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The examination of the differences in the motor proficiency skills of children practising gymnastics vs. non-sportive children

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ABSTRACT

This study aimed to investigate whether or not gymnastics is effective to develop 60–72-month-old children's motor skills. The participants were selected from two different preschools in the same district of Ankara, Turkey. While half of the children participated in regular gymnastic activities in their schools, the remaining part of them did not participate in any kind of sportive activities. As a data gathering instrument, the Bruininks-Oseretsky motor proficiency test was used to measure the participants' motor skills. The test consists of eight sub-tests in original, which are running speed and agility, balance, bilateral coordination, strength, upper-limb coordination, response speed, visual-motor control, upper-limb speed, and dexterity. The results revealed that children participating in gymnastic programme achieved higher scores on speed and agility, balance, bilateral coordination, strength, upper-limb coordination, response speed, and visual-motor control than the non-sportive group of children.

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Motor skills; motor proficiency; Bruininks-Oseretsky; preschool children; early childhood education

Introduction

Motor development has been defined in many ways. Haywood and Getchell (2005) defined motor development as sequential and continuous changes in the motor skills of children as they age. Additionally, according to Gabbord (1996), motor development is a lifelong process of changes that occur in motor proficiency with possible effects on interaction between individuals' biology and their social environment. Common characteristics of these definitions are individual, environmental, and motional factors that can impact individuals' motor competence during their lives; which in turn, their motor development.

Children's development as a whole, including physical and biological development, promotes their movement skills (Haywood & Getchell, 2005). The development of children's motor skills can also benefit from the enriched stimulus in their immediate environment and allowing children move freely in this environment in early years. According to Gallahue and Ozmun (2006), children should be offered a variety of physical activities that can possibly improve and promote development as a whole. However, these physical activities should be developmentally appropriate according to their age and physical activities (Gallahue & Ozmun, 2006). There are plenty of activities that can both attract young children's attention and contribute to their healthy development.

Gymnastics is one of those activities offering children to learn how they move their body as it includes running, leaping, rolling, swing, statistical, and dynamical balance. According to Coelho (2010), gymnastics can be accepted as one of the important activities to improve children's movement skills and health through fitness. Similarly, several researchers underlined that gymnastic

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activities help young children nurture their motor performances, including fundamental movement skills (i.e. Akın, 2013; Culjak, Miletic, Kalinski, Kezic, & Zuvela, 2014), body control (Garcia, Barela, Viana, & Barela, 2011), and fitness (Lyulina, Zakharova, & Vetrova, 2013). Participation in gymnastic activities contributes to both growth and development of skeletal mass in young children (Burt, Ducher, Naughton, Courteix, & Greene, 2013) which in turn improves their motor proficiency (Culjak et al., 2014; Garcia et al., 2011). The advantages of gymnastics are not limited to physical development, but there are also benefits to children's social skills (Al-Awamleh, 2010; Werner, 2004).

Children are natural at so many body movements including rolling, crawling, and they try to maintain their body control. After first few years in life, children take their initial steps towards more complex movements such as walking and running, and this advance motor skills enrich their physical capabilities. Almost all body movements in children show innate compatibility with movements in gymnastics, and gymnastics can serve as a foundation for other sport types that children can possibly be into (Werner, 2004). Children's locomotor and balance skills can benefit from gymnastic activities. Gymnastic also enhances children awareness and potential of their own skills by encouraging them through a variety of enjoyable and aesthetic movements. As a result, gymnastic activities can contribute to the development of children's motor proficiency (Werner, 2004).

To investigate motor development, preschoolers should be given a priority as it is important to learn the fundamental movements in a correct way at an early age after identifying their levels of motor development and follow their motor development in a long term. Even though the researchers have developed measurement tools to gauge young children's motor development (Bruininks, 1978; Gallahue & Cleland-Donnelly, 2003; Morris, Atwater, Williams, & Wilmore, 1980), their numbers are still limited for determining children's levels of motor development in non-Western cultures (Gabbord, 1996; Gallahue & Ozmun, 2006).

There are ample research studies focusing on the relationship between children's physical activities and their motor development. However, most of these studies are outdated. Among these, King and Dunn (1989) conducted a study with 91 primary school children who are first, second, and fourth graders. They used the short form version of the Bruininks-Oseretsky motor proficiency test and the motor performance evaluation form. This form was filled by children's teacher in their respective classroom based on teachers' observation and impression for each child. The results of the study showed that there is a statistically significant difference between children's performance who previously obtained high and low motor performance. Similarly, Cooley, Oakman, McNaughton, and Ryska (1997) conducted a research with 574 children to explore whether or not physical education lessons have any impacts on children's motor development. The age range of the participants of the study was 7- to 10-year-old children. Results showed that the higher participation to the physical activity, the higher motor development performance was. These researchers also found a significant difference across gender. The boys had higher motor development performance than the girls.

More relevant to the scope of the current research, several researchers examined the effects of gymnastics programmes on children's physical development, in particular, motor fitness. In one of these studies, Madic et al. (2018) selected 56 healthy preschool girls to study how developmental gymnastics impact their motor fitness. In their quasi-experimental study, these researchers found that the treatment group showed significant gains in almost all seven parameters they measured. In another quasi-experimental design, Karachle, Dania, and Venetsanou (2017) looked at how a six-month gymnastics programme affects preschool children's motor proficiency ($n = 21$) compared to children with no participation in such a programme ($n = 13$). Their results revealed that although both groups showed progress, the treatment group performed significantly better than those in the control group.

Although the effects of physical activity have been studied extensively in Western societies, there is a scarcity of research investigating children's motor development in Turkey. Among the few, İnan (1989) explored the relationship between participation in gymnastics club and 64 preschool

children's motor performance. Half of the participant children were enrolled in gymnastics club, while the remaining half of them did not. During the data collection period, children's physical movement activities including balance, quickness, long jumping, catching, and throwing were measured by the researcher. According to the results of this study, children who enrolled in gymnastics club had higher motor skills performance than that of children in the control group.

Similarly, Özkan, Afyon, and Çelebi (2010) implemented eight weeks movement education programme to preschool children for measuring their motor performance. The researchers used motor performance measurement originally developed by Morris et al. (1980). The results reflected that there is a statistically significant difference in children's scores on motor performances. In fact, participating in regular movement education programme affected young children's motor performances; in turn, physical development. Yarımkaya and Ulucan (2015) also explored 40 four to six-year-old children's motor development by applying the 12-week movement education programme. These researchers used motor performance test developed by Morris et al. (1980) and found a statistically significant difference between post-test scores on children in experimental and control groups.

Several researchers, in their experimental studies, also found that young children who participate in movement education programme, in a period of time, have higher post-test scores on motor proficiency than children in the control group (Altınkök, 2016; Karagöz, 2009; Kerkez, 2006; Ulutaş, 2011; Yavuz & Özyürek, 2018).

When we know about children's motor development level, they might be encouraged to reach the highest levels of their performance. It appropriate activities might also be selected to improve their motor development by adults. In essence, if individuals' age, gender, performances in different development domains, including cognitive, sensory, social, and motor development are more or less known, it would be more meaningful to teach and motivate children when they are at an appropriate age (Gökmen, Karagül, & Aşçı, 1995). Movement programmes prepared considering children's developmental periods promote their motor proficiency and well-beings (Deli, Bakle, & Zachopoulou, 2006; Venetsanou, Kambas, & Giannakidou, 2004). Moreover, since some of the fundamental movement skills, such as object control and locomotor skills cannot be promoted without training, practising or reinforcing by means of organized movement programmes (Logan, Robinson, Wilson & Lucas, 2012), such kinds of programmes might be included in early childhood education programmes.

The current research aimed to investigate whether gymnastics as a physical activity is an effective activity to promote motor skills in young children aged 60–72 months. The research question that leads to this study was: 'Is there any difference between motor skills of gymnastics children and non-sportive ones (children who has no organized activity)?'

Methodology

Research design

To understand whether gymnastics as a physical activity can improve young children's development, the motor skills of children assigned to control and treatment groups were compared based on their participation in gymnastics activities. The purpose of this study was to see if, increased physical activity via gymnastics, there would be improvements in young children's motor skills. For this purpose, a quasi-experimental design, non-equivalent group design (NEGD), was employed in this study. NEGD is a quasi-experimental method that is appropriate when comparing two groups that are not randomly assigned (Fraenkel & Wallen, 2005).

The participants

The participants were 30 children who are between 60- and 72-month-old (see Table 1). None of the children in the current study were described as having special needs. The participants were selected

Table 1. Descriptive statistics by groups.

Groups	Frequency	Percentage
Sportive children	32	33.3
Non-sportive	16	66.7

from two different preschools within the same district of Ankara, Turkey. While the first half of the children participated in regular gymnastics activities in their schools, the second remaining half did not participate in any sport activities that require physical effort. Children were considered to be assigned to the treatment group if they participated in the gymnastics activities for at least six months. The training for children in the treatment group was provided by a physical education teacher with expertise in artistic gymnastics. These programmes lasted about for 26 weeks and children in the treatment group practiced two times each week.

The instrument

The Bruininks-Oseretsky motor proficiency test (BOT-2) was used in this study to measure children's motor skills. The test was developed by Bruininks in 1978 and he piloted it on 765 children in US, BOT-2 is appropriate for children aged between four and half years and fourteen and a half years old with an internal consistency of $\alpha = .89$. The test consists of eight sub-tests: (1) running speed and agility, (2) balance, (3) bilateral coordination, (4) strength, (5) upper-limb coordination, (6) response speed, (7) visual-motor control, and (8) upper-limb speed and dexterity. There are a total of 46 items measuring both gross motor and fine motor skills. There is also a short form of the test which includes 8 sub-tests with 14 items. There are also several studies that reported high internal reliability scores (Beitel & Mead, 1980; Verderber & Payne, 1987). In the current study, the researchers used the short form of the test to measure the levels of children's motor development. In addition to this test, the researchers also used the General Information Form to obtain children's demographic information.

Data collecting procedure

The researchers took an active role during the data collection process. After acquiring necessary ethical permissions from the Ministry of National Education, school principals were contacted. They were given brief information about the target of the study and the implementation procedure of the test. The classroom environment where the researchers implement the test tasks was prepared by the researchers. Then, the researchers met children in a large classroom. Firstly, they gave brief information about what the purpose of this research study and what kind of activities they would be involved in. Children's participation in this study was voluntary. In addition, parents of these children were asked to give permission for their children's participation in the study. The collection of the consent forms and explanation of the aims and study were done prior to the administration of tests.

The researchers proceed with the data collection process. First, the researchers set up a classroom with the Bruininks-Oseretsky motor proficiency test materials for each particular activity. Each activity started with one of the researchers modelling the first movement for children. Then, the children took turn to perform the same movement afterwards. While children perform the movements, the second researcher recorded a video of the children to make a more comprehensive analysis. The data collection process took approximately six hours. After the completion of the data gathering process, the researcher discussed videos with the second coder and cross-checked the final scores on the tests.

Data analysis procedures

Initially, the descriptive statistics was generated using SPSS. Then, an inferential statistic method was used to test the effects of treatment on both groups of children. Due to the limited number of

participant ($N = 30$) in the study, the Mann–Whitney U non-parametric test was implemented to understand the difference between treatment (sportive) and control group (non-sportive children).

Results

The result of the analysis for the motor proficiency total score is shown in Table 3. A z value of −5.20 with a significance level of $p = .00$ confirms that there is a statistically significant difference between the treatment and control groups. The treatment groups scored higher than that of the control group (Table 2).

Table 3 also presents the results of each sub-test scores. A majority of the results were significant for the sub-tests with the exception of strength and upper-limb speed, and dexterity was only marginally significant. On the other hand, results also showed that there is a significant difference between the scores of non-sportive and gymnastics children in terms of speed and agility, balance, bilateral coordination, strength, upper-limb coordination, response speed, and visual-motor control. The p values for each significant sub-tests were .01, .04, .00, .00, .07, .00, and .00, respectively.

Discussion

This study showed that children's participation gymnastics programme in preschool improved a majority of their motor skills including speed and agility, balance, bilateral coordination, strength, upper-limb coordination, response speed, and visual-motor control than a non-sportive group of children.

Findings of this study are consistent with the findings of Madic et al. (2018) and Mostafavi, Ziaee, Akbari, and Haji-Hosseini (2013). Madic et al. (2018) examined the effect of developmental gymnastics on motor skills of preschool children. These researchers studied 56 preschool girls and divided the whole group into two: one is the experimental group and the remaining is a control group. The basic characteristics of the training included station and circuit task, and obstacle course. Children regularly attended this gymnastics training for one hour two times a week for six months. The results showed that children attending gymnastics trainings showed significant improvements in motor skills, such as coordination and strength.

Supporting the findings of the current research, many other research findings (i.e. Bala, Krneta, & Drid, 2013; Lupu, 2010; Pienaar, Rensburg, & Smit, 2011; Roth et al., 2010) revealed that organized

Table 2. Mean scores of groups by activities.

	Groups	*N*	Mean Rank
Total scores of motor proficiency	No-Activity	16	9.66
	Gymnastics	32	31.92
Speed agility	No-Activity	16	17.25
	Gymnastics	32	28.13
Balance	No-Activity	16	18.63
	Gymnastics	32	27.44
Bilateral coordination	No-Activity	16	13.09
	Gymnastics	32	30.20
Strength	No-Activity	16	13.72
	Gymnastics	32	29.89
Upper-limb coordination	No-Activity	16	19.56
	Gymnastics	32	26.97
Response speed	No-Activity	16	12.75
	Gymnastics	32	30.38
Visual-motor control	No-Activity	16	11.13
	Gymnastics	32	31.19
Upper-limb speed and dexterity	No-Activity	16	22.16
	Gymnastics	32	25.67

Table 3. Test results for total score and sub-tests.

	Mann–Whitney *U*	Wilcoxon W	*Z*	*p*
Total scores of motor proficiency	18.50	154.50	−5.20	0.00
Speed agility	140.00	276.00	−2.64	0.01
Balance	162.00	298.00	−2.08	0.04
Bilateral coordination	73.50	209.50	−4.32	0.00
Strength	83.50	219.50	−3.82	0.00
Upper-limb coordination	177.00	313.00	−1.79	0.07
Response speed	68.00	204.00	−4.13	0.00
Visual-motor control	42.00	178.00	−4.77	0.00
Upper-limb speed and dexterity	218.50	354.50	−0.84	0.40

physical activity programmes in preschool years have positive effects on children's motor proficiency skills. Lupu (2010) investigated whether there was a significant difference on motor development of preschool children who are attending motor games during the whole week and the children who are attending motor games only one day a week. The results revealed that exposing children to physical activities for a whole week had a positive impact on young children's capacity of movement control and promoted their motor skills. Similarly, a kinder-kinetics programme was implemented to preschool children to examine whether it affects their perceptual-motor skills and cognitive development (Pienaar, Rensburg, & Smit, 2011). These researchers also found that such a programme influences children's gross motor skills, fine motor skills, perceptual-motor, and overall motor skills.

More specifically, the results of the current research about improving overall motor proficiency skills are consistent with the findings of several research studies (Dortaj & Asemi, 2012; Lupu, 2010; Sajedi & Barati, 2014). Dortaj and Asemi (2012) investigated the influence of special motor programme on early primary school children's cognitive and motor skills. They found that children's motor skills, such as balance and coordination, can be promoted by a particular motor programme. Similarly, Sajedi and Barati (2014) found that the activities that require eye-hand coordination, hand-foot coordination, and overall body coordination can contribute to the development of children's motor skills.

In the present study, regular gymnastics programme did not show any differences in children's scores in upper-limb speed and dexterity. This result can be attributed to daily activities of young children contributing to their motor skill development (Corrie & Barratt-Pugh, 1997). Therefore, for children who did not participate in gymnastics activities in the current research, their motor skills might have been promoted naturally through their daily physical activities.

Limitations, conclusion and future research

Early childhood years are very critical for children's future life since the rate of development is much higher than the rest of their life. Children's essential movement patterns are formed through aforementioned physical activities during these years. Nurturing children's motor development can result in the promotion of their other developmental domains, since supporting one developmental area has an influence on children's development as a whole in the early years. The findings of this study support the conclusion that regular physical activity programmes in early childhood, in particular, gymnastics can improve young children's motor skills.

There are some limitations that need to be addressed in the current research. The researchers did not have resources to follow children's daily activities and some of these activities, such as the unstructured daily activities or status of inactivity, can directly relate children's overall motor skills. In addition, this study was conducted with a small group of preschool girls. Further research is needed that has a larger, more representative sample, and employ methods to control additional factors such as children's daily physical activity levels. This will help the researchers to further isolate the effects of gymnastics activities on children's motor skills.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributor

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