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# The Impact of Using Physical-Kinesthetic and Social Intelligence Strategies on the Development of Multi-Intelligences Among Fifth Graders in Jordan

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This study investigates the impact of using an educational program based on the strategies of physical-kinesthetic and social intelligence. The study population consisted of all fifth graders in the schools of the Islamic Educational College in Amman, Jordan male and female students (N = 250). The study sample was chosen from the study population students (n = 70), and they were all fifth-grade female students from in the academic year 2019-2020. Four tools were used on both the control and experimental groups. The results show that there are statistically significant differences at the level of significance ($\alpha < 0.05$) between the performance averages of the two groups in favour of the experimental group. The employment of the proposed educational program contributes to the development of the rest of multi-intelligences of fifth-grade female elementary students as well as the achievements in science, math, and fitness.

**Key words**: *educational program, hypothesis testing, social intelligence strategy, multiple intelligence*

## Introduction

Enhancing students' physical abilities enables them to reach a state of mastery in learning and acquisition in variety of disciplines measured through examining their cognitive performance. Instead of raising the question: how well do students perform, we ask how well the schools are ready to build and develop intelligence? This question is considered a cornerstone when dealing

with the cognitive theory and its applications. One of the widely spread contributions of cognitive theory was the invention of the intelligence quotient test (IQ test) which has been revised in many forms in order to measure people intelligence (Deary, 2001). The application of a certain test in schools and universities, which depends on the so-called IQ ratio, is considered of importance because it assists in classifying those learners based on their IQ percentage score. Despite their importance and how wide spread they are, IQ tests faced conceptual criticism. For example, Gardner (1983) argued that it measures only the individuals' abilities in logic and linguistics. These two do not necessarily reflect the overall ability of individuals. As an alternative reasoning solution, Gardner provided his theory of multi-intelligence (MI) in which he attempted to figure out the relationship between learning, creativity, and intelligence. Gardner tried to lead a comprehensive effort to build and develop intelligence among learners in educational associations. His assumption was that people already have different types of intelligences, but these intelligences might not be well-developed in effective ways throughout elementary school settings. Researchers such as Almeida et al, (2010) believe that MI should be implemented as indicators in the classifying process when dealing with intelligence. However, the theory of MI might be debatable when applied to individuals where gifted education is of concern (Shearer, 2020). Intell (2018) argued that by adopting a comprehensive model based in neuroscience framework, education could be more effective and more personalised to promote individual academic achievements.

***Theoretical Background***

The basic dimension of the curricula framework is to emphasise the possible interactions with individual mind, body and environment with integration to technology (Wang & Zang, 2017). Educators have made numerous attempts to design special curricula based on educational theories, especially cognitive ones. Among these theories is the MI Theory presented by Gardner (1983). The theory of MI (Gardner, 1999a & 1999b) classified seven areas of individuals' intelligence. Two of the seven areas of MI provided by Gardner are of particular interest in this study: (1) Bodily or *physical-kinesthetic intelligence*: this type reflects the potential of one's ability to utilise whole or part of the body to solve problems by using mental abilities while performing movement properly, to possess fitness level with coordination priority. It enables one to control bodily movements in harmony in both body and mind; individuals with this intelligence could play more than one sports with mastery. Also, they have the ability to succeed in role playing, have the tendency to engage in different sports, perform motor activities successfully, and believe in learning by doing. (2) *Social/interpersonal intelligence*: this type relates to one's ability to notice, observe and distinguish among individuals and work effectively with others. It also reflects the individual's moods, motivations and desires and understanding their intentions. Also, it reflects the ability of one to deal with and understand others within the environment and show the ability

to express personal feelings and empathy towards others without difficulties. We note that the other five areas of MI are listed as part of our investigation in the results section.

The theoretical background in relevance to the MI theory reveled that there is such a positive and strong relationship between some types of intelligences and academic achievements. (Silver & Perini, 1997; Willis & Asotren, 2001; McClelland & Morrison, 2003). Among this line of research Bednar et. al (2002) concluded that through maths instruction, students learned better when gearing to multi-intelligence strategy. This may shed some light on the need of linking some discipline such as physical education and its fields with cognitive theories, including the theory of multiple intelligences. Analysing the level of the sports and physical education personnel is considered of great importance when we are concerned about well-being and health of generations (Ekici, 2011). The intelligence level of physical educators, coaches and trainers, and managers must be examined and analysed because of the fact that they graduate from different institutions. The reason for that is because of the significant role in getting their students be well prepared, healthy and intelligent individuals. Urgup & Aslan (2015) investigated students multi-intelligence domains in the three different departments in the school of physical education at Cumhuriyet University in Sivas, Turkey where the intrapersonal intelligence was highest domain among students compared to other types of MI.

***Literature Review***

Throughout reviewing the related research of the previous literature in the area of multiple intelligence in sports and physical education, the researcher encountered a lack of studies in this line of research with few endeavours in horizontal integration curriculum in teaching physical education with other areas of discipline pertaining to MI theory. The researchers encountered that some studies dealt with the theory of multiple intelligences in physical education settings. Previous studies showed the importance of multiple intelligences theory in teaching subject matters in general such as Gonzalez-Treviño et al (2020) where they found no statistically significant differences in MI between boys and girls in Mexican schools.

Ozdilek (2010) in her study, used certain learning styles with sixth grade pupils of different types of intelligence in maths and science to check their achievement levels. She found low positive correlations between achievement and the MI of mathematical-logical, visual-spatial and interpersonal intelligences. Many studies aimed at approving the relationship between multiple intelligence strategies and academic achievement in mathematics, as in the studies of Isik & Tarim, 2009; Tabuk & Ozdemir, 2009; Torresan, 2007; Willis & Johnson, 2001. The results of these previous studies administrate a cause and effect relationship between instructional programs based

on multi-intelligence treatments and achievements in science, mathematics and linguistics at different grade levels of students (Silver et al, 1997; Willis & Asotren, 2001; Bednar et al, 2002).

In their research relative to sports education curriculum and MI, Martain & Mackenzie (2013) consider using the strategy of linking physical-kinesthetic as a path for success by having the students in middle school and high school engage in physical education classes with future active life-styles in adulthood. This was an investigation of knowledge, sports skills, and understanding.

The objective of this paper is to identify and examine the effect of using physical-kinesthetic and social/interpersonal intelligence strategies on students in fifth grade. We apply a physical education instructional program on developing academic achievements among these fifth graders in *general sciences* and *mathematics* in Jordan. Our motivation is that elementary school years are an important formational stage in students' lives, where they can develop their physical-kinesthetic and social intelligences through applied instructional programs composed of general sciences, mathematics, and physical fitness. It is an endeavour from the researchers to adopt the application of the MI theory when applying the curriculum of physical education to the subjects of general science, mathematics, and physical fitness. The hypothesis presented in this paper is that a statistically significant difference in the academic achievement performance at the level of significance $\alpha$ at the $p$-value = 0.05 between the experimental and control groups exists in favor of the experimental group. This applies to the subjects of general science, mathematics, and physical fitness alike. We presented the results of our analysis in two different ways: (a) studying the overall intelligences based on Gardner's MI theory and (b) studying two areas of intelligences of choice, which we use towards the formulation of our hypotheses.

**Proposed Instructional Program**

Based on the findings of the researchers in the pre-measurements and literature review, the researchers propose an educational program based on the strategies of physical-kinesthetic and social intelligences.

**Formulation.** The program is done through the distribution of female fifth-grade students into groups and the implementation of a special program based on the curriculum of the fifth graders. Specialists from the Ministry of Education were recruited to manage the curricula in this field. This program is composed of 1) curriculum content and 2) physical fitness components. Select educational units from the curriculum content are chosen. These are: (a) kinetic rhythm: 12 educational units, (b) volleyball: 11 educational units, (c) badminton: 11 educational units, and (d) soccer: 11 educational units. Similarly, select units from the physical fitness components are chosen. These are: (a) 50-yard running/dashing (b) shuttle run, (c) hanging/pull ups (d) sitting

down from the back position/modified set ups, (e) long jump with stability, and (f) 600 yards running-walking. The general outcomes of the selected units were determined according to the strategies of physical-kinesthetic and social intelligence. Lesson memos have been planned as 45 lessons applied three times per week, so that the duration of each session was 45 minutes, and thus the time required to implement the program was 15 weeks. The researchers have determined the subject of the lesson for each daily educational unit and educational outputs, which are expected to be achieved through the implementation of the daily educational unit, where no less than three outputs were developed for each memo. The time allocated to each educational unit was determined. Also, the time allocated to each educational part was determined within a single educational unit. Scientific concepts which included in the memo are expected to be clarified through explanation. In addition to the strategies (physical-kinesthetic and social intelligences), educational materials and tools are available to implement the session. These means contribute to the evaluation and ensure the achievement of educational outcomes have been identified through diagnostic, formative, and summative evaluation used during or at the end of the session. Homework was assigned daily and due at the end of each daily educational unit.

**Effectiveness.** to verify the effectiveness of the applied educational program in terms of appropriateness and the time required to apply each activity, the educational program was applied to a sample equivalent to the study sample consisting of 25 students.

**Validity of the program.** The educational program was presented to the same specialists from the Ministry of Education as well as teachers and supervisors for feedback on the educational program. This feedback was focused on the strategies and activities proposed. The researchers reviewed the feedback of the specialists and made the appropriate adjustments based on the feedback, to produce the final image of the educational program. Table 1 shows the time distribution of the educational program.

## Methods

The experimental approach and design were utilised to validate the hypotheses of the study, due to its suitability. Two groups, pre- and post-experimental, were used in this study.

### *Participants*

The members of the study sample were n = 70 students chosen from the fifth-graders at the Islamic Educational College school in Amman, Jordan. They were distributed randomly into four groups, each group consisted of 17 or 18 students. Table 1 shows the distribution of the sample of the study for both groups. Both groups were subject to the same tools of the pre-testing. Then students of

the *experimental group* were subjected to the proposed educational program, while students of the *control group* underwent the traditional method of teaching physical education. We conducted the post-tests corresponding to the pre-tests, with the same conditions that were applied to the two groups.

**Table 1 Time distribution of the educational program**

| Content | Time Distribution |
|---|---|
| Duration of the application of the educational program | During the first semester |
| Number of the weeks needed for the application of the educational program | 15 weeks |
| Number of weekly lessons | 3 units |
| Total number of the educational program units | 45 units |
| Duration of a single unit | 45 minutes |
| Total time of the educational program. | 2025 minutes |

***Tools***

To verify the study hypotheses, we used the Mackenzie (2000) multiple intelligence scale, which has been circulated in many studies. Seven types of intelligences were dealt with on this scale in order to validate the objectives of the study. Each list contains one type of intelligence from the Gardner's multiple intelligences and consists of ten paragraphs. The achievement test for general sciences that we prepared, the achievement test for mathematics, and the battery tests of the American Association for Health, Physical Education and Recreation (AAHPER), were all used as secondary tools.

**Tools' honesty and validity.** To ensure the honesty and validity of the tools, we presented them to a group of arbitrators and specialists in the fields, where we made the necessary adjustments according to their opinions based in their level of expertise.

**Tools' reliability.** To verify the reliability of the study tools, we use the *test-retest method* (i.e., Pearson correlation coefficient) on the exploratory sample which reached 25 students, then re-test the same sample two weeks later. We keep into consideration that the re-testing should be in the same circumstances. We process the data to calculate the reliability coefficients by re-testing. Table 2 shows the stability coefficients of all the study tools.

**Table 2 The distribution of the sample of the study for both groups**

| Group | Number of students | Number of grades | Number of students per grade | Percentage |
|---|---|---|---|---|
| Control group | 35 | 2 | 17, 18 | 50% |
| Experimental group | 35 | 2 | 17,18 | 50% |
| Sum | 70 | 4 | 70 | 100% |

***Data Collection Procedure***

The researchers followed the following sequential procedures in order to achieve the objectives of the educational program**:** (a) Determining the problem of this study, setting its own questions, and defining its goals after reviewing the previous literature and studies. (b) Choosing the appropriate study sample, where the fifth-grade elementary students were chosen, and the school in which the study will be carried out was selected, the proposed educational program was designed, in addition to the selection of study tools and their arbitration up to the final image of the tools. (c) The credibility and stability of each study tool was found, beside extracting the official related documents from the official departments and authorities, to facilitate the researchers' task, then the researchers conducted the exploratory study. (d) Meetings between the researchers and the physical education teachers were held in the school, in addition to the educational counsellor and the science and mathematics teachers for the fifth-grade, in order to clarify the task of each of them in the study procedures, and the objectives of the study, its questions and tools were also clarified.

**Table 3 Test-re-test reliability coefficient for all study tools**

| Tool | Reliability coefficient |
|---|---|
| Multiple intelligence scale | 0.90 |
| Diagnostic test for general sciences | 0.97 |
| Mathematics diagnostic test | 0.98 |
| Fitness tests | 0.92 |

Coordination ability was carried out to conduct pre-tests under the same conditions, as the multi-intelligence survey scale was applied on the first day on both study groups, the general science diagnostic test on the second day on both groups of study, and the diagnostic test of mathematics on the third day on both study groups at the same time and in the same conditions. Fitness tests were applied from the first day, and the application of the pre-tests of the study tools took a week, and the pre-tests were held outside the allocated program times. The researchers were keen on the availability of the factor of suspense and continuous encouragement to the two study groups when implementing the study tools. It was agreed upon the date for the start of the educational program, as it was applied during the first semester, and it was agreed to compensate the daily educational unit in the case that the implementation date coincides with an official holiday, and it was also

agreed to strictly adhere to the implementation of the proposed educational program with this study. A physical education teacher was determined to implement the proposed educational program for the experimental sample, and another physical education teacher in the same school to implement the regular educational program for the control sample, without informing the control group teacher of the proposed program to ensure complete neutrality in this topic. Intensifying the researchers' attendance of the classes of the two groups ensured the proper functioning of the daily educational unit procedures. The results of all pre-study tools were collected. Post-test studies of the study tools were applied, in the same conditions as the application of the pre-tests, with full compliance with the time of implementation, and with the same specific and implemented procedures, with full adherence to the application of the program in the first semester of the academic year 2019-2020. The results of this study were extracted.

### *Data Analysis*

The independent variables are the strategies of physical-kinesthetic and social intelligence as in the educational program. The dependent variables are measurements obtained on the other seven multi intelligences, the academic achievement in general science and maths subjects, and the fitness level of the sample.

## Results

The results are presented in two different ways: (a) studying the overall intelligences based on Gardner's MI theory and (b) studying two areas of intelligences of choice, which we use towards the formulation of our hypotheses. We present the means and standard deviations (SD) for the control and experimental groups in each intelligence area of the seven areas separately and the study tool as a whole. To validate the hypotheses, we use means, SDs, and one-way analysis of variance (ANOVA) to assess whether these differences are significant and constitute a statistical indication. The significance value directs us to either reject the *null hypothesis* (no statistically significant differences in the means) or reject the *alternative hypothesis* since the differences are indeed significant and constitute a statistical indication. Our *p*-value of choice is 0.05, which denotes the level of significance (i.e., if $\alpha$ is less than 0.05, then the differences are significant and constitute a statistical indication).

### *Overall Intelligences*

Table 4 shows apparent differences in the arithmetic mean between the control and experimental groups in each of the multi-intelligence areas of the study tool separately, and on the study tool as a whole.

**Table 4 Means and SD for both groups of the multi intelligence scale**

| Intelligence | Group | Size | Arithmetic mean | SD |
|---|---|---|---|---|
| Intra-Personal | Control | 35 | 6.57 | 2.08 |
| | Experimental | 35 | 6.57 | 1.80 |
| Musical | Control | 35 | 7.09 | 1.69 |
| | Experimental | 35 | 7.51 | 1.70 |
| Visual-spatial | Control | 35 | 5.74 | 2.09 |
| | Experimental | 35 | 6.80 | 2.07 |
| Logical-mathematical | Control | 35 | 6.69 | 1.59 |
| | Experimental | 35 | 8.17 | 1.45 |
| Linguistic-verbal | Control | 35 | 6.47 | 1.84 |
| | Experimental | 35 | 7.06 | 1.88 |
| Inter-personal/Social | Control | 35 | 6.97 | 1.32 |
| | Experimental | 35 | 7.80 | 1.69 |
| Physical-kinesthetic | Control | 35 | 4.94 | 2.14 |
| | Experimental | 35 | 6.51 | 2.25 |
| The tool as a whole | Control | 35 | 44.43 | 7.43 |
| | Experimental | 35 | 50.43 | 9.61 |

Table 5 shows that the level of significance of the tool as a whole in the development of multi intelligences was 0.005, which is less than the level of significance, which indicates the presence of statistically significant differences in the development of multiple intelligences in favor of the group with the higher arithmetic mean as shown in Table 4, where the mean of the experimental group M = 50.43 with SD = 9.61 while the mean of the control group was M = 44.43 with SD = 7.43.

It is also noted from Table 5 that there are statistically significant differences for each of the visual-spatial intelligences at the level of significance 0.037 and for the benefit of the experimental group, logical-mathematical intelligence, at the level of significance 0.001, and for the benefit of the experimental group, social intelligence at the level of significance 0.025, and for the benefit of the experimental group, and physical-kinesthetic intelligence, at the level of significance 0.004, and for the benefit of the experimental group.

It is also noted from Table 5 that there are no statistically significant differences for each of the field of personal intelligence, where the level of significance reached 1.00, as well as the absence of statistically significant differences in the field of musical intelligence, where the significance level reached 0.294 which is not significant, and also no statistically significant differences in the field of linguistic-verbal intelligence, where the level of significance is 0.161.

**Table 5 ANOVA results for the two groups of multi intelligence**

| Intelligence | Source of variance | Sum of squares | df | Average squares | F value | Level of significance |
|---|---|---|---|---|---|---|
| Intra-Personal | Group | 0,000 | 1 | 0.000 | | |
| | Error | 257.143 | 68 | 3.782 | 0.000 | 1.000 |
| | Sum | 257.143 | 69 | | | |
| Musical | Group | 3,214 | 1 | 3.214 | | |
| | Error | 195.486 | 68 | 2.875 | 1.118 | 0.294 |
| | Sum | 198.700 | 69 | | | |
| Visual-spatial | Group | 19.557 | 1 | 19.557 | | |
| | Error | 294.286 | 68 | 4.328 | 4.519 | *0.0037 |
| | Sum | 313.843 | 69 | | | |
| Logical-mathematical | Group | 38.629 | 1 | 38.629 | | |
| | Error | 166.514 | 68 | 2.449 | 15.775 | *0.001 |
| | Sum | 205.143 | 69 | | | |
| Linguistic-Verbal | Group | 6.914 | 1 | 6.914 | | |
| | Error | 234.457 | 68 | 3.448 | 2.005 | 0.161 |
| | Sum | 241.371 | 69 | | | |
| Inter-personal/Social | Group | 12.014 | 1 | 12.014 | | |
| | Error | 156.571 | 68 | 2.303 | 5.218 | *0.025 |
| | Sum | 168.586 | 69 | | | |
| Physical-kinesthetic | Group | 43.214 | 1 | 43.214 | | |
| | Error | 328.629 | 68 | 4.833 | 8.942 | *0.004 |
| | Sum | 371.843 | 69 | | | |
| The tool as a whole | Group | 630.000 | 1 | 630.000 | | |
| | Error | 5,017.143 | 68 | 73.782 | 8.539 | *0.005 |
| | Sum | 5,647.143 | 69 | | | |

***Intelligences of Choice***

In this subsection, we show the result of validating our hypotheses, which investigates whether the selected two areas of intelligence (i.e., Physical-kinesthetic and Inter-personal/Social) have an effect on the performance of the students in school subjects (general science, mathematics, and physical fitness).

**General science.** It is noted from Table 6 that the control group's arithmetic mean in the achievement of general sciences for post measurement was 33.40 with SD = 7.17, while the experimental group's mean in the achievement of science for post-measurement was M = 87.51 with SD = 4.05, which indicates the presence of apparent differences between the two groups. To show whether these differences were statistically significant, ANOVA was extracted for both study groups (control and experimental) as shown in Table 7.

**Table 6 Means and SD of both groups for the achievements in general science**

| Group | Number | Arithmetic mean | SD |
|---|---|---|---|
| Control | 35 | 33.40 | 7.171 |
| Experimental | 35 | 87.51 | 4.054 |
| Total | 70 | 35.46 | 6.142 |

**Table 7 ANOVA results for the two groups of achievement in general science**

| Source of variance | Total squares | df | Average squares | F value | Level of significance |
|---|---|---|---|---|---|
| Group | 296.229 | 1 | 296.229 | | |
| Error | 2,307.143 | 68 | 33.929 | 8.731 | *0.004 |
| Total | 2,603.371 | 69 | -- | | |

It is noted from Table 7 that the level of significance for the tool as a whole for the achievement of general science subject is $\alpha = 0.004$, which means that there were statistically significant differences in the achievement of fifth-grade students for the benefit of the experimental group.

**Mathematics.** The data of the achievement test for mathematics were treated and analysed by using descriptive statistics and One-Way ANOVA. Tables (8) and (9) showed the differences between the experimental and control groups.

**Table 8 Mean and SD for the groups in mathematics**

| Group | Number | Arithmetic mean M | SD |
|---|---|---|---|
| Control | 35 | 37.66 | 8.363 |
| Experimental | 35 | 39.66 | 4.988 |
| Total | 70 | 38.66 | 6.909 |

It is noted from Table 8 that the arithmetic mean of the control group in the achievement of mathematics for post-measurement was $M = 37.66$ with $SD = 8.36$, while the mean of the experimental group in the achievement of post-mathematics was $M = 39.66$ with $SD = 4.98$, which indicates that there are apparent differences between the two groups. In order to show if these differences were statistically significant, the common mono-variance analysis of the two control and experimental study groups was extracted as in Table (9).

**Table 9 ANOVA results for the two groups in mathematics**

| Source of variance | Total squares | df | Average squares | F-value | Level of significance |
|---|---|---|---|---|---|
| Group | 70.000 | 1 | 70.000 | | |
| Error | 3,223.771 | 68 | 47.408 | 1.477 | *0.029 |
| Total | 3,293.771 | 69 | -- | | |

It is noted from Table 9 that the significance level of the tool as a whole is 0.029, meaning that there are statistically significant differences in the post achievement of fifth-grade students in the achievement test in mathematics subject, in favour of the experimental group.

**Physical fitness.** The data of the achievement in the fitness test were treated and analysed by using descriptive statistics and One-Way ANOVA. Table 10 and Table 11 showed the differences between the experimental and control groups.

**Table 10 Mean and SD for both groups in the fitness tests**

| No. | Test | Group | Number | Arithmetic mean | SD |
|---|---|---|---|---|---|
| 1 | 50-yard running/dashing | Control | 35 | 10.97 | 1.67 |
| | | Experimental | 35 | 10.54 | 1.15 |
| 2 | Shuttle run | Control | 35 | 25.23 | 8.29 |
| | | Experimental | 35 | 11.89 | 2.14 |
| 3 | Hanging | Control | 35 | 21.49 | 11.05 |
| | | Experimental | 35 | 29.11 | 14.67 |
| 4 | Sitting down from the back position | Control | 35 | 26.69 | 7.85 |
| | | Experimental | 35 | 38.66 | 8.45 |
| 5 | Long jump with stability | Control | 35 | 1.4123 | 0.21 |
| | | Experimental | 35 | 1.2786 | 0.22 |
| 6 | 600 yards Running-Walking | Control | 35 | 3.4683 | 0.67 |
| | | Experimental | 35 | 3.5546 | 0.72 |

It is noted from Table 10 that there are apparent differences in the arithmetic mean between the control group and the experimental group. To show whether these differences were statistically significant, the common mono-variance analysis of the fitness tests tool was calculated as in Table 11.

**Table 11 ANOVA results of the two groups in fitness tests**

| Test | Source of variance | Total squares | df | Average squares | F value | Level of significance |
|---|---|---|---|---|---|---|
| 50 yards Running | Group | 3.214 | 1 | 3,214 | | |
| | Error | 139.657 | 68 | 2,054 | 1.565 | 0.215 |
| | Total | 142.871 | 69 | | | |
| Shuttle Run | Group | 3,115.557 | 1 | 3,115,557 | | |
| | Error | 7,489.714 | 68 | 36,613 | 85.093 | 0.001* |
| | Total | 5,605.271 | 69 | | | |
| Hanging | Group | 1,018.414 | 1 | 1,018.414 | | |
| | Error | 11,468.286 | 68 | 168.651 | 6.039 | *0.017 |
| | Total | 12,486.700 | 69 | | | |
| Sitting down from the back position | Group | 2,508.014 | 1 | 2,508.014 | | |
| | Error | 4,523.429 | 68 | 66.521 | | |
| | Total | 7,031.443 | 69 | | 37.703 | 0.001* |
| Long jump with stability | Group | 0.313 | 1 | 0.131 | | |
| | Error | 3.185 | 68 | 0.047 | 6.680 | 0.072 |
| | Total | 3.498 | 69 | | | |
| 600 yards Running-Walking | Group | 0.130 | 1 | 0.130 | | |
| | Error | 33.191 | 68 | 0.488 | 0.267 | 0.607 |
| | Total | 33.321 | 69 | | | |

It is noted from Table 10 and Table 11 that there are statistically significant differences in the shuttle run test where the level of significance was 0.001 in favor of the experimental group with a mean of 11.89 and with SD = 2.14, while the mean for the control group was 25.23, with SD = 8.2, and the presence of statistically significant differences in the hanging test where the level of significance was 0.017 in favor of the experimental group, with arithmetic mean M = 29.11 and SD =14.6, while the arithmetic mean of the control group was M = 21.49 with SD = 11.05. It is also noticed that there are statistically significant differences in the sitting test from the back position. The level or significance was 0.001 in favor of the experimental group and with total arithmetic mean M = 38.66 and SD = 6.96. Also, it is noted from Table 11 that there are no statistically significant differences in the 50 yards dash and 600 yard running and walking test and in the long jump test from stability.

**Discussion**

This study aimed to identify the effect of the educational program based on the strategies of physical-kinesthetic and social intelligence, in developing multiple intelligences, and academic achievement in general sciences and mathematics and in addition to the level of physical fitness among students of the fifth elementary grade, where the researchers prepared and formed the proposed educational program depending on official physical education curriculum accredited by the Ministry of Education in Jordan.

To verify this hypothesis, the researchers treated and analysed the data by utilising proper statistical techniques. The results of the study pertaining to multi intelligences approach prepared by Mackenzie (2000) utilised One-way ANOVA to identify the extent of development of multi-post intelligence in both groups. Table 4 shows the means and standard deviations of the both groups in details for each of the multiple intelligence areas and on the multiple intelligence tool as a whole.

The results of this study were consistent with the studies of Tabuk and Ozdimir (2009), Isik and Tarim (2009), Almeida and et. al (2010), and Martin and Mackenzie (2013). The researchers believe that this is consistent with the basic principles developed by Gardner according to the theory of multiple intelligences, since the use and development of multiple intelligences' field within the individuals may lead to the development of other areas of multiple intelligences with different degrees; this depends on the individual's genetic capabilities, and the appropriateness of the surrounding environment in the development of these areas, where this principle is considered an important factor if it was taken by teachers of different subjects in general, and physical education teachers in particular, because this principle makes the teacher constantly search for strategies related to the areas of multi intelligences and development. Applying a strategy in a certain intelligence field can lead to the development of other intelligences, and this appears already in the educational process by some researchers Wang and Zeng (2017), Intell (2018), Ozdilek (2020). The researchers believe that when introducing a kinematic concept, for example, we do not teach it integrally while teaching kinetic skills only, in isolation from the rest of other subjects, but we teach it when teaching science so that the kinetic concept and the Arabic language are linked by explaining and clarifying the kinetic concept; this should be done in a well-liked scientific framework that relies on positive social interaction, a thing that contributes to improving several areas of multiple intelligences simultaneously, according to Gardner's theory.

***Hypothesis Validation***

In light of the statistical significance presented by the data analysis, we validate our hypothesis in the four areas: overall, general science, mathematics, and physical fitness.

**Overall.** The hypothesis formulated by the researchers was accepted in some of the seven multi-intelligences due to the statistically significant differences. Some of these areas are visual-spatial, logical-mathematical, interpersonal social, and physical-kinetical, and the intelligences as a whole. The researchers attribute the reason to this; it is as a result of the effect of the educational program based on such strategies when applying the curriculum of physical education to fifth-grade female elementary students in the Islamic Educational College School at Amman, Jordan.

**General science.** This corresponds according to the researchers' point of view in regard to Gardner's theory of multi intelligences where developing a field of multi-intelligences automatically may contribute to the development of another field of intelligence. The development of physical-kinesthetic and social intelligence as a result of the activation of its strategies may contribute to the development of the field of visual spatial intelligence in which in turn led to an improvement in their academic achievement in general sciences, due to the link between science and the visual-spatial intelligence, and many other areas of intelligence. These results correspond with the study of Ozdileck (2010) and Intell (2018). According to the researcher's views, spatial-visual intelligence is the individual's ability to recognise directions or places.

**Mathematics.** Similar to general science, the hypothesis formulated by the researchers for mathematics was accepted because of the significant differences that appeared in the academic achievement resulted in mathematics subject matter. Logical-mathematical intelligence represents individual's ability to use numbers effectively, their ability to find association between patterns and relationships, and their ability to deal with problems and solve them. Usually, mathematics requires an ability to use numbers, build relationships and solve problems, and this may formulate a positive relationship between developing logical-mathematical intelligence and achievement in mathematics. As for the relationship between physical-kinesthetic intelligence, and logical-mathematical intelligence, we find that there is a relationship between sports, and dealing with numbers and computations, for example, when passing football, this requires knowing the appropriate distance and strength required for passing and knowing the dimensions of the play areas; this may contribute to the development of physical-kinesthetic intelligence and logical-mathematical intelligence. Solving problems in a logical way is considered one of the basics of implementing the physical education class. It was taught with a practical, methodological framework based on multiple intelligence theory strategies and related activities in addition to the use of the body as a learning tool. An example of this is linking between numbers and the body

movement as a part of the strategies of the body maps. This helps improve logical-mathematical intelligence within physical-kinesthetic intelligence strategies. This is consistent with Bedner's (2002) finding about a positive relationship between the use of multi intelligences and improving motivation and student achievement in mathematics in grades three to five. Willis & Jahnson (2001) showed that the use of the multiple intelligence theory helped the third-grade primary students in mastering the multiplication table. The results of Isik & Tarim (2009) study showed that the effect of the use of multiple intelligences and dual education on the achievement of some mathematical skills among fourth-graders has improved their multi-intelligences. This helps maintain the impact of education and information for a longer period.

**Physical fitness.** The hypothesis was accepted because the significant differences appeared in the academic achievement resulted in fitness capability. Physical-kinesthetic intelligence contributes to an increased neural activity in the brain (Intell, 2018). It activates the areas responsible for movement and increases the flow of the adrenaline hormone, which helps transfer information from short-term memory to long memory. The nerve zone responsible for this intelligence is the cerebellum, the primary nodes, and the motor cortex. As for the biological basis for this intelligence, it includes synergy between the nervous and motor systems so that those who enjoy this intelligence are superior in physical activities and in coordination between the visual and the motor (Sokolov, Miall, & Irvy, 2017). Those who use body language master the sports, as they move and easily remember information when they are given motor hints. As Gardner (1993) pointed out, the movements of the body play an important role in expanding the horizons of awareness and consciousness among learners and reflect positively.

### *Limitations and Future Research*

This study had some limitations that invoke caution with the interpretation of its results and future research. First, we chose female fifth-graders instead of a male-female mix. Second, we chose a private school instead of a group of schools including public ones. Third, we chose only two types of intelligences as our dependent variables. Future research can be done regarding the relationship between other intelligences besides the ones identified in Gardner (1983) and academic achievement in other school subjects besides science, maths, and physical fitness such as social studies and language arts is an interesting area of study.

## Conclusion

This study shows that the experimental group members outperformed the control group in the development of physical-kinesthetic intelligence and social intelligence. Further, the employment of an educational program, based on the strategies of physical-kinesthetic and social intelligences

according to Gardner's theory of multi-intelligences, contributes to improving the academic achievement in general sciences, mathematics, and physical fitness of fifth-grade female elementary students. An interesting area of future research is to apply the findings of using physical education in improving academic achievements to students from higher grades.

**REFERENCES**

Almeida, LS et al (2010) "Intelligence assessment: Gardener multi intelligence theory as an alternative." Learning Individual differences, 20, 225-230. ResearchGate.

Bednar, J et al (2002) "Improving Student Motivation and Achievement in Mathematics through teaching to the Multiple Intelligences." Eric ED.466408, p.98. ResearchGate.

Checkley, K (1997). "The First Seven… and The Eighth: A conversation with Howard Gardner." Educational Leadership, 55(1), 8-13. SemanticScholar.

Ekici, S (2011) "Multi intelligence level of physical education and sports school students." Educational Research Review, 6(21), 1012-1026. ResearchGate.

Gardner, H (1983) "Frames of Mind: The Theory of Multiple Intelligences." New York: Basic Books.

Gardner, H (1993). Multi intelligence: the theory in practice. NY, Basic Books

Gardner, H (1999a). The Disciplined Mind: Beyond Facts and Standardized Tests, The K-12 Education That Every Child Deserves. New York: Simon and Schuster.

Gardner, H (1999b). Intelligence Reframed: Multiple Intelligences for the 21st Century, New York: Basic Books.

Deary I. J. (2001). Intelligence: A very short introduction. Oxford, UK: Oxford University Press.

Ozdilek, Z (2010) "To what extent do different in multi intelligences affect Sixth grade students' achievement level on the particle model of matter?" Piocedia Soc. Behav. Science 2:4858-4862. ResearchGate.

Gonzalez-Treviño et. Al (2020) Assessment of multi intelligences in elementary school students in Mexico: An exploratory study. Heliyon 6 (4:e03777). ResearchGate.

Savas P (2012). Pre-service English as a foreign language teachers' perception of relationship between multi intelligence and foreign language learning. Learning and individual differences 22 (6) 850-855. ResearchGate.

Shearer, B (2018) "Multi intelligence in teaching and education: Lesson learned from Neuroscience." Journal of Intelligence, 6(3). ResearchGate.

McKenzie, W. (1999). The One and Only Surfaquarium. Retrieved on 10th of April, 2013 from http://surfaquarium.com/MI/inventory.htm

Martin, M & Mackenzie, M (2013) Sports education and Multi intelligences: A path to student success. Strategies,26(4)31-34. ResearchGate.

McCoog, IJ (2010). "The existential learner" J. of Educational Strategies Issues and Ideals, 83(4),126-128.

Ministry of Education (2015). Teacher's Guide / Physical Education for Fifth Grade, Curriculum and Textbook Administration: Jordan.

Richards, J. C., & Rodgers, T. S. (2014). Approaches and methods in language teaching (3rd ed.). Cambridge, UK: Cambridge University Press.

Saban A (2002). Multiple Intelligence Theory and Education, Nobel Publish Distribution.

Shearer, CB (2020), "Multi intelligences in gifted and talented education." Lessons learned from neuroscience after 35 years. Roeper Rev.42,42 -49.

Silver, H, Strong, R, & Perini, M. (1997). "Integrating learning styles and multiple intelligences." Educational Leadership, 55(1), 22-27. Available: http://www.ascd.org/publications/educational-leadership/sept97/vol55/num01/Integrating-Learning-Styles-and-Multiple-Intelligences.aspx#:~:text=Though%20both%20theories%20claim%20that,content%20and%20products%20of%20learning.

Sokolov, A, Miall, C, and Irvy, R (2017). "The Cerebellum: Adaptive prediction for Movement and cognition. Opinion ,21(5)313-332. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5477675/

Tabuk, M & Ozdemir, A (2009). The Effects of Multiple Intelligence Approach in Project Based Learning on Mathematics Achievement. Available: ResearchGate.

Uragup, S & Aslan, CS (2015). "Investigation of students' multi intelligence domains in Three Different Departments of the School of PE and Sports." Educational Research and Review, 10(15), 2068-2075. ResearchGate.

Wang, M & Zheng, X (2017). "Embodied cognition and curriculum construction." J. of Educational Philosophy and theory, 50(3), 217-228. ResearchGate.

Willis, JK, Johnson A (2001). "Using Multiple Intelligences to Master Multiplication". Teaching Children Mathematics 7(4), 260. ResearchGate.