Deanship of Graduate Studies

Al-Quds University

Associations between motor coordination and cardiorespiratory fitness with academic achievement in school students (11-13 years) in the West Bank/Palestine

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M.Sc. Thesis

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Associations between motor coordination and cardiorespiratory fitness with academic achievement in school students (11-13 years) in the West Bank/Palestine

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Thesis Approval

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Dedication

First and foremost, I would like to thank God for your guidance, strength, mental power, and protection and for providing me with an excellent life.

This research is entirely dedicated to my dear family; they gave me strength and emotional support.

I dedicate this work to my husband Abdallah Abu Rajab, my son Yaqoub, and my daughter Shahed, Jana, and Saja for their constant encouragement and support as I finish my academic journey.

This thesis is mainly dedicated to Dr. Hadeel Halaweh, who supported me during the writing of my thesis and helped me stay motivated.

Thank you to Al-Quds University students and teachers for constantly inspiring me to become a better student.

Declaration

This thesis is submitted in partial fulfillment of the requirement for the Master's degree in physical therapy.

I declare that the content of this thesis (or any part of the same) has not been submitted for a higher degree to any other University or institution.

Signed WAFA

Date: 8/7/2023

Acknowledgment

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Associations between motor coordination and cardiorespiratory fitness with Academic Achievement in school students (11-13 years) in the West Bank/Palestine

Prepared by: Wafa Abed Almote Tanineh

Supervisor: Dr. Hadeel Halaweh

Abstract:

Background:

Children make up about half of the population in Palestine. Children in schools face numerous academic difficulties regarding academic achievement, and vital factors that may help children attain better academic achievement are good motor coordination and cardiorespiratory fitness.

Objectives: This study aimed to investigate the association between motor coordination and cardiorespiratory capacity with academic achievement among school students (11—13 years) in the West Bank/Palestine**.**

Methods: a cross-sectional study was conducted with a total of 252 students (11–13 years old) from various private schools in villages northwest of Jerusalem and the city of Ramallah. The sample was divided into two equal groups (males and females) using a stratified random sample. Motor coordination and physical fitness measures were evaluated by the flamingo balance test, plate tapping test, alternative wall toss test, and modified bass dynamic balance test. Cardiorespiratory fitness was evaluated by the 3-minute step test. Academic performance was obtained through students' grade point average (GPA) scores at the end of the school previous year and the current year, additionally, the rate of subjects: mathematics, language (Arabic), and foreign language (English) was recorded and computed. The Mann-Whitney Test, Kruskal Wallis Test, and Spearman's rank correlation coefficient were used to examine the association between motor coordination and cardiorespiratory capacity and academic achievement variables. The statistical significance level was set at $p<.05$.

Results: There was a significant correlation between academic achievement and motor coordination (p=.00), and cardiorespiratory capacity (p=.00) among school students (11-13

years). A linear regression result indicated that a significant correlation was recorded between Modified balance, Alternate Hand Wall Toss (AHWT), three minutes, The number of study hours per day for the student, and grade point average current year ($p<.05$). In addition, there is a statistically significant correlation ($p=.00$) between fine and gross coordination. Also, students who practice physical activity and sports had better coordination, cardiorespiratory capacity, and academic achievement compared to students who don't ($p=.00$).

Conclusion: This study showed that motor coordination and cardiorespiratory capacity among school students positively correlated academic achievement. Therefore, promoting physiotherapy and physical activity interventions to enhance cardiorespiratory capacity and motor coordination in school students is recommended and encouraged.

Keywords: Motor control, Physical fitness, Academic performance, school students, Primary education, EUROFIT battery of tests.

الارتباط بين التناسق الحركي واللياقة القلبية التنفسية مع التحصيل الدراسي لدى طلاب المدارس (11-13 سنة) في الضفة الغربية / فلسطين

الإعداد: وفاء عبدالمعطي طنينه

اشراف : د. هديل حلاوة

ملخص عن الدراسة باللغة العربية

المقدمة: يشكل الأطفال حوالي نصف سكان فلسطين. يواجه الأطفال في المدارس العديد من الصعوبات الأكاديمية فيما يتعلق بالتحصيل الأكاديمي ، والعوامل الحيوية التي قد تساعد الأطفال على تحقيق تحصيل أكاديمي أفضل هي التناسق الحركي الجيد واللياقة القلبية التنفسية.

الأهداف:هدفت هذه الدراسة إلى معرفة العلاقة بين التناسق الحركي والقدرة التنفسية القلبية مع التحصيل الدراسي لدى طلاب المدارس (11-13 سنة) في الضفة الغربية / فلسطين.

المنهج المتبع للدراسة : تم إجراء دراسة مقطعية على إجمالي 252 طالباً (11-13 سنة) من مختلف المدارس الخاصة في القرى الواقعة شمال غرب القدس ومدينة رام الله. تم تقسيم العينة إلى مجموعتين متساويتين (ذكور وإناث) باستخدام عينة عشوائية طبقية. تم تقييم مقاييس التناسق الحركي واللياقة البدنية من خلال اختبار flamingo balance test, plate tapping test, alternative wall toss test, and modified bass dynamic balance test. , وتم تقييم اللياقة القلبية التنفسية من خلال اختبارThe 3-minute step test . تم الحصول على التحصيل الأكاديمي من خلال متوسط درجات الطلاب في نهاية العام الدراسي السابق والعام الحالي ، بالإضافة إلى تسجيل معدل المواد: الرياضيات واللغة (العربية) واللغة الأجنبية (الإنجليزية). تم استخدام The Mann-Whitney Test, Kruskal Wallis Test, and Spearman's rank correlation coefficient لفحص الارتباط بين التناسق الحركي والقدرة التنفسية للقلب ومتغيرات التحصيل الدراسي وتم تعيين مستوى الدلالة الإحصائية عند $p <.05$.

نتائج الدراسة: توجد علاقة ارتباط معنوية بين التحصيل الدراسي و التناسق الحركي ($p = .00$) والقدرة التنفسية القلبية ($p = .00$) بين طلاب المدارس (11-13 سنة). تم تسجيل ارتباط معنوي بين Modified balance, Alternate Hand Wall Toss (AHWT), three minutes ، وعدد ساعات الدراسة في اليوم للطالب ، ومتوسط درجة العام الحالي ($p <.05$). بالإضافة إلى ذلك ، هناك علاقة ذات دلالة إحصائية ($p = .00$) بين Gross and fine motor coordination ، كما أن الطلاب الذين يمارسون النشاط البدني والرياضة كان لديهم تناسق وقدرة قلبية تنفسية وإنجاز أكاديمي أفضل مقارنة بالطلاب الذين لا يمارسون النشاط البدني ($p = .00$).

الإستنتاج: أظهرت هذه الدراسة أن التناسق الحركي والقدرة التنفسية القلبية لدى طلاب المدارس تؤثر بشكل إيجابي على التحصيل الدراسي. لذلك ، يوصى بتشجيع تدخلات العلاج الطبيعي والنشاط البدني لتعزيز القدرة التنفسية القلبية والتناسق الحركي لدى طلاب المدارس.

الكلمات المفتاحية: التحكم الحركي ، اللياقة البدنية ، الأداء الأكاديمي ، طلاب المدارس ،التعليم الابتدائي، مجموعة اختبارات EUROFIT.

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1-1 Introduction

Children in elementary school make up a large part of the world, the population in Palestinian is Young, and more than One-third of the Population is less than 15 Years, the percentage of individuals aged (0-14) years constituted 38% of the total population in mid-2022, of whom 36% were in the West Bank and 41% in Gaza Strip(Bureau 2022). Fitness has several advantages for both mental and physical health and is very important for children to develop and achieve, and one of the factors that help children develop effectively is to have good motor coordination and cardiorespiratory fitness (Esteban-Cornejo et al. 2014).

Motor skills are the basic internal mechanisms that allow the body or portions of the body to move in space, and they involve both motions and the cognitive processes that result in movements(Cameron et al. 2016). Children's motor skill development incorporates many body systems such as sensory, musculoskeletal, cardiorespiratory, and neurological systems, and the child's ability to interact with the environment(Lopes et al. 2013). Motor coordination is" defined as the capacity to efficiently control the degrees of freedom of the different segments that are involved in the motion and activate multiple muscles at the appropriate time and with the proper amount of force so that a smooth, efficient, and accurate motion occurs"(Chagas, Leporace, and Batista 2016). Although roughly 6-13% of all school-age children have poor motor coordination, still problems with fine and gross motor abilities are frequently disregarded as developmental issues(Katagiri et al. 2021). Furthermore, motor coordination has recently been deliberated that motor coordination is more than just a matter of children's general motor development. It has been proposed, that motor coordination scores are related to academic achievement in children (Chagas, Leporace, and Batista 2016).

Additionally, related similar studies have demonstrated a beneficial relationship between cardiorespiratory fitness (CRF) with academic achievement (AA) (García-Hermoso et al. 2017; Marques et al. 2018; Oliveira et al. 2017; Pate et al. 2020; Santana et al. 2017). Physical fitness is an important health indicator both in childhood and later in life, the cardiorespiratory element of physical fitness has been shown to improve mental and physical health in children (Esteban-Cornejo et al. 2014).

Cardiorespiratory fitness (CRF) is defined as “the ability to deliver oxygen from the environment to the mitochondria to perform physical work"(Fan et al. 2021). Besides this, CRF measures an individual's ability to perform whole-body physical activities such as walking, running ---and, etc (Pate et al. 2020)

Academic achievement is identified to be the level of knowledge, skill, and behavior demonstrated by a student in a subject, or course when compared to the norm and by the certifications provided by teachers(Escolano-Pérez and Bestué 2021). Many factors may influence students' academic achievement, such as socioeconomic status, screen time, etc(García-Hermoso et al. 2017).However, the scope of our study is to investigate the relationship between motor coordination, and cardiorespiratory with academic achievement based on the average grades in the language and mathematics classes.

1-2 Problem statement

Students in schools have several academic challenges in terms of academic achievement, with both students and parents continually under pressure to improve academic achievement. As a result, it would be important to address critical factors that may contribute to academic achievement focusing on the association between motor coordination, and cardiorespiratory with academic achievement.

In the West Bank (Palestine), the number of elementary schools is constantly increasing and they are one of the most important. In Palestine, there is still limited research in this field and a need to determine factors that may contribute to academic achievement levels among elementary school children.

1-3 Study justification

Various factors may influence students' academic achievement, such as socioeconomic status, screen time, etc. However, the scope of our study is to investigate the relationship between motor coordination, and cardiorespiratory with academic achievement.

In Palestine, there is still a gap and a lack of studies that investigate the relationship between motor coordination, and cardiorespiratory with academic achievement. Especially with the

increased number of elementary school students, it is necessary to study this topic that may help the students to better academic achievement. Also, the family can improve coordination and cardiorespiratory with inexpensive activities, and these activities can contribute positively to academic achievement

1-4 Study hypotheses

- There is a statistically positive significant correlation between academic achievement and cardiorespiratory capacity among school students (11-13 years).
- There is a statistically positive significant correlation between academic achievement and motor coordination (the flamingo balance test, alternative wall toss test)
- There is negative significant correlation between academic achievement and (plate tapping test and modified bass dynamic balance test) among school students (11—13 years).

1-5 Study objectives

- To investigate the association of motor coordination and academic achievement among school students (11-13 years).
- To investigate the relationship between cardiorespiratory capacity and academic achievement among school students (11-13 years).

1-6 Terminology & Abbreviation

- CRF: cardiorespiratory fitness
- AA: academic achievement
- MC: motor coordination
- PISA: International Student Assessment Program
- PF: physical fitness
- GPA: grade point average
- AHWT: Alternate Hand Wall Toss
- 3MST :3 Minute Step Test
- HR: heart rate
- PA: physical activity

Chapter Two
Literature Review

2.1 Theoretical Framework

2.2 Similar Studies

2-1 Theoretical studies:

2-1-1 Children

Children make up about half of the population in Palestine, by the middle of 2022, the Palestinian central bureau of Statistics indicated that there are about 2.35 million children in Palestine, 1.20 million of them males and 1.15 million females. In Palestine, children comprise 43.9% of the population (47.3% in the Gaza Strip and 41.7% in the West Bank). Students make up almost a quarter of the population of Palestine, approximately 1.34 million students were studying in schools for the 2020–2021 academic year, of whom 1.078 million were elementary school students (50.8% of whom were male and 49.2% were female), and 260 thousand were secondary school students (45.0% of whom were male and 55.0% were female)(H.E. Dr. Awad, highlights the Palestinian children's situation on the Occasion of the Palestinian Child Day, 05/04/2022. n.d.). Children in schools face numerous academic difficulties regarding academic achievement, where both children and parents are constantly under pressure to enhance better academic achievement(Batez et al. 2021). Therefore, it would be necessary to address vital factors that may contribute to academic achievement focusing on the association between motor coordination, and cardiorespiratory with academic achievement.

2-1-2 Motor coordination

Motor proficiency is essential and effective in a child's school preparation. The deficit can affect student achievements. In elementary school children, motor skill performance is a predictor of academic achievement(da Silva Pacheco et al. 2016). Motor coordination is one of the most essential factors used to determine a child's developmental growth(Guillamón, Cantó, and García 2021). It is known that children who have a significant delay in the development of fine and gross motor coordination may fail to gain academically (Chagas, Leporace, and Batista 2016). And, higher-order cognitive skills are required for motor skills, and a clear connection between these skills has been shown in typically developing children (Katagiri et al. 2021). Evidence suggests that it may be possible to hypothesize relationships between motor coordination and academic achievement levels because some brain neuronal structures (in the cerebellum and frontal lobe, basal ganglia) are responsible for both motor coordination and cognition(Chagas, Leporace, and Batista 2016; Lopes et al. 2013).

2-1-2-1 Motor coordination division

1- Gross motor skill involves the large muscles of the body and balance, movement of the trunk and limbs, and posture.

2- Fine motor skills involve the coordination of small muscle movements required for tasks such as drawing, writing, speaking, and reading and typically include manual dexterity (Cameron et al. 2016).

2-1-3- Physical fitness

Fitness is defined as:" a physiological state of well-being that reduces the risk of hypokinetic disease, a basis for participation in sports, and good health, which enables one to complete the tasks of daily living. Components include cardiorespiratory endurance, muscle strength endurance, flexibility, and body composition"(Donnelly et al. 2016).

2-1-3 -1 Cardiorespiratory fitness

Cardiorespiratory fitness (CRF) is defined" as the ability to carry out daily tasks with vigor and alertness without undue fatigue and with ample energy to enjoy leisure-time pursuits and respond to emergencies"(Saevarsson et al. 2018). Also, CRF is a broad term that is frequently used to describe an individual's performance throughout a standardized exercise test or program. Endurance performance (such as the 1-mile [1.6-km] or 20-meter shuttle run) has long been included in school-based fitness test batteries as a field measure of CRF defined as maximum oxygen consumption (VO2max)(de Almeida Santana et al. 2017). And, the 20-meter shuttle run test, a robust measure for estimating aerobic capacity in children, is been used to assess cardiorespiratory fitness (CRF) (Visier-Alfonso et al. 2021).

CRF is thought to stimulate angiogenesis in the motor cortex and improves cerebral vascularization, which may affect cognitive function(Santana et al. 2017). The integrity of the white matter tracts that support executive function and changes in the thickness of the grey matter in certain cortical regions are two possible pathways through which they may modify brain structure and function. Attention, memory, and executive function are all enhanced as a result of changes in brain plasticity that alter the neuronal structure and improve transmission capacity. As a result, it is predicted that improvements in academic performance may result from the advantages of cardiovascular fitness on brain anatomy, function, plasticity, and cognition(Páez-Maldonado et al. 2020; Sardinha et al. 2014).

2-1-4 Academic achievement (AA)

2-1-4-1 Academic achievement definition:

Academic achievement is defined as: "the extent to which a student, teacher, or institution has achieved their educational goals, commonly measured by examinations or continuous assessment "(Donnelly et al. 2016). AA refers to a child's academic achievement and performance, which can be evaluated by grade point averages, a cluster of achievement exams, or specialized tests for reading or arithmetic skills, such as reading speed, fluency, and comprehension, and the ability to solve logical/arithmetic problems (Santana et al. 2017). Academic achievement has been identified as a public health concern since it greatly influences persons' future educational attainment and health(Saevarsson et al. 2018). Due to the poor results obtained in the Organization for Cooperation and Economic Development's International Student Assessment Program (PISA) tests, the analysis of the factors associated with academic performance has been a constant concern among public and private institutions all over the world. This fact has been the focus of an increasing body of research on schoolchildren and teenagers(Guillamón, Cantó, and García 2021). Also, all governments have as one of their top priorities improving student academic achievement (AA), as the quality of education has been directly linked to both individual well-being and the social and economic development of the country (Escolano-Pérez and Bestué 2021).

2-1-4-2 Factors affecting students' academic achievement:

Numerous factors can affect a student's academic success or failure, including those that are specific to the student (such as their level of cognitive, psycho-motor, or emotional development), family-based (such as the parent's education level, their family's income level, the frequency of their shared activities with their children, etc.), and educational (such as their teacher's teaching style and the environment in the classroom)(Escolano-Pérez and Bestué 2021).

2-2 Similar studies:

A study conducted by Lopes, Luís et al. (2013) aimed to evaluate the relationship between gross motor coordination (MC) and academic achievement (AA) in a sample of Portuguese children aged 9-12. Years. A total of 596 urban children (281 girls) from the north of Portugal were recruited. Academic performance was assessed using the Portuguese Language and Mathematics National Exams. Gross coordination was measured with the Körperkoordination

Test für Kinder. Cardiorespiratory fitness was evaluated by a maximal multistage 20-m shuttle-run test of the Fitness gram. Also, Body weight and height were measured. Socioeconomic status was based on annual family income. The result after controlling for cardiorespiratory fitness, body mass index, and socioeconomic level, children with insufficient MC or MC abnormalities showed a greater likelihood of having poor AA, compared to those with normal or good MC (p 05 for trend for both genders) (Lopes et al. 2013). Also, a similar study conducted by Da Silva Pacheco et al (2016) had research that examined interlimb coordination and its relationship to academic performance in children aged 8–11 years. A total of 100 Brazilian children were examined using the Bruininks–Oseretsky Test of Motor Proficiency and the Academic Performance Test. Participants were grouped into low (<25%) and high (>75%) academic achievers. The result showed a significant difference between groups for total motor composite ($P < 0.001$) favoring the high group, bilateral coordination had the greatest impact on academic achievement among the body coordination subtests (Bilateral Coordination and Balance) (da Silva Pacheco et al. 2016).

In a recent study conducted in Spain, Guillamón, Andres Rosa, et al (2021) investigated the relationship between motor coordination and academic performance, a total of 163 Spanish schoolchildren aged 6–9 years were recruited. The GRAMI-2 Test was used to assess motor coordination. The average grades in language, math, natural science, social science, English, and the arts were used to measure academic performance. The results indicated the existence of a positive relationship between motor coordination and academic performance (Guillamón, Cantó, and García 2021). On the other hand, in a study conducted by Chagas, Daniel et, al (2016) among middle school children (n=122), academic achievement was assessed using writing, reading, and mathematics performance, and gross motor coordination was assessed using the Körperkoordinationstest für Kinder test. In both boys and girls, bivariate correlations found no significant correlations between gross motor coordination and academic achievement scores. However, when physical activity levels were controlled; the results showed a significant correlation between gross motor coordination scores with writing skills (Chagas, Leporace, and Batista 2016).

Difficulties with fine and gross motor skills are frequently neglected as developmental issues, despite the fact that 6-13% of all school-age children have poor motor coordination. Understanding motor coordination is critical in terms of school adaptation. The purpose of this longitudinal cohort study was to investigate if preschool children's fine and gross motor skills predict later academic achievement and psychological maladaptation. A total of 2,501 children were recruited (5–13 years old). The result up to the sixth grade, preschool children's early motor problems had a major impact on their academic achievement and psychosocial maladaptation. Preschool gross motor impairments were linked to later peer difficulties and greater emotional symptoms (Katagiri et al. 2021).

A longitudinal study was conducted by Sardinha et al (2016). The purpose of this study was to examine the possible relationship between youth academic achievement and cardiorespiratory fitness (CRF). The sample consisted of a total of 1286 fifth, sixth, and seventh-grade students from 14 schools who were followed for three years. They varied in age from 11 to 14 years. Academic achievement was assessed using the students' marks at baseline and at follow-up 3 years apart, in Portuguese, mathematics, foreign language (English), and science. The Progressive Aerobic Cardiovascular Endurance Run test from the Fitnessgram battery was used to evaluate CRF. Their findings indicated that there were high improvements in cardiorespiratory fitness that were prospectively associated with better academic achievement (Sardinha et al. 2016).

Furthermore, a similar study investigated the links between CRF, weight status, and academic achievement in youth, and assessed if these interactions were mediated by poverty status conducted by Pete et al (2020); South Carolina fifth graders (N = 27,791) and eighth graders (N = 16,047) were included in the sample. Academic achievement was measured using a state-wide assessment and divided into two categories (does not meet/approaches standards vs meets/exceeds standards). CRF was assessed and expressed as Healthy Fitness Zone. The demographics and socioeconomic level of the students were provided. After adjusting for weight status and adjusting for variables, the odds of meeting or exceeding academic criteria were strongly correlated with the CRF. By level of poverty, the association between CRF and

academic success differed dramatically. After adjusting for CRF, the relationship between weight status and academic achievement was not statistically significant (Pate et al. 2020).

A systematic review conducted by Santana C et al (2017), aimed to review the scientific data on the relationship between PF and AA in children and adolescents. It was done by using the databases PubMed/Medline, ERIC, LILACS, SciELO, and Web of Science. Included were cross-sectional and longitudinal studies published between 1990 and June 2016 that looked at the relationship between at least one element of PF and AA in children and adolescents. Out of the 45 studies included, 25 revealed a positive correlation between PF components and AA, while 20 describe a single correlation between AA and CRF, and the relationship between muscular strength and flexibility with AP remains uncertain (Santana et al. 2017).

In a study conducted in Finland by Syväoja H et al (2019), which aimed to examine both independent and dependent longitudinal associations of physical fitness (PF) components with academic achievement, a total of 954 fourth to seventh graders from nine schools throughout Finland participated in a 2-year follow-up study. Academic achievement scores (grade point average [GPA]) and PF were assessed with a maximal 20-m shuttle run test, muscular fitness with curl-up and push-up tests, and motor skills with a 5-leaps test and a throwing-catching combination test. The study concluded changes in aerobic and muscular fitness were positively associated with changes in academic achievement during adolescence, although changes in motor skills had only a marginally significant association. Improved motor skills, on the other hand, independently predicted better academic achievement 1 year later, although aerobic or muscular fitness did not. Better academic achievement predicted improved motor skills, aerobic fitness, and muscular fitness. Adolescent developmental changes may cause parallel and simultaneous changes in academic achievement and PF(Syväoja et al. 2019).

A systematic review and meta-analysis conducted by Álvarez-Bueno C et al (2020). The purpose of this study was to measure the relationship between aerobic fitness and academic achievement and to understand how different aerobic fitness tests and individual demographic characteristics may change this relationship. It included 41 cross-sectional and 7 longitudinal studies on children and adolescents from MEDLINE, EMBASE, Cochrane Central Register of

Controlled Trials, Cochrane Database, and Web of Science. Academic achievement was positively correlated with cardiorespiratory fitness. Depending on demographic and aerobic fitness test parameters, associations were higher in boys than in girls and children compared to adolescents(Álvarez-Bueno et al. 2020).

Batez M et al (2021) conducted a study aimed to determine the relationship between motor competence, physical fitness, and academic achievement in young school-aged children. A total of 130 elementary school children were recruited from Serbia. Körperkoordinations Test für Kinder was used to assess the motor competence in children. The EUROFIT battery of tests was used to assess physical fitness, while the children's GPA was used to assess academic achievement (grade point average). This study provides evidence that academic achievement in children is often associated with physical fitness and motor skill. Plate tape and sit and reach, on the other hand, were identified as the most important predictors of academic achievement(Batez et al. 2021).

Additionally, in a similar study conducted by Geertsen, Svend Sparre et al (2016), where a total of 423 Danish children (age: 9.29±0.35 years, 209 girls) were recruited, the study analyzed the relationships between motor skills, physical fitness, and cognitive abilities in relation to academic achievement in reading, comprehension, and mathematics using standardized, objective examinations. The study concluded that academic achievement in mathematics and reading comprehension, as well as fine and gross motor skills, are positively connected with several cognitive processes. Additionally, the ability to exercise was linked to both academic achievement and performance in specific cognitive domains (Geertsen et al. 2016).

Chapter Three
Methods and Materials

3.1 Study design

3.2 Study setting

3.3 Study sample

3.4 Data collection

3.5 Statistical analysis

3.6 Ethical considerations

3-1 Study design

A cross-sectional study was conducted on the association of motor coordination and cardiorespiratory capacity with academic achievement among school students (11-13) years.

3-2 Study setting

The study was conducted in private schools in villages northwest of Jerusalem and the city of Ramallah.

3-3 Study sample

3-3-3-1 Study procedures

The recruitment procedure was conducted in collaboration with various private schools in the villages northwest of Jerusalem and the city of Ramallah, the informed consent form of the school management teams as well as the informed consent of the school students' parents was obtained before data collection commencement (Appendix 2).

To determine whether the used questionnaires and outcome measures are understandable and valid for measuring and achieving the objectives of this study, a pilot study was conducted with 10 students in January 2023. According to the pilot study results, all questions were clear, and no further changes were required.

The aim and technique of the tests were explained to the participants and were given explicit instructions on how to perform the tests exactly, swiftly, and consistently by the factor being measured each test item is accompanied by particular instructions that are delivered orally to each participant. Trials are granted for each test item to allow for test familiarization. Following the familiarization, the participants take the tests, and the results are recorded. The measurements were done between 9:30 and 11:30 am, to prevent potential tiredness during the teaching day.

3-3-2 Sampling method

A convenient sample was taken from private schools that agreed to participate in the study, the sample consisted of private schools in villages northwest of Jerusalem and the city of Ramallah

incuding: (Mughtaribi Bir Nabala school (90 student), Nushat Almutaqen school (31student), Alhuda al-Islamia school (40 student), Alawael school (91 students). Consequently, a stratified random sample was used for selecting the subjects with even numbers as listed in the students' sheets (Marks books), the number of selected students from each school was based on the total number of class students of these schools. The sample was distributed equally into two groups, males and females, each group approximately had the same number of male and female students from the sixth, seventh, and eighth grades.

3-3-3 Sample size

A total of 252 students were recruited in this study, the sample size was calculated by Raosoft software where the margin error is 5%, the confidence level is 95%, and the population size is about 100,000.

3-3-4 Inclusion criteria

1-Attendance of student percentage of at least 90% during the months of the academic year (school regularly).

2- Students don't receive additional educational support (private lessons).

3-Participants who get informed consent forms from parents/guardians who permit their child's participation in the study.

4- Students from the sixth to eighth grades, living in the West Bank.

3-3-5Exclusion criteria

1-School student who showed a clinical diagnosis of some type of cardiovascular, or any other disease that makes investigations difficult.

2 -Students who did not concern to be evaluated, and/or parents or guardians are not willing to sign a consent form.

3- Female students who have their active menstrual cycle.

3-4 Data collection

3-4-1 Tools of data collection

3-4-1-1 Demographic and clinical characteristics questionnaire

Data regarding age, sex, grade, address, diagnosed disease (cardiovascular, musculoskeletal, and others), the parent's education level, and anthropometric measurements (such as the weight and height of the student), in addition to lifestyle's variables of the participants were taken (appendix1).

3-4-1-2 Motor coordination and physical fitness measures

1-Flamingo Balance Test (Gurkan et al. 2016)

A measure of total body balance, the Flamingo Balance Test is a component of the Eurofit Testing Battery. This one-legged balance test evaluates dynamic balance as well as leg, pelvic, and trunk muscle strength. The relative reliability was found excellent for this test (Intraclass Correlation Coefficient = 0.84–0.98), and the absolute reliability ranged between 4.5% and 7.1% for coefficient variation and between 0.5 and 1.5 for the standard error of measurement. (Gurkan et al. 2016)

Procedure:

The student is asked to remove her/his shoes and stand on the beam, maintaining equilibrium by gripping the instructor's hand. The free leg is flexed at the knee and the foot of this leg is held close to the buttocks while balancing on the preferred leg. Begin computing time by the stopwatch (seconds) as soon as the instructor releases go. Stop the stopwatch whenever the person loses their equilibrium (either by falling off the beam or letting go of the foot being held). The balance position is held for as long as possible, up to 60 seconds, and a stopwatch will be

used to record the amount of time spent on the beams (Gurkan et al. 2016). As shown in Figure 3-1 Flamingo Balance Test.

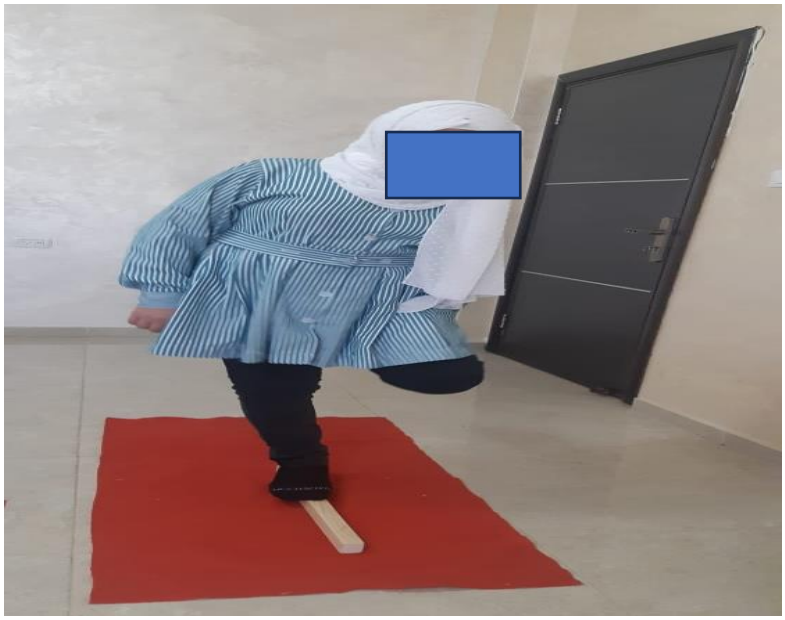

Figure 3-1 Flamingo Balance Test

2-Plate Tapping test:

The Eurofit test battery fit well within the 95% confidence interval, and three Eurofit motor fitness test items (flamingo balancing, plate tapping, and sit-ups) had a confidence limit of less than three Eurofit motor fitness test items (flamingo balancing, plate tapping,) had a confidence limit less than.70.it reliable test (Tsigilis, Douda, and Tokmakidis 2002)

The Plate Tapping Test (Reaction Tap Test) is a reaction test that examines upper body reaction time, hand-eye coordination, and speed using an alternating wall tapping action.

Procedure:

The participants are seated at a table with two metal plates, each having a diameter of 20 cm and center 80 cm apart. The free arm's hand is positioned on a rectangular plate with 10-20 cm

measurements that are mounted in the board's middle. The subjects are instructed to make 25 touches with the circular plate as quickly as they could using their dominant hand. Score the time taken to complete 25 cycles is recorded. Perform the test twice and the best result is recorded. (Cho, Yun, and So 2020; Uygur et al. 2019).

3- Alternate Hand Wall Toss (AHWT):

The AHWT is a valid coordination test (Cho, Yun, and So 2020) in which a ball is thrown from one hand in an underarm motion against a wall at a set distance from the wall and caught with the opposite hand. For 30 seconds, the total number of repeating catches is recorded.

Distances of 1.2 m are used. The ball is first thrown with the right hand and caught with the left hand, then with the left hand and catch with the right hand.

scoring: general ratings for the wall toss test, based on the score of the number of successful catches in 30 seconds, excellent >35, good 30-35, average 20-29, fair 15-19, poor <15 (Cho, Yun, and So 2020). As shown in Figure 3-2 Alternate Hand Wall Toss (AHWT).

Validity and reliability are provided simply with the mean and standard deviation of the data; these can be useful as a basis for evaluation of the eye–hand coordination test.(Cho, Yun, and So 2020). The validity of coordination test Hand Eye test was found as 0.718 (good). 2. The reliability of coordination test Hand Eye was 0.875 (Irawan and Lesmana 2020)

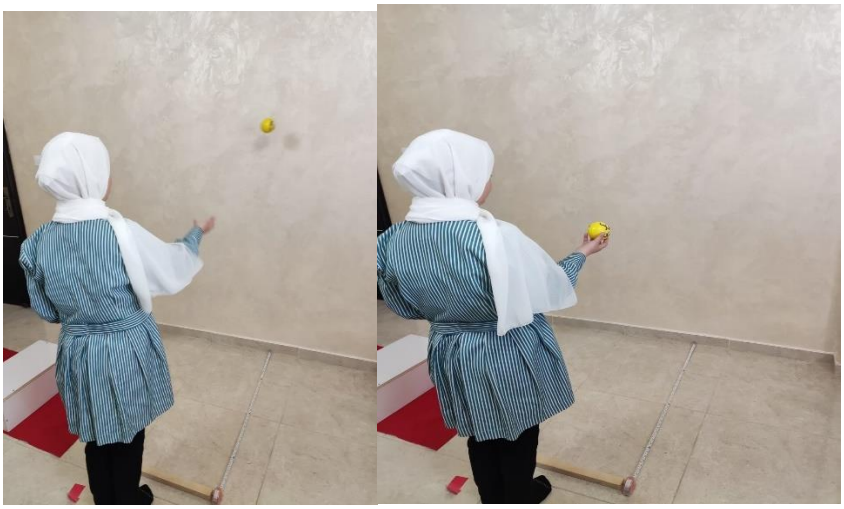

Figure 3-2 Alternate Hand Wall Toss (AHWT)

4- Modified Bass Test of Dynamic Balance

The Modified Bass Test of Dynamic Balance is described as a valid and reliable test with acceptable reliability of 0.75 and a validity of 0.46 (Ambegaonkar et al. 2013).

Procedure: On the beginning point square, the person stands still and on the right foot. The participant then jumps with the left foot to the first tape mark and stops there for five seconds, then stands there for a further five seconds before hopping to the second tape mark with the right foot. Up until the course is finished, this is repeated with alternate foot hopping and retaining a static stance for five seconds at each station. The sole must completely enclose each tape mark at each location to hide it from view. A period of getting comfortable with the method and the course should be allowed.

Scoring: success or failure is noted for the outcome. A successful performance involves hopping to each tape mark without putting the heel or any other part of the body on the floor and maintaining a still stance for five seconds on each tape mark without revealing the tape mark (Schwiertz et al. 2020). As shown in Figure 3-3 Modified Bass Test of Dynamic Balance.

Figure 3-3 Modified Bass Test of Dynamic Balance

3-4-1-3 Cardiorespiratory fitness measure

The 3- Minutes Step Test:

It is one of several step tests designed to measure exercise capacity using HR mean post-exercise findings. The provided age- and gender-specific reference range of HR mean post-ex allows for the assessment and monitoring of submaximal exercise-induced changes in the cardiovascular system and, as a result, a given individual's physical fitness (Jankowski et al. 2015). The 3-minute step test is performed by stepping on and off a 20-cm single-step device as many times as possible in 3 minutes while not using any handles. The 3MST is valid and feasible in students between 6 and 13 years old (Iturain Barrón, Quintana Riera, and Reychler 2021). As shown in Figure 3-4 the 3- Minutes Step Test

Figure 3-4 The 3- Minutes Step Test

3-4-1-4 Academic achievement measure

Academic achievement was obtained through students' grade point average (GPA) scores at the end of the school previous year and the current year, additionally, the rate of subjects: mathematics, language (Arabic), and foreign language (English) was recorded and computed.

3-5 Statistical analysis

Data were analyzed by using the statistical package for Social Sciences (SPSS) version 23. Descriptive and inferential analysis were performed. The scale variables were expressed as mean ± SD, while categorical variables were expressed as frequency. The association between motor coordination and cardiorespiratory capacity with academic achievement variables were tested by Mann-Whitney Test, Kruskal Wallis Test, and Spearman's rank correlation coefficient. Additionally, multiple linear regression was used to examine the association of (motor coordination and cardiorespiratory fitness) with academic achievement (GPA); the regression coefficient (β), *p* values and 95% confidence interval (95% CI) were reported. Statistical significance was set at $p<.05$.

3-6 Ethical considerations

Ethical approval was obtained from the research ethical committee at Al-Quds University (Appendix 3), and the participating schools. All parents or guardians of the participants were

informed about the study's purpose and objectives, and they were asked to sign a consent form in Arabic before enrolment in the study. The participants had the right to participate, reject, or withdraw from the study without restrictions. Data was processed confidentially; data analysis was done using codes rather than names and all data were kept in a locked safe place under the supervision of the chief investigator.

Chapter Four

Results Presentation, Analysis & Discussion

4.1 Results presentation and analysis

4.2 Results Discussion

4.3 Study Limitations and Strengths

4-1 Results presentation and analysis

4-1-1 Descriptive statistics

4-1-1-1 Demographic Characteristics of the Participants

A total number of 252 students were recruited from private schools in villages northwest of Jerusalem and the city of Ramallah, from the sixth, seventh, and eighth grades, 50% males and 50% females. The participants didn't have any disease, hearing, movement, or pronunciation problems. Additionally, about 6% had a visual problem and used glasses, 51.2% lived in the city and 48.8 % in the villages, demographic characteristics of the participants are illustrated in Table (4-1).

Table 4-1 Demographic Characteristics of the Participants

Variable	Males		Females	
	N	%	N	%
Grade				
Sixth	42	33.3	42	33.3
Seventh	42	33.3	42	33.3
Eighth	42	33.3	42	33.3
Address				
City	38	30.2	91	72.2
Village	88	69.8	35	27.8

Visual problems

Figure 4-1 shows that 96% of the males and 92.1% of the females had no visual problems and there were no significant differences between groups (p =.18).

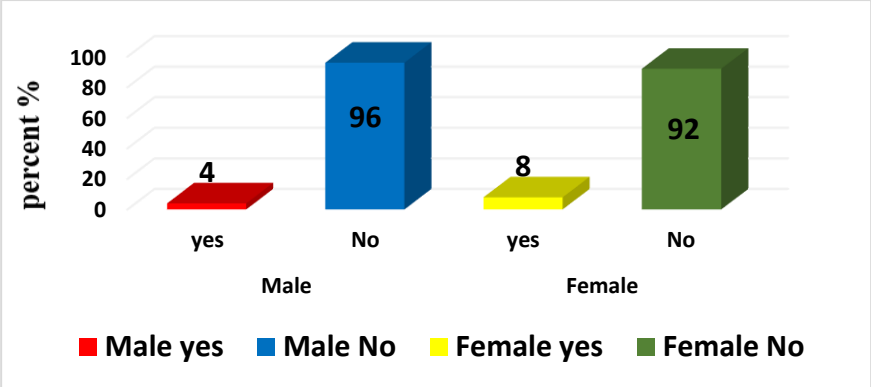

Figure 4-1 Percentage of visual problem

4-1-1-2 lifestyle of the participants

About 64.3% of males do sport compare to 40.5% of females who do sport, the football game was the most game for males with a percentage of 53.2 %, while among females walking was the most prominent activity (24.6%). The dominant hand and foot for both sexes were on the right side. Additionally, there was a statistical significant difference between the two sexes related to the number of study hours per day where females recorded a higher number of hours (P=.00). However, related to the number of hours spent watching television and using smart devices, no statistical significant difference between the two groups was recorded (P=.18). The lifestyle's variables of the participants are illustrated in Table (4-2).

Table 4-2. The lifestyle of the participants

Variable	Males		Females	
	N	%	N	%
Does the student do sports activities?				
Yes	81	64.3	51	40.5
No	45	35.7	75	59.5
Type of sport				
Swimming	11	8.7	16	12.7
Football game	67	53.2	4	3.2
Walking	3	2.4	31	24.6
Student's spending time				
with mother	-	-	6	4.8
with both	126	100.0	120	95.2
What is the dominant hand?				
Right	117	92.9	116	92.1
Left	9	7.1	10	7.9
What is the dominant foot?				
Right	118	93.7	118	93.7
Left	8	6.3	8	6.3
	Mean ± SD		**Mean± SD**	
The number of study hours per day for the student	2.30± 1.38		2.92±1.43	
The number of hours the student watches television and smart devices	2.41±1.45		2.17±1.40	

Sports activities for students

Figure 4-2 shows that 64.3% of males do sport, while the percentage was 40.5 among females, there were significant differences between groups (p=.000).

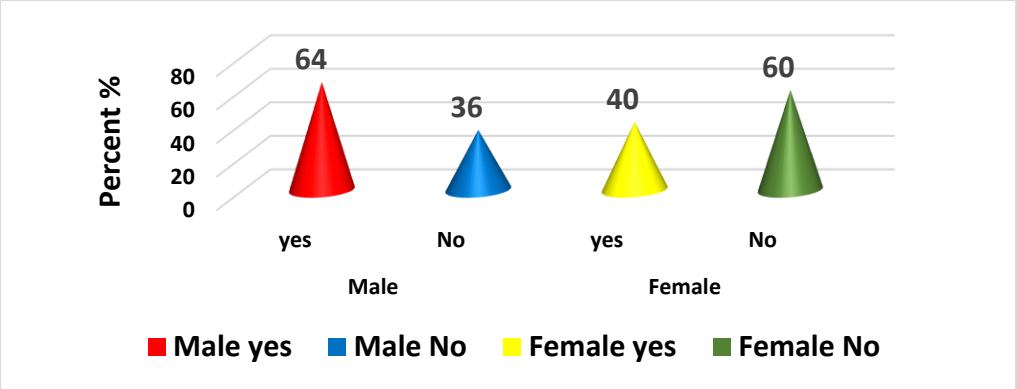

Figure 4-2 distribution of Sports activity among students

4-1-1-3 Age and Anthropometric Characteristics of the Participants

The average age was 12±.82 for males and females, with no statistical significant difference between the two groups related to age (p>0.05). In addition, the mean weight was 49.29±11.82 for males compared to 46.87±8.89 for females, with no statistical difference between the two groups related to weight (p>0.05), anthropometric characteristics of the participants are illustrated in Table (4-3).

Table 4-3 Characteristics of the Participants

Variable	Male N=126	Female N=126	P value
Age (year)	12±.82	12±.82	1.00
Height(m)	1.53±.09	1.52±.86	.32
Weight (kg)	49.29±11.82	46.87±8.89	.07
BMI	20.81±3.65	20.17±2.84	.12

4-1-1-4 Characteristics of the parents:

The majority of the parents of the students had work, 100% of the fathers worked while the percentage of working mothers was 22.6%. Characteristics of the parents are illustrated in Table (4-4).

Table 4-4 Characteristics of the parents

Variable	Males		Females	
	N	%	N	%
Does the mother work?				
Yes	18	14.3	39	31
No	108	85.7	87	69
Does the father work?				
Yes	126	100	125	99.2
No	-	-	1	.8
Mother's education level				
primary education	11	8.7	8	6.3
high school education	54	42.9	38	30.2
College	14	11.1	16	12.7
University	47	37.3	64	50.8
Father's education level				
primary education	19	15.1	18	14.3
high school education	60	47.6	41	32.5
College	10	7.9	5	4
university	37	29.4	62	49.2

Mothers' education level

Figure 4-3 shows that the mothers' education levels (44%) had a university degree. And 37%high school education.

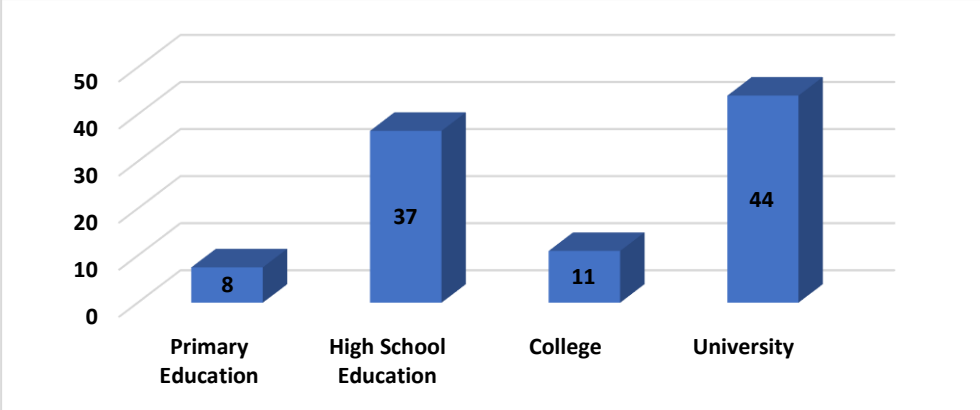

Figure 4-3 distribution mothers' education level

Fathers' education level

Figure 4-4 shows the fathers' education levels were university 39%. While 40% of father education levels were in high school.

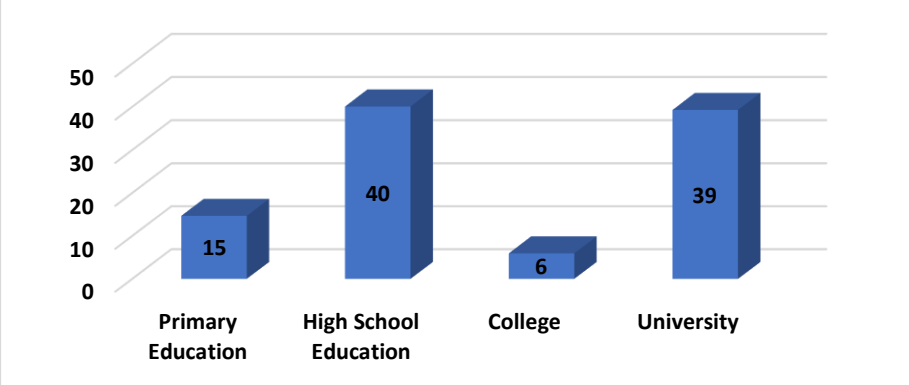

Figure 4-4 distribution father education level

4-1-1-5 Descriptive statistics related to academic achievement

The results showed that the mean grade point average of the current year was 81.87± 14.02. Additionally, the Arabic rate was 77.43±17.19. The descriptive data of academic achievement are illustrated in Table (4-5).

Table 4--5 Descriptive statistics of academic achievement

Variable	Minimum	Maximum	Mean	Std. Deviation
grade point average current year	47.10	99.30	81.87	14.02
grade point average previous year	40.00	99.50	81.85	14.02
Arabic rate	24.00	100.00	77.43	17.19
English rate	32.00	99.00	78.31	15.79
Math rate	40.00	100.00	76.58	18.06

4-1-1-6 Descriptive statistics related to the cardiorespiratory fitness

The highest mean of the 3- minutes step test was among females in the sixth-grade110.21±18.19. Table (4-6) illustrates descriptive statistics related to cardiorespiratory fitness.

Table 4-6 The 3- Minutes Step Test

Sex	Grade	Mean ± Std. Deviation
Male	sixth	94.69 ± 24.84
Male	seventh	103.52 ± 15.21
Male	eighth	107.71±15.67
Female	sixth	110.21± 18.19
Female	seventh	109.09±20.12
female	eighth	108.02 ± 24.73

Categories of 3- minutes step test for males.

Regarding the 3- minute-step test Categories for males, the distribution was: 34% excellent, and 22% very good, related results are illustrated in Figure 4-5.

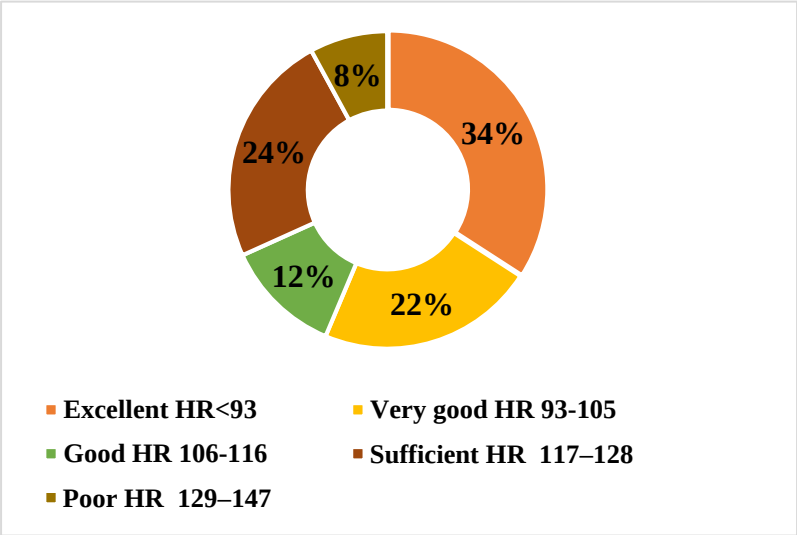

Figure 4-5 Values of 3- minutes step test Categories for males

Categories of 3- minutes step test for females

Regarding the-3 minute-step test categories for females the distribution was: 44% excellent, and 14% very good, other results are illustrated in Figure 4-6.

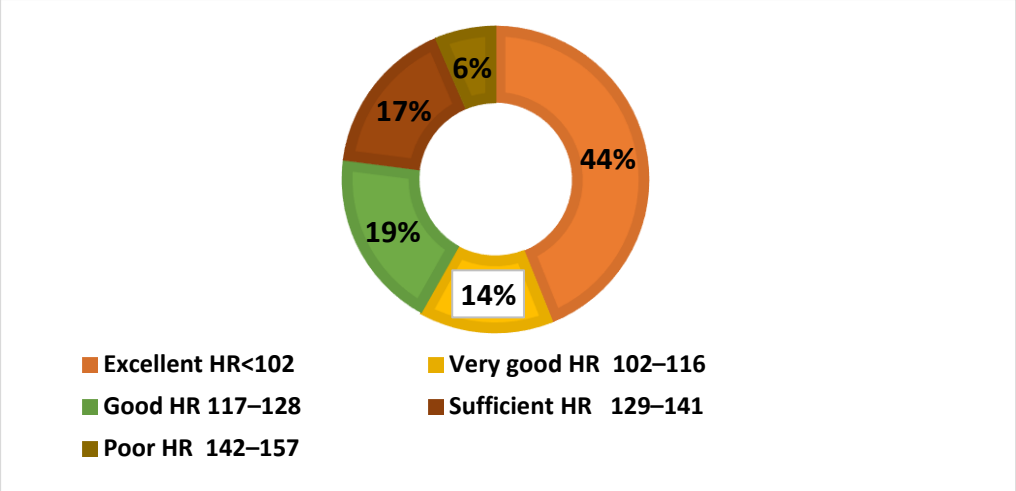

Figure 4-6 Values of 3- minutes step test Categories for females

4-1-1-7 Descriptive statistics related to the balance

Flamingo Balance Test for eighth-grade boys was the highest at 52.14±26.69 While the lowest mean was recorded on the Flamingo Balance Test for the seventh-grade bats at 9.98±6.71 Flamingo test results are shown in Table 4-7.

Table 4-7 Flamingo Balance Test

Variable	M±SD
Flamingo Balance Test for males sixth-grade scale	13.69±8.83
Flamingo Balance Test for females sixth-grade scale	16.95±11.35
Flamingo Balance Test for males seventh-grade scale	9.98±6.71
Flamingo Balance Test for Females seventh-grade Scale	11.10±7.35
Flamingo Balance Test for males eighth-grade scale	52.14±26.69
Flamingo Balance Test for females eighth-grade scale	14.86±9.88

Modified bass test for balance

The results show that 66% of the females and 60% of the males have passed the test. There were no significant differences between groups (p=.34). As shown in Figure 4-7.

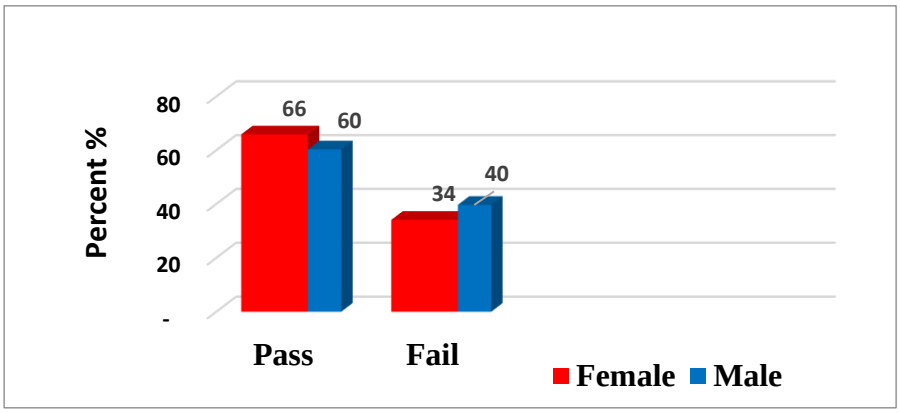

Figure 4-7 values of Modified bass balance test

4-1-1-8 Descriptive statistics related to the coordination

All participants' mean value of the Alternate Hand Wall Toss (AHWT) was 18.32±5.41, and the mean value of the Plate Tapping Test was 23.09±6.41. As illustrated in the table (4-8).

Table 4-8 Plate Tapping Test

Variable	M±SD
Plate Tapping Test	23.09±6.41
Plate Tapping Test for males sixth-grade scale	22.98±5.06
Plate Tapping Test for Females sixth-grade Scale	21.43±5.85
Plate Tapping Test for males seventh-grade scale	23.31±7.05
Plate Tapping Test for Females seventh-grade Scale	24.93±6.11
Plate Tapping Test for males eighth-grade scale	24.69±5.85
Plate Tapping Test for females eighth-grade scale	21.26±7.62
Alternate Hand Wall Toss (AHWT): scale	18.32±5.41

Categories of alternative hand wall toss

According to Categories of alternative hand wall toss: About half of the participants recorded an "average" score, with no significant differences between groups (p=.31). as shown in Figure 4-8.

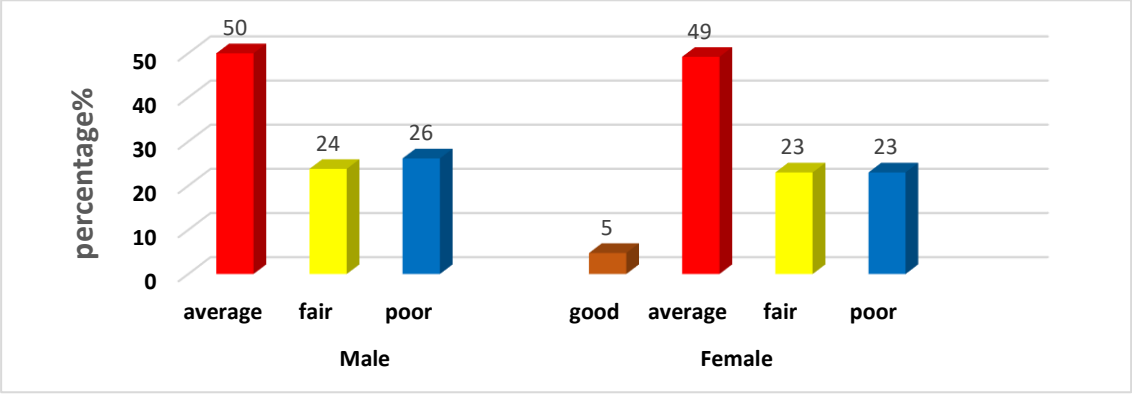

Figure 4-8 Descriptive Values of alternative hand wall toss Categories

Normality distributed of the parametric data

Table 4-9 illustrates that variables for coordination, cardiorespiratory fitness, and academic achievement were not normally distributed, implying that the non-parametric test was used for further statistical significance analysis.

Table 4-9 Tests of Normality

Variable	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Modified balance	.370	252	.000	.687	252	.000
Three minutes	.085	252	.000	.987	252	.018
Flamingo balance	.437	252	.000	.072	252	.000
plate tapping	.094	252	.000	.960	252	.000
Alternate Hand Wall Toss (AHWT)	.134	252	.000	.979	252	.001
grade point average current year	.130	252	.000	.904	252	.000
grade point average previous year	.138	252	.000	.909	252	.000
Arabic rate	.103	252	.000	.918	252	.000
English rate	.104	252	.000	.942	252	.000
Math rate	.128	252	.000	.912	252	.000

4-1-2 Inferential statistical analysis of the tested variables

Mann-Whitney Test

4-1-2-1 Academic achievement for both groups (male, female)

The results show that the grade point average of the current year is 79.04± 14.30 for males compared to the grade point average current year of 84.70±13.19 for females with a significant difference between groups males and females ($P<0.05$). The results of academic achievement for both groups are shown in Table 4-10.

Table 4-10 Academic achievement for both groups (n=252).

Variable	sex	Mean	Std. Deviation	Median	P value
grade point average current year	male	79.04	14.30	82.25	.000
	female	84.70	13.19	89.45	
grade point average previous year	male	79.05	14.35	81.50	.001
	female	84.65	13.15	90	
Arabic rate	male	73.75	18.28	77	.001
	female	81.11	15.23	86	
English rate	male	74.13	16.95	75	.000
	female	82.49	13.33	85	
Math rate	male	72.75	19.09	77	.001
	female	80.41	16.16	85	

4-1-2-2 The coordination and cardiorespiratory fitness for both groups

The results indicated that there was a significant difference between groups on the cardiorespiratory fitness test and flamingo test (P<.05), while the Modified Bass Test of Dynamic Balance, plate tapping, (AHWT) had no significant difference between group males and females. The coordination and cardiorespiratory fitness results for both groups are shown in Table 4-11.

Table 4-11 the coordination and cardiorespiratory fitness for both groups (n= 252).

Variable	sex	Mean	Std. Deviation	Median	P value
Modified Bass Test of Dynamic Balance	male	.84	1.18	0	.57
	female	.89	1.50	0	
Three minutes	male	101.98	19.71	102	.01
	female	109.11	21.04	108.5	
Flamingo balance	male	25.27	150.66	10	.01
	female	14.30	9.89	12	
plate tapping	male	23.66	6.04	24	.08
	female	22.54	6.74	21	
Alternate Hand Wall Toss (AHWT)	male	17.79	4.84	19	.23
	female	18.84	5.89	20	

4-1-2-3 Academic achievement with mothers' work

According to work status, all fathers had work, however, the percentage of working mothers was 22.6%, and the comparison between groups was conducted based on the mother's working status; our results showed that students (children of working mothers) had a significant higher academic achievement compared to non-working mothers that in academic achievement there was (P=0.000). Results of academic achievement for both groups are shown in Table 4-12.

Table 4-12 Academic achievement with mothers' work (n=252).

Variable	Does the mother work?	Mean	Std. Deviation	Median	P value
grade point average current year	Work	91.23	7.57	94.30	.000
	Doesn't work	79.14	14.31	83	
grade point average previous year	Work	91.82	7.37	94	.000
	Doesn't work	78.93	14.17	81	
Arabic rate	Work	87.65	12.05	93	.000
	Doesn't work	74.45	17.34	78	
English rate	Work	87.63	10.76	91	.000
	Doesn't work	75.58	15.99	77	
Math rate	Work	87.96	12.49	93	.000
	Doesn't work	73.25	18.11	78	

4-1-2-4Academic achievement with students doing sports activities

The results show that there was a significant difference in academic achievement between the groups of students who participated in sports activities (P<.000). The results of academic achievement for both groups are shown in Table 4-13.

Table 4-13 Academic achievement according to sports activities (n=252)

Variable	Does the student do sports activities?	Median	Mean	Std. Deviation	P value
grade point average current year	yes	89.05	86.06	11.78	.00
	No	78.30	77.26	14.87	
grade point average previous year	yes	88.60	85.82	12.28	.00
	No	79.50	77.48	14.56	
Arabic rate	yes	86	81.00	16.49	.00
	No	77	73.51	17.147	
English rate	yes	87	82.75	14.48	.00
	No	74	73.43	15.78	
Math rate	yes	88	82.33	16.09	.00
	No	71	70.25	18.06	

4-1-2-5 The coordination and cardiorespiratory fitness with students doing sports activities

The results show that the cardiorespiratory fitness test and the coordination tests had a significant difference between groups ($P<0.00$). The results of coordination and cardiorespiratory fitness for both groups are shown in Table 4-14.

Table 4-14 The coordination and cardiorespiratory fitness with students doing sports activities (n=252)

Variable	Does the student do sports activities?	Median	Mean	Std. Deviation	P value
Modified Bass Test of Dynamic Balance	yes	0	.49	1.11	.00
	No	1	1.27	1.47	
Three minutes	yes	98	100.06	20.17	.00
	No	117	111.58	19.55	
Flamingo balance	Yes	12	27.27	147.05	.00
	No	10	11.55	8.51	
plate tapping	yes	20	21.63	5.86	.00
	No	25	24.71	6.62	
Alternate Hand Wall Toss (AHWT	yes	20	19.86	4.76	.00
	No	16	16.63	5.59	

Results of Kruskal Wallis Tests

4-1-2-6 Academic achievement according to the grade

The results show that academic achievement had a significant difference according to the grade except the Arabic rate had no significance (P>.05). In addition, the sixth grade recorded a high score. The results of academic achievement according to grade are shown in Table 4-15.

Table 4-15 Academic achievement according to the grade (n=252)

Variable		Mean	Std. Deviation	Median	P value
grade point average current year	sixth	86.57	11.05	88	.00
	seventh	79.62	14.165	82	
	eighth	79.42	15.44	83	
grade point average previous year	sixth	86.30	11.25	89	.00
	seventh	79.75	14.07	83	
	eighth	79.50	15.49	81	
Arabic rate	sixth	81.27	14.27	84	.07
	seventh	76.76	15.63	80	
	eighth	74.26	20.49	78	
English rate	sixth	81.31	16.24	87	.04
	seventh	76.26	14.66	77	
	eighth	77.35	16.15	78	
Math rate	sixth	83.90	14.47	87	.00
	seventh	76.21	16.47	80	
	eighth	69.62	20.07	70	

4-1-2-7The coordination and cardiorespiratory fitness according to the grade

The results show that the cardiorespiratory fitness test has no significant difference according to the grade (P>0.05). In addition, the Plate tapping tests and (AHWT) had no significant difference, while the Modified Bass Test of Dynamic Balance and flamingo had a significant difference according to the grade, the results of coordination, and cardiorespiratory fitness according to the grades shown in Table 4-16.

Table 4-16The coordination and cardiorespiratory fitness according to the grade (n=252)

Variable		Mean	Std. Deviation	Median	P value
Three minutes	sixth	102.45	23.00	100	.34
	seventh	106.31	17.95	106	
	eighth	107.87	20.58	111	
Flamingo balance	sixth	15.32	10.24	12	.00
	seventh	10.54	7.02	10	
	eighth	33.50	184.31	11	
Plate tapping	sixth	22.20	5.49	21	.15
	seventh	24.12	6.61	24	
	eighth	22.97	6.97	23	
Alternate Hand Wall Toss (AHWT):	sixth	17.80	3.98	20	.71
	seventh	18.38	5.90	20	
	eighth	18.77	6.11	20	
Modified Bass Test of Dynamic Balance	sixth	.48	.99	0	.00
	seventh	.85	1.22	0	
	eighth	1.27	1.65	0	

Correlation results

4-1-2-8 Correlation of Coordination, cardiorespiratory fitness, and academic achievement

The results show that there was a significant correlation between the coordination test and cardiorespiratory fitness test for both groups and the grade point average current year, grade point average previous year, Arabic rate, English rate, and Math rate (p=.00). As shown in Table 4-17.

Table 4-17 Correlation coordination, cardiorespiratory fitness, and academic achievement (n=252).

Variable		grade point average current year	grade point average previous year	Arabic rate	English rate	Math rate
Three minutes	Spearman's Correlation	-.461-	-.463-	-.436-	-.444-	-.445-
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Flamingo balance	Spearman's Correlation	.650	.612	.555	.532	.603
	Sig. (2-tailed)	.00	.00	.00	.00	.00
plate tapping	Spearman's Correlation	-.488-	-.487-	-.469-	-.452-	-.522-
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Alternate Hand Wall Toss (AHWT)	Spearman's Correlation	.707	.706	.669	.637	.671
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Modified Bass Test of Dynamic Balance	Spearman's Correlation	-.718-	-.700-	-.663-	-.641-	-.718-
	Sig. (2-tailed)	.000	.000	.000	.000	.000

4-1-2-9 Correlation of Flamingo Balance Test and academic achievement according to grades

The results show that there was a positive correlation between Flamingo Balance Test for both groups in the seventh and eighth grades and academic achievement, with a correlation significant ($p<.05$). In addition, the results show that there was no significant correlation between Flamingo Balance Test for males in sixth grade and academic achievement, while there was a positive correlation between the Flamingo Balance Test for females in sixth grade as shown in Table (4-18).

Table (4-18) Correlation of Flamingo Balance Test and academic achievement according to grades (n=252).

Variable		grade point average current year	grade point average previous year	Arabic rate	English rate	Math rate
Flamingo Balance Test for males sixth-grade scale	Correlation Coefficient	.034	-.152-	-.057-	.049	.190
	Sig. (2-tailed)	.833	.338	.722	.756	.227
Flamingo Balance Test for females sixth-grade scale	Correlation Coefficient	.432**	.464**	.419**	.420**	.351*
	Sig. (2-tailed)	.004	.002	.006	.006	.023
Flamingo Balance Test for males seventh-grade scale	Correlation Coefficient	.679**	.658**	.505**	.508**	.635**
	Sig. (2-tailed)	.000	.000	.001	.001	.000
Flamingo Balance Test for females seventh-grade scale	Correlation Coefficient	.827**	.823**	.791**	.761**	.819**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Flamingo Balance Test for males eighth-grade scale	Correlation Coefficient	.773**	.783**	.724**	.611**	.746**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Flamingo Balance Test for females eighth-grade scale	Correlation Coefficient	.834**	.800**	.763**	.776**	.775**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

4-1-2-10 Correlation of Plate Tapping Test and academic achievement according to grades

The results show that there was a negative correlation between Plate Tapping Test for both groups in the seventh and eighth grades and academic achievement, with a correlation

significant (p<.05). But in the eighth grade for males, there was no correlation between Plate Tapping Test and English rate (P value =.107). In addition, the results show that there was no significant correlation between Plate Tapping Test for both groups in sixth grade and academic achievement. The results of the correlation Plate Tapping Test and academic achievement are shown in Table (4-19).

Table 4-19Tapping Test and academic achievement according to grades (n=252).

Variable		grade point average current year	grade point average previous year	Arabic rate	English rate	Math rate
Plate Tapping Test for males sixth-grade scale	Correlation Coefficient	-.061-	-.026-	-.205-	-.254-	-.189-
	Sig. (2-tailed)	.701	.871	.193	.104	.230
Plate Tapping Test for Females sixth-grade Scale	Correlation Coefficient	-.108-	-.121-	-.228-	-.098-	-.222-
	Sig. (2-tailed)	.497	.446	.147	.538	.158
Plate Tapping Test for males seventh-grade scale	Correlation Coefficient	-.481-**	-.486-**	-.482-**	-.390-*	-.401-**
	Sig. (2-tailed)	.001	.001	.001	.011	.008
Plate Tapping Test for Females seventh-grade Scale	Correlation Coefficient	-.685-**	-.695-**	-.710-**	-.639-**	-.666-**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Plate Tapping Test for males eighth-grade scale	Correlation Coefficient	-.401-**	-.443-**	-.358-*	-.253-	-.546-**
	Sig. (2-tailed)	.009	.003	.020	.107	.000
Plate Tapping Test for females eighth-grade scale	Correlation Coefficient	-.770-**	-.764-**	-.688-**	-.807-**	-.811-**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

4-1-2-11Correlation of the 3- Minutes Step Test and Academic Achievement according to grades

The results show that there was a negative correlation between the 3- Minutes Step Test and Academic achievement, with a significant correlation (p=.00). The Correlation between the 3- Minutes Step Test and academic achievement is shown in Table (4-20).

Table 4-20 Correlation of the 3- Minutes Step Test and Academic Achievement according to grades (n=252).

Variable		grade point average current year	grade point average previous year	Arabic rate	English rate	Math rate
The 3- Minutes Step Test for males	Spearman's Correlation	-.532-**	-.531-**	-.475-**	-.529-**	-.529-**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
The 3- Minutes Step Test for females	Spearman's Correlation	-.523-**	-.523-**	-.508-**	-.514-**	-.500-**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

4-1-2-12 Correlation of the Lifestyle of Student and Academic Achievement

The results show that there was a negative correlation between the number of hours the student watches television and smart devices and academic achievement, with a significant correlation (p=.00). In addition, the results show that there was a positive correlation between the number of study hours per day for the student and academic achievement, the Correlation between the Lifestyle of Student and Academic Achievement are shown in Table (4-21).

Table 4-21 Correlation of the Lifestyle's variables with Academic Achievement (n=252).

Variable		grade point average current year	grade point average previous year	Arabic rate	English rate	Math rate
The number of study hours per day for the student	Spearman's Correlation	.440**	.420**	.354**	.351**	.402**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
The number of hours the student watches television and smart devices	Spearman's Correlation	-.380-**	-.401-**	-.371-**	-.358-**	-.394-**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

4-1-2-13 Correlation between Modified Bass Test of Dynamic Balance and Alternate Hand Wall Toss (AHWT).

The results show that there was a negative correlation between the Modified Bass Test of Dynamic Balance and Alternate Hand Wall Toss (AHWT) (P =.00). The results are shown in Table 4-23.

Table 4-22 Correlation between Modified Bass Test of Dynamic Balance and Alternate Hand Wall Toss (AHWT)

Variable		Modified Bass Test of Dynamic Balance	Alternate Hand Wall Toss (AHWT)
Modified Bass Test of Dynamic Balance	Spearman's Correlation		-.705-**
	Sig. (2-tailed)		.000
Alternate Hand Wall Toss (AHWT):	Spearman's Correlation	-.705-**	
	Sig. (2-tailed)	.000	

4-1-2-14 Regression analysis:

A linear regression model was conducted to predict the association of the Modified balance, Alternate Hand Wall Toss (AHWT), three minutes, the number of study hours per day for the student, and grade point average current year. Model 1 showed a negative correlation between grade point average current year and Modified balance (β =-.65-, P=.00). After controlling by Alternate Hand Wall Toss (AHWT) in model 2, a positive correlation between Alternate Hand Wall Toss (AHWT) and Modified balance (β =.47. p= .00). The result indicated that significant correlation was recorded between Modified balance, Alternate Hand Wall Toss (AHWT), three minutes, The number of study hours per day for the student, and grade point average current year ($p<.05$). As shown in table 4-23.

Table 4-23 Regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	87.71	.80		109.9	.00
	Modified balance	-6.75-	.50	-.65-	-13.6-	.00
2	(Constant)	62.87	2.9		21.5	.00
	Modified balance	-3.75-	.55	-.36-	-6.8-	.00
	Alternate Hand Wall Toss (AHWT)	1.22	.14	.47	8.8	.00
3	(Constant)	70.65	4.9		14.1	.00
	Modified balance	-3.36-	.59	-.32-	-5.7-	.00
	Alternate Hand Wall Toss (AHWT	1.15	.14	.44	8.1	.00
	Three minutes	-.07-	.04	-.10-	-1.9-	.05
4	(Constant)	66.99	4.82		13.9	.00
	Modified balance	-2.91-	.57	-.28-	-5.1-	.00
	Alternate Hand Wall Toss (AHWT	1.07	.14	.41	7.9	.00
	Three minutes	-.07-	.03	-.11-	-2.2-	.03
	The number of study hours per day for the student	2.06	.41	.21	5.0	.00

a. Dependent Variable: grade point average current year

4-2 Results Discussion

This study was conducted to investigate the association between motor coordination and cardiorespiratory capacity with academic achievement among school students (11—13 years).

In our research, the sample was taken as 50% males and 50% females, and this sample simulates the normal distribution in Palestine. Where the percentage of school students for the academic year 2022/2023 (51% males and 49% females) (PCBS: Almost half of the Palestinian society are children n.d.).

The schools from which the sample was taken were dealing with students without motor or auditory problems and speech problems, but 6% of the students used glasses, which can be considered as a normal percentage; a similar study showed 25.3% of children aged 2-17 wear glasses or contact lenses in a survey conducted in the USA (QuickStats: Percentage* of Children(†) Aged 2-17 Years Who Wear Glasses or Contact Lenses,(§) by Sex and Age Group - National Health Interview Survey, United States, 2019(¶). 2021). According to the participants, BMI means the normal distribution of 20.81±3.65 males 20.17±2.84females. The current study's findings are similar to normative values for physical fitness in children aged 11-17 in Kosovo (Milaim and Murat 2018).

Regarding participants' lifestyles, the largest number of those who practice sports are males (64%), with 40% of females, which is less than half. Conversely, the mean of hours the student watches television and smart devices increases in males at the expense of physical activity. even though children and teens are currently the most active groups of the population in developed cultures, there is a clear tendency toward an increase in sedentary lifestyles among school-age children (Petrigna et al. 2022; Trudeau and Shephard 2005), and the level of PA declined over time for both males and females, but that females at ages 12 and 13 experienced a greater decline(Pojskic and Eslami 2018). According to Visier-Alfonso et.al (Visier-Alfonso et al. 2021), they found that males were more physically active than females, results that are consistent with our findings.

Our results regarding parents' characteristics indicated all of the fathers had work, however a quarter of mothers had work and this could be due to different reasons, including the lack of

job opportunities and many mothers, need to sit in their homes to raise their children because changes in salaries, benefits, or the husband's refusal to let his wife work. Most families believe that both parents must work to support their children at a level previously accomplished by one wage earner, and in many cases, two earners are required to keep the family out of poverty(Scarr, Phillips, and McCartney 1989).

Our results showed that students (children of working and educated mothers) had a significant higher academic achievement compared to non-working mothers. This could be related to that parental involvement in their children's education is essential because children learn both at home and at school, it could be one important component in enhancing children's academic development. A similar study demonstrated that children of parents with greater levels of education or parents who spend more time in school have better grades than children of parents with lesser levels of education (Selden et al. 2020), and this is consistent with our findings. Additionally females' education, like males' education, is critical to a country's progress, both are the two wheels of society's cart, an educated mother is a source of courage and strength for her children, as well as the fundamental unit of an educated society (Shaheen and Awan 2020).

Regarding academic achievement related to sex, our study's findings showed that females students recorded higher grades (p=.00); similar findings were found in previous studies, which could be attributed to that females students are more self-disciplined(Duckworth and Seligman 2006), and prioritize academic preparation more than male students, and they are more concerned with pleasing adults such as parents and teachers(Dubuc, Aubertin-Leheudre, and Karelis 2020; Pomerantz, Altermatt, and Saxon 2002; Voyer and Voyer 2014).

Results of CRF in our study indicate that males students recorded a better score on the 3-minutes step test compared to females (p=.01), similar findings recorded in a study conducted by Pojskic et al(Pojskic and Eslami 2018), showed that in the age ranges of 11 to 14, males had significantly greater CRF than females. This could be attributed that sex-based differences in body fat tissue and lean body weight composition produce major changes, and differences in hemoglobin (Fan et al. 2021). The sex differences in hemoglobin levels in adults are well known, and the underlying mechanisms are most likely a direct effect of sex hormones on erythropoiesis, including estrogen and androgens. There are no significant differences in red blood cell count, hemoglobin, or serum ferritin concentrations between sexes in pre-pubertal humans.The

difference in hematological variables between sexes emerges after menstruation and persists for 10 years after menopause. Menstruation and dietary consumption are the primary causes of women's decreased hemoglobin and iron levels in comparison to men (Bianco et al. 2015).

Our results indicated that there was a significant difference according to sex on the flamingo test (P=.01), in which males recorded a higher score, a similar study showed in comparison to females, males showed significantly greater average levels of gross MC and fitness, this could be due to that the males do physical activity and sport more than females (Lopes et al. 2013).Physical activity declines moderately to severely among females between the sixth and eighth grades throughout adolescence, physical fitness and motor coordination deterioration appear to be related to the level of physical activity, according to evidence (Ghasemian, Shohre, and Dulabi 2020).

Our results show that there was a significant difference in academic achievement (p=.00), cardiorespiratory fitness (p=.00), and coordination (p=.00) between the groups according to participation in sports activities, where both females and males who participated in sports activities recorded higher scores compared to their peers who did not participate in sports activities. The neurophysiological perspective's fundamental argument for explaining the association between PA and AA is that PA has direct, positive effects on the brain and nervous system. PA improves brain functioning by increasing blood flow and enhancing glucose and lipid metabolism, leading to increased concentration and cognitive abilities(Álvarez-Bueno et al. 2020; Donnelly et al. 2016; Escolano-Pérez and Bestué 2021; Oliveira et al. 2017; Terson de Paleville and Immekus 2020). CRF is thought to stimulate angiogenesis in the motor cortex and improves cerebral vascularization, which may affect cognitive function (Santana et al. 2017).The integrity of the white matter tracts that support executive function and changes in the thickness of the grey matter in certain cortical regions are two possible pathways through which they may modify brain structure and function. Attention, memory, and executive function are all enhanced as a result of changes in brain plasticity that alter the neuronal structure and improve transmission capacity. As a result, it is predicted that improvements in academic performance may result from the advantages of cardiovascular fitness on brain anatomy, function, plasticity, and cognition(Páez-Maldonado et al. 2020)(Sardinha et al. 2014).

In addition, because gross motor control appears to play such a crucial role in AA, the study emphasizes the need of giving chances for children to engage in structured and unstructured PA that improve diversity of motor skills(Lopes et al. 2013). A randomized controlled trial stated that physical activity in school settings could lead to improved academic achievement(Have et al. 2018). Sports participation demonstrated a positive direct association with academic achievement, although cardiorespiratory fitness mediated the majority of the positive associations between sports activity and academic achievement, however, certain sports activities requiring more complex motor abilities may also be directly connected to academic success (Ishihara et al. 2020).

The results of our study support our hypotheses regarding the association between AA and CRF and coordination. Firstly, we found a positive significant correlation between cardiorespiratory fitness test for both sexes and the grade point average of the current year, grade point average of the previous year, Arabic rate, English rate, and Math rate (p=.00). A Systematic Review and longitudinal design studies showed the same results, as a reason that cardiorespiratory fitness improves the structure and function of the brain, which supports students' attention and memory, and increase the vasculature in the cerebral cortex (de Almeida Santana et al. 2017; Marques et al. 2018; Santana et al. 2017; Sardinha et al. 2016)

Also, there is a significant correlation between the coordination test for both groups and the grade point average of the current year, grade point average of the previous year, Arabic rate, English rate, and Math rate. Similar studies showed significant relationships between motor coordination and academic performance(Guillamón, Cantó, and García 2021; Syväoja et al. 2019). According to the findings of a similar study, children of both genders with low gross MC had a greater chance of having low AA. Possible biological, psychological, and social explanations could be used to explain this connection. The cerebellum is activated during coordinated exercise, which improves a variety of coordination skills and has an impact on motor activities. Furthermore, the frontal lobes play an essential role in influencing MC and cognitive function (Lopes et al. 2013). Academic achievement and gross motor skills are

positively and significantly correlated (da Silva Pacheco et al. 2016), and AA was significantly connected with both fine and gross motor skills(Katagiri et al. 2021; Zhang et al. 2018) Significant correlations were observed in the plate tapping test in our study (p=.00), this might be related to various brain regions associated with attentional control and visual processing, as well as specific brain regions associated with response selection and planning, Overall, this emphasizes the significance of coordinated movements during plate tapping, which leads to faster processing and retention of information during the school(Batez et al. 2021).

The results of the linear regression model indicated that a negative significant correlation was recorded between Modified balance, Alternate Hand Wall Toss (AHWT), three minutes, The number of study hours per day for the student, and grade point average current year ($p<.05$). a similar study showed a significant relationship between academic achievement and total motor performance, indicating that an increase of 1 point in Body Coordination increased the probability of having strong academic achievement by 12% (95% CI: 4.4-21%)(da Silva Pacheco et al. 2016). And another study showed regression results suggest that children with greater cardiorespiratory capacity also have higher motor fitness and highlight the independent importance of each component of physical fitness in relation to academic performance. (Batez et al. 2021; Esteban-Cornejo et al. 2014; Lopes et al. 2013). Additionally, our results showed that there was a significant correlation between gross and fine coordination, these results are in line with the results of other studies which also showed that significantly correlations between fine and gross motor abilities in schools' students(Katagiri et al. 2021; Skowronski et al. 2018).

4.3 Study Limitations and strengths

The current study had several limitations:

- Many schools refused to participate in our study.
- Some schools refused to give students grades.
- Because of the teachers' strike in the public schools, we were unable to recruit students from public schools.

Strengths of the current study

- To the best of our knowledge, this is the first study in Palestine investigating the relationship between cardiorespiratory capacity and motor coordination with academic achievement among school students (11-13 years).
- The study has a relatively large sample size.
- This study might be used as a valuable resource for students and parents, as well as a potential contributor to the associated challenges of academic achievement.

Chapter Five

Conclusions and Recommendations

5.1 Conclusions

5.2 Recommendations

5.1 Conclusions

Based on our results we conclude:

- There is a positive significant correlation (p=.00) between academic achievement and motor coordination (the flamingo balance test, alternative wall toss test) and negative significant correlation between academic achievement and (plate tapping test and modified bass dynamic balance test) among school students (11-13 years).
- There is a statistically positive significant correlation (p=.00) between academic achievement and cardiorespiratory capacity among school students (11—13 years).
- There is a statistically positive significant correlation (p=.00) between fine and gross motor coordination.
- Students who practice physical activity and sport had better coordination, cardiorespiratory capacity and academic achievement compared to students who don't (p=.00).

5.2 Recommendations

Recommendations for schools and The Ministry of Education

- Based on the findings of our study, interventions to enhance motor coordination and cardiac fitness in schools' children should be encouraged, not only for health advantages but also for cognitive and academic progress.
- Promotion of schools' motor coordination and cardio fitness screening programs for students on a regular basis, and these screenings to be part of the schools' health programs.
- The application of these findings in the field of early evaluation may be beneficial in identifying subsequent academic problems for the students.
- Integrating coordination and cardio fitness exercises into school-related classes and activities.

Recommendations for physiotherapists:

- Physiotherapists should be aware of and understand the association between cardiorespiratory capacity and motor coordination with academic achievement among school students.
- It is crucial that physiotherapists have an important role in school health, in terms of developing schools' screening program.
- Promote interventions to enhance cardiorespiratory capacity and motor coordination in schools' students.
- Conducting future longitudinal and experimental research in this field.

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Appendixes

Appendix1: Demographic and clinical characteristics questionnaire

استمارة تقييم الطالب /ة الاوليه

1-الرقم التسلسلي :

2- العمر :

3- الجنس : 1- ذكر 2 - انثى

4-الصف: 1-السادس 2-السابع 3-الثامن

5- العنوان : 1- مدينه 2-قريه 3- مخيم

6- المدرسه:

7-هل يوجد امراض عند الطالب/ة ؟1- نعم 2- لا اذا كانت الاجابه نعم حددز

8-هل يوجد يوجد مشاكل سمعيه عند الطالب/ة ؟ 1- نعم 2- لا

9- هل يوجد مشاكل بصريه عند الطالب/ة ؟ 1- نعم 2- لا

10-هل يوجد مشاكل حركيه عند الطالب/ة ؟ 1- نعم 2- لا

11- هل يوجد مشاكل في النطق عند الطالب/ة ؟ 1- نعم 2- لا

12-هل يستعمل الطالب/ة ادوات طبيه مساعدة ؟ 1- نعم 2- لا اذا كان نعم ما هي

1- نظارات طبيه 2- سماعه طبيه 3- ادوات مشي مساعده مع تحديد نوع الاداه المساعدة

13-ما هو مستوى تعليم الام ؟ 1- تعليم ابتدائي . 2- تعليم ثانوي .3- كليه .4- جامعه

14-ماهو مستوى تعليم الاب ؟ 1- تعليم ابتدائي . 2- تعليم ثانوي .3- كليه .4- جامعه

15-هل يقوم الطالب/ة بانشطه رياضيه ؟ 1- نعم 2- لا اذا كانت الاجابه نعم حدد

16- عدد ساعات الدراسه للطالب/ة يوميا ؟

17 – عدد ساعات مشاهدة الطالب/ة التلفاز والاجهزه االذكيه

18 – ما هو عدد افراد الاسرة ؟ 1- الام 2- الاب 3- الاخوة والاخوات العد د الكلي (.....)
اذا لم يشمل العدد الام او الاب اذكر السبب

19-ما هوترتيب الطالب /ة في الاسرة؟

20-ما هومتوسط الدخل الشهري للاسرة ؟

21- هل يعاني الوالدين من مشاكل صحيه ؟ 1-نعم 2- لا اذا كان نعم حدد

1- الام حدد 2 – الاب حدد

22- هل تعمل الام؟ 1-نعم 2- لا اذا كان نعم حدد طبيعه العمل

23-هل يعمل الاب ؟1- نعم 2- لا اذا كان نعم حدد طبيعه العمل

24-وقت قضاء الطالب/ة 1- مع الاب 2- مع الام 3- كليهما

25- ما هي اليد المسيطرة ؟ 1- اليمين 2- اليسار

26 – ماهي القدم المسيطره ؟ 1- اليمين 2- اليسار

27- هل يتلقى الطالب/ة اي دروس خصوصيه ؟ 1- نعم 2- لا

- مقايس الجسم

1-الطول

2- الوزن

3-مؤشر كتله الجسم

Appendix 2: Informed consent

نموذج تعريف بالبحث

Associations between motor coordination and cardiorespiratory fitness with academic achievement in school students (11-13 years) in the West bank/Palestine

الارتباط بين التناسق الحركي واللياقة القلبية التنفسية مع التحصيل الدراسي لدى طلاب المدارس (11-13) في الضفة الغربية / فلسطين

اسم البحث: الارتباط بين التناسق الحركي واللياقة القلبية التنفسية مع التحصيل الدراسي لدى طلاب المدارس (11-13) في الضفة الغربية / فلسطين

اسم الباحث : وفاء طنينه

تهديكم الباحثة في هذه الدراسة أ. وفاء طنينه اطيب التمنيات وتشكر لكم استعدادكم لمشاركه ابنكم او ابنتكم بهذا البحث، الذي هو جزء من دراسة الماجستير في العلاج الطبيعي من جامعة القدس. هذا البحث يهدف إلى التعرف على العلاقة بين االتناسق الحركي واللياقة القلبية التنفسية مع التحصيل الدراسي .

- طبيعة الفحصوصات التي سوف تستخدم في هذا البحث هي فحوصات أمنة ولا يوجد منها اي ضرر على الطالب ، حيث تتضمن فحص لياقه االقلب والجهاز التنفسي وفحوصات االتناسق الحركي .

إن إشتراككم في هذا البحث هو طوعي و مرتبط بتوقيعكم على نموذج موافقة بالمشاركة وتصريح بفهمكم لطبيعة البحث، فحوصاته . وفي حال وجود اي استفسار عن البحث او اي شيء متعلق بهذه الدراسة، يرجى التواصل مباشرة مع الباحث (أ.وفاء طنينه) على الارقام التالية 0599945197 .

شاكرين لكم حسن تعاونكم

Informed consent to participate in Research

نموذج الموافقة على المشاركة في البحث

اسم البحث : الارتباط بين التناسق الحركي واللياقة القلبية التنفسية مع التحصيل الدراسي لدى طلاب المدارس (11-13) في الضفة الغربية / فلسطين

اسم الباحثة وفاء طنينه

Evaluator name:

Date of evaluation and signature:

نموذج الموافقه على المشاركه في البحث

عزيزي الوالد – الوالدة

توقيعك ادناه على نموذج الموافقة هذا هو بموجب موافقة مكتوبة وموقعة على مشاركه ابنك - ابنتكم في دراسة بحثية التي تقوم بها الباحثه أ. وفاء طنينه بعنوان " اسم البحث : الارتباط بين التناسق الحركي واللياقة القلبية التنفسية مع التحصيل الدراسي لدى طلاب المدارس (11-13سنه صف سادس ,سابع ,ثامن) في الضفة الغربية / فلسطين , وايضا على الموافقه على الحصول على علامات ابنك-ابنتكم من المدرسه في مادة العربي والانجليزي ورياضيات .

و هو إقرار بإنه قد تم شرح أهداف البحث و طريقة الفحص و وتطبيق ادوات القياس للبحث ، وانه قد تم شرح حقوقك المتضمنة:

- سرية المعلومات التي تصرح بها وعدم إطلاع اي شخص عليها و تخزينها في مكان امن لا يصل اليه سوى الباحث.
- إخفاء هوية المشارك في تحليل البحث والنتائج.
- استخدام المعلومات للاغراض العلمية فقط.
- حرية إنسحابك في اي وقت من الدراسة ومن دون الحاجة لإبداء الأسباب ودون اية عواقب شخصية او مالية.
- حقك في الإطلاع على نتيجة فحوصاتك ونتائج البحث النهائية.

وأنه في حال كان لديك أسئلة حول الدراسة او حول اي معلومة متعلقة بها, يرجى الاتصال بالباحثة وفاء طنينه على *رقم التلفون:* 0599945197

موافقة المشارك

لقد تم وصف الدراسة البحثية لي شفهيا، وبما فيه المعلومات المدرجة أعلاه، وأوافق على المشاركة بهذه الدراسة البحثية. سوف أحصل على نسخة موقعة من هذا النموذج للاحتفاظ بها في سجلاتي، أوافق على المشاركة بهذة الدراسة.

اسم الابن –الابنه الرباعي:

اسم والد او والدة:

توقيع الوالد او الوالدة :

التاريخ:

Appendix3: Ethical approval from Al-Quds University

Al-Quds University
Jerusalem
Deanship of Scientific Research

بسم الله الرحمن الرحيم

جامعة القدس
القدس
عمادة البحث العلمي

Research Ethics Committee
Committee's Decision Letter

Date: Feb 15, 2023

Ref No: 274/REC/2023

Dears Dr. Hadeel Halaweh, Ms. Wafa Tanineh,

Thank you for submitting your application for research ethics approval. After reviewing your application entitled "Associations between motor coordination and cardiorespiratory fitness with academic achievement in school students (11-13 years) in the West bank/Palestine", the Research Ethics Committee confirms that your application is in accordance with the research ethics guidelines at Al-Quds University.

We would appreciate receiving a copy of your final research report/ publication.

Thank you again and wish you a productive research that serves the best interests of your subjects.

PS: This letter will be valid for two years.

Sincerely,

Suheir Ereqat, PhD
Associate Professor of Molecular Biology

Research Ethics Committee Chair

Cc. Prof. Imad Abu Kishek - President
Cc. Members of the committee
Cc. file

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