), 38–41. <https://doi.org/10.15561/physcult.2022.0205>
- Welk, G. J. (2017). The Intersections of Science and Practice: Examples From FitnessGram® Programming. *Research Quarterly for Exercise and Sport*, 88(4), 391–400. <https://doi.org/10.1080/02701367.2017.1377485>
- Wilke, L., Boeker, S., Mumm, R., & Groth, D. (2022). Social status influences human growth. *Human Biology and Public Health*, 3. <https://doi.org/10.52905/hbph2021.3.22>
- Winnick, J. P., & Short, F. X. (2005). Conceptual framework for the Brockport Physical Fitness Test. *Adapted Physical Activity Quarterly*, 22(4), 323–332. <https://doi.org/10.1123/apaq.22.4.323>
- Ye, W., & Shao, X. (2022). Status Quo Analysis of Physical Fitness Test Data Based on Health Monitoring. *Computational and Mathematical Methods in Medicine*, 2022, 1–13. <https://doi.org/10.1155/2022/3931404>

