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ROLE OF MOTOR SKILLS IN PHYSICAL EDUCATION PREDISPOSITION AND SOCIAL COMPETENCE

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ABSTRACT

The aim of this research was to investigate the role of motor skills in secondary school students' physical education predisposition and social competence. The Körperkoardinations Test für Kinder (KTK), Physical Education Predisposition Scale and Social Competence Scale were used for data collection. The participants consisted of 523 (237 females, 286 males; mean age=12.97) secondary school students from Trabzon, Turkey. The study was conducted during the 2017–2018 spring semester. The results showed that age and gender variables had a significant influence on motor skills. A significant influence was found in terms of physical education and physical activity facilities between the various school facilities. School facilities were categorised into three groups: good, medium and limited, and it was found that students with access to good (81.64) or medium (81.29) facilities had significantly higher KTK scores than those with access to limited (60.79) facilities. In addition, motor skill performance significantly predicted social competence (R^2=0.22) and physical education predisposition (R^2=0.33). These results suggest that children's motor skills can have a positive effect not just on their physical competence, but also on their social competence and physical education predisposition.

***Keywords*:** Motor development; Motor skills; Middle school; Physical education; School sports facilities; Social development; Secondary schools.

INTRODUCTION

Motor skills, which can be defined as the quality of an individual's performance when carrying out a certain movement, are an important determining factor of children's participation in physical education and physical activities (Pangrazi & Beighle, 2016; Temple *et al.*, 2016). Harris (2013) stated that physical education is a set of skill learning methods that are included in the school curriculum to improve the physical competence of students through movement. It is known that participation in physical education, sports and gaming activities play a key role in developing students' physical education predisposition, as well as their physical, sensual, social and mental features (Turkish Public Health Institution, 2018).

Physical education and sports activities begin in pre-school (ages 4–6 years) and lasts until the end of secondary school (ages 10–13 years) (Craggs *et al*., 2011; Zhou & Wang, 2019; Panhelova *et al.*, 2020). During this time, students should also be able to improve their self-management, psychosocial and thinking skills through physical education and sports participation (Turkish Ministry of National Education, 2017). Hilland *et al.* (2018) and Braga (2019) argue that young people focus on two basic questions when making a decision about

whether or not to take part in physical activity. The first is, 'Can I do it?', which corresponds with the concept of self-efficacy, and the second is, 'Is it worth it?', which corresponds with the concept of attitude. It has been suggested that those who answer yes to both questions are more likely to have a predisposition towards physical education and physical activity (Ladwig *et al.,* 2018).

High-quality physical instruction can give students the necessary skills to maintain an active way of living throughout their youth and into adulthood. According to the US National Physical Education standards published by the US National Association for Sport and Physical Education, to create a high-quality physical education environment in schools, the facilities and equipment need to be of a high standard (Lee *et al.,* 2007). Indeed, the goal of improving physical activity facilities and equipment in schools was included in the 2010 US national objectives (Objective 22-12) (US Department of Health and Human Services, 2000).

It is known that improving school facilities and equipment can have a positive effect on student participation in physical activities both during the time that students spend at school and in later life (Black *et al.,* 2019). Considering that participation in physical activities increase motor skills, the physical education classes provide important opportunities for the motor skill development of children (Robinson *et al*., 2015; Hellin *et al*., 2019). Physical education classes and recess provide pupils with opportunities to improve physical activity during the school day. Physical education and sports equipment can affect children's active time in schools. It was important to examine the physical activity facilities and equipment owned by the schools included in this study as sufficient access to these can enable children to be more active during school time (Fernandes & Sturm, 2010). Burns *et al.* (2019) reported that increasing the active time of children in schools was associated with improved motor skills.

Children who are more active and have more advanced movement skills tend to be able to learn more (Johnstone & Ramon, 2011). Researchers have claimed that cognition and social skills develop parallel with the movement of the body (Westendorp *et al.,* 2011; McClelland *et al.,* 2015; Adolph & Franchak, 2016; De Jager & Victor, 2017). In other words, mental and social development depend upon perception and movement and cannot be understood as an isolated internal phenomenon. Social competence is the ability of children to choose an appropriate method to achieve their interpersonal interaction goals, and socially competent young children can interact and engage in activities with adults and peers (Pels & Kleinert, 2016; Schüller & Demetriou, 2018). Motor skill performance is thought to be an important factor in children actively exploring their world and developing their skills (Skinner & Piek, 2001). Every new skill that a child learns provides the opportunity to engage in new activities and interactions (McClelland *et al*., 2015).

In contrast to what was previously accepted, it has been argued that children's motor performance continues to develop throughout their school years (Rosenbaum, 2005; Leversen *et al.,* 2012). During this time, children engage in new activities, increase their mobility and expand their horizons beyond their primary family environment. It is understood that children's motor skill performance should be sufficient to play with their peers and participating in activities, like jogging, jumping, catching and throwing balls. These activities may be simple, but they are of vital importance to children's social development (You *et al.,* 2019). Unsurprisingly, children with poor motor skills are now known to be at risk of a number of physical, psychosocial and psychiatric problems, such as low self-esteem, lack of social support and anxiety (Turkish Ministry of National Education, 2017).

It is not surprising that children with inadequate motor skills encounter problems such as struggling to exist in the outside world, not being accepted by friends and low participation in

social activities (Zeng *et al*., 2019; Hoffmann *et al*., 2020). While physical education and sports activities are important for helping children achieve the desired level of motor fitness (Trawick-Smith, 2012; Akın *et al.*, 2016), the components of motor fitness (coordination, balance, speed, agility and power) are also thought to influence social mobility (Özer & Aktop, 2014; Kenny *et al.*, 2016). Physical education and sports activities where motor skills are actively used (lessons, inter-school tournaments, inter-class matches) provide students with opportunities to improve their peer relationships, self-esteem, relationships with instructors and responsibility. Considering all these factors, participating in physical education, sports and physical activities is expected to play a positive role in the development of students' social competencies and skills (Sulkowski *et al.*, 2012; Pangrazi & Beighle, 2016).

Various competencies, such as movement skills, active and healthy lifestyle behaviours and social skills are present in the general structure of the physical and sports education curriculum in Turkey (Turkish Ministry of National Education, 2017). Many studies have looked at these competencies separately (Ryan & Deci, 2000; Timperio *et al.*, 2004; Tong *et al.*, 2007; Morgan & Hansen, 2008; Camacho-Minano *et al.*, 2011; Murillo Pardo *et al*., 2013; Dyremyhr *et al.*, 2014; Lewis, 2014; Dion *et al*., 2015; Hills *et al.*, 2015). The number of studies examining the relationship between motor skills, social skills and physical education predisposition in terms of the mobility competency of secondary school students are limited. For this reason, the relationship between motor skills, physical education predisposition and social skills are investigated in this study.

PURPOSE OF RESEARCH

The aim of this research was to investigate the role of motor skills in secondary school students' physical education predisposition and social competence.

METHODOLOGY

Research design and recruitment of participants

The research was designed according to a descriptive relational screening model. The cross-sectional screening method, which reveals the state of the variables at any period, was applied and carried out within the quantitative methodology framework. The data were collected during physical education classes after permission was obtained from the local education directorate. Students who attended the classes and who did not have any health problems were included in the study. The data collection process began with the students completing a personal information form, the Physical Education Predisposition Scale and the Perceived Social Competence Scale (PSCS). The KTK test was then applied to all students who successfully completed the form and the scales. During the application of the KTK test, support was given by four physical education and sports teachers. The data were recorded in a hand-written data collection form created by the researchers. Data collection took an average of 20 minutes per student and was carried out in the indoor sports areas of the schools between January and June 2017.

Research sample

The study population consisted of 523 students (237 girls; 286 boys; 12–14 years of age; 6th, 7th or 8th grade students) attending secondary schools affiliated with the Ministry of National

Education in Akçaabat, Trabzon, Turkey. To determine the sample groups, the research proposal was first submitted to the Trabzon provincial directorate of national education, and the physical facilities of the selected schools were examined after obtaining the necessary ethical and application permission (no: 1488124). Permission to use the KTK was also obtained. The education directorate granted permission for 12 schools to take part, out of which three were selected using purposeful sampling and convenience sampling.

The physical facilities of these schools were divided into three categories within the framework of the purposeful sampling method: limited, medium and good. The categories were determined using the 'Guide for Minimum Design Standards of Educational Institutions' by the Ministry of National Education and the Ministry of Family, Labour and Social Services. Accordingly, schools with playgrounds, multi-purpose gyms and adequate sports equipment were categorised as 'good' (n=2); the schools with sufficient sports equipment, playgrounds and gymnasium were categorised as 'medium' (n = 4); and the schools that only had playgrounds were categorised as 'limited' (n=6). The sample consisted of students who had received education for at least one year in the relevant school according to their school records.

Data collection tools

Body Coordination Test for Children

The body coordination test for children (KTK) was developed by Kiphard and Schilling in 1974 and re-modernised in 2007 by the same authors. A reliability, validity and standardisation study for the KTK was conducted by Özkara (2018) with Turkish children. The motor coordination test for children is a very reliable (r=0.85) and valid (r=0.60–0.80) measurement tool in terms of evaluating motor skill (Iivonen *et al.*, 2015; Kiphard & Schilling, 2000). It was designed to evaluate the coordination and mobility competence of children between the ages of five and 14 years (Kiphard & Schilling, 2000) and consists of four physical tests: walking backwards, hopping for height on one foot, jumping sideways and side-stepping (through a platform).

The sum of the scores for the four subtests provides an overall motor quotient (MQ), with <56 indicating 'insufficient motor coordination'; 56–70 indicating 'severe motor insufficiency'; 71–85 indicating 'moderate motor insufficiency'; 86–115 indicating 'normal' motor competence; 116–130 indicating 'good' motor competence and 131–145+ indicating 'very good' motor competence. The average score is determined by evaluating the average of the raw scores obtained from the subtests and an assessment of age and gender (Kiphard & Schilling, 2007).

Before the KTK was conducted, the application stages of the test were explained to the physical education teachers. The test batteries were introduced and training was given, including videos of the test being applied. The practical training of the researchers and the teachers was completed during physical education lessons at the schools as part of the pilot studies. The data were collected by the researchers with the support of the teachers (n=4).

Physical Education Predisposition Scale (PEPS)

The physical education predisposition scale (PEPS) was developed by Hilland *et al*. (2009) to measure the predisposition of secondary school students towards physical education classes. The scale consists of 11 items, and two factors have a five-point Likert-type rating scale with (1) indicating 'I do not agree at all'; (2) indicating 'I do not agree'; (3) indicating 'I am indecisive'; (4) indicating 'I agree'; and (5) indicating 'I strongly agree'. The scale takes two to three minutes per child for children aged 9–15 years (Hilland *et al*., 2009). The lowest score

that can be achieved is 11, and the highest score is 55. A high score indicates a high predisposition to physical education. A Turkish form of the PEPS was given to the students before the KTK was conducted (Öncü *et al.*, 2015).

Perceived Social Competence Scale

The PSCS was developed by Anderson-Butcher *et al.* (2007) to examine the degree to which children and young people engage in prosocial behaviour and create positive social interactions with their peers and the environment. The scale is suitable for children aged 4–16 years and consists of six items with a five-point Likert-type rating scale: (1) indicates 'I do not agree at all'; (2) indicates 'I do not agree'; (3) indicates 'I am indecisive'; (4) indicates 'I agree' and (5) indicates 'I absolutely agree'. The lowest score that can be achieved is six, and the highest score is 30. For the Turkish form of the scale, the factor loadings were between 0.57 and 0.80, and Cronbach's alpha was 0.80 (Sarıçam *et al*., 2013). The scale took approximately two to three minutes per child and was completed by the children before the PEPS.

Ethical considerations

The local provincial directorate of national education carries out ethical processes for children under the age of 18 years. The application was made to the directorate with the necessary documents (research proposal, ethical application form, parental consent form, voluntary participation form and researcher curriculum vitae). The local directorate of the ethics committee approved the application (no: 1488124), obtained the necessary permissions from the families and informed the schools regarding the implementation phase of the study. The children signed consent forms after a verbal explanation of the study had been given. The research was conducted in accordance with the 1964 Helsinki declaration and its later amendments.

Statistical analysis

Out of the 598 children tested, data from 523 were included in the analyses. Data were excluded if any of the forms had not been completed correctly or had missing data. Descriptive statistics (frequency, arithmetic mean, standard deviation) were generated, and normal distribution (histogram, kurtosis, skewness) assumptions were tested. Intergroup and predictive analyses were carried out with t-tests, ANOVAs, Tukey multiple comparisons and regressions. The IBM SPSS 21 statistical package was used to conduct the analyses. The significance level was p=0.05.

RESULTS

The study sample consisted of 523 students (45.2% female), including 184 12-year-olds (35.1%; 76 females), 173 13-year-olds (33%; 78 females) and 166 14-year-olds (31.7%; 83 females). One hundred and seventy-five students were in 6th grade (33.4%), 179 were in 7th grade (34.2%), and 169 were in 8th grade (32.3%). When divided by the schools' physical facilities categories, there were 90 males and 88 females in the limited category, 88 males and 87 females in the medium category and 108 males and 62 females in the good category. The general distribution of the sample group and the results of the normality tests are shown in Table 1.

Table 1. **DESCRIPTIVE SCORES OF KTK, PEPS, AND PSCS**

Tests	Gender	n	M±SD	Min–Max	Skewness	Kurtosis
KTK	Female	237	68.76±17.80	40–123	0.86	0.85
	Male	286	79.13±19.90	30–132	0.15	-0.30
PEPS	Female	237	43.02±5.36	20–55	-0.61	1.25
	Male	286	44.22±5.21	16–55	-0.99	3.36
PSCS	Female	237	23.76±5.42	6–30	-1.01	0.87
	Male	286	24.63±4.67	10–30	-0.64	-0.38

Motor Skills and Gender

A t-test was conducted to compare the KTK scores by gender. The MQs of the male students (Mean=79.13±17.80) were significantly higher than those of the female students (Mean=68.76±19.90; t=-6.22; p<0.01).

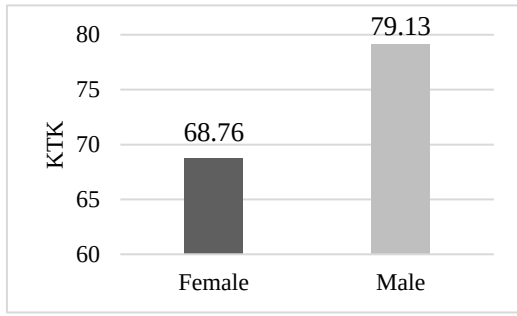

Figure 1. **AVERAGE KTK SCORES FOR MALE AND FEMALE STUDENTS**

Motor skills and age

An ANOVA was conducted to compare the KTK scores across student age groups.

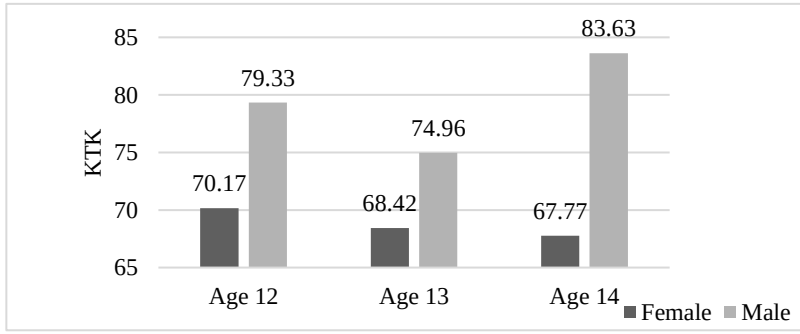

Figure 2. **AVERAGE KTK SCORES FOR MALES AND FEMALES IN AGE GROUPS**

No significant difference was found in the MQ scores of the female students (F_2 234=0.38, p>0.05); however, a significant difference was found for the male students (F_2 283=4.31, p<0.05). A Tukey HSD multiple comparison test revealed that the 14-year-old male students (SD=83.63) had significantly higher MQ scores than the 13-year-old male students (SD=74.96).

General levels of motor skills

According to the results of the KTK, 87 students (16.7%) had inadequate motor competence, 143 (27.3%) had severely insufficient motor competence, 159 (30.4%) had moderately insufficient motor competence, 111 (21.2%) had normal motor competence, 22 (4.2%) had good motor competence, and one (0.2%) had very good motor competence.

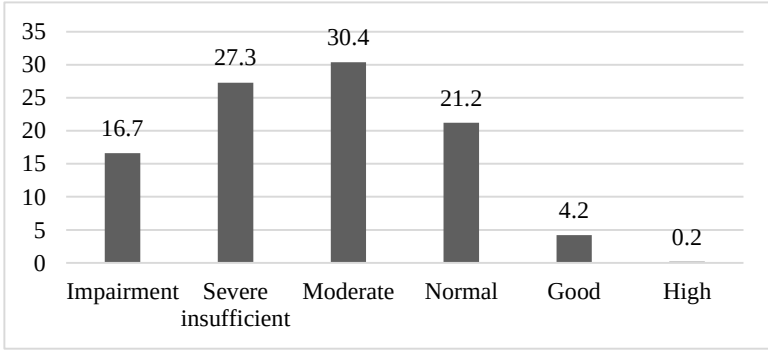

Figure 3. **PERCENTAGE OF STUDENTS IN KTK MOTOR COMPETENCE CATEGORIES**

Motor skills and physical facilities

An ANOVA was conducted to compare KTK scores across physical facilities categories (good, medium, limited). The results showed a significant difference in the MQ scores of the students across categories (F_2 520=86.12; p<0.05). According to the results of the Tukey HSD multiple comparison test, the scores of students in the good (SD=81.64) and medium categories (SD=81.29) were significantly higher than the scores of the students in the limited category (SD=60.79). No significant difference was found between the good and medium categories.

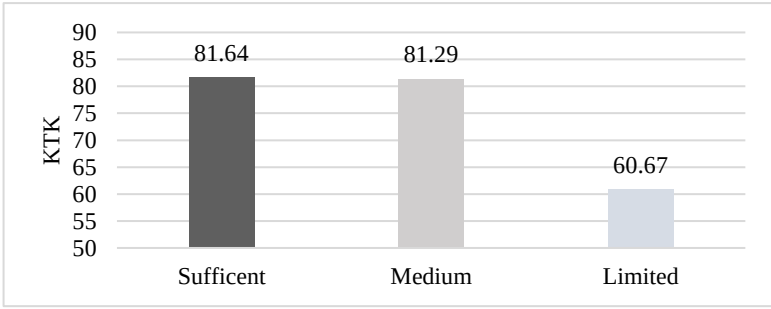

Figure 4. **AVERAGE KTK SCORES ACCORDING TO SCHOOLS' PHYSICAL**

Motor skills as a social competence predictor

A regression analysis was conducted to determine if the motor skills of the students significantly predicted their social competence. The results were significant, with motor skills explaining 22% of the variance in social competence (R^2=0.22, F(1.521)=148.53, p<0.01). The simple linear regression formula for this relationship was Social Competence= 15.25+0.12*Motor Skill.

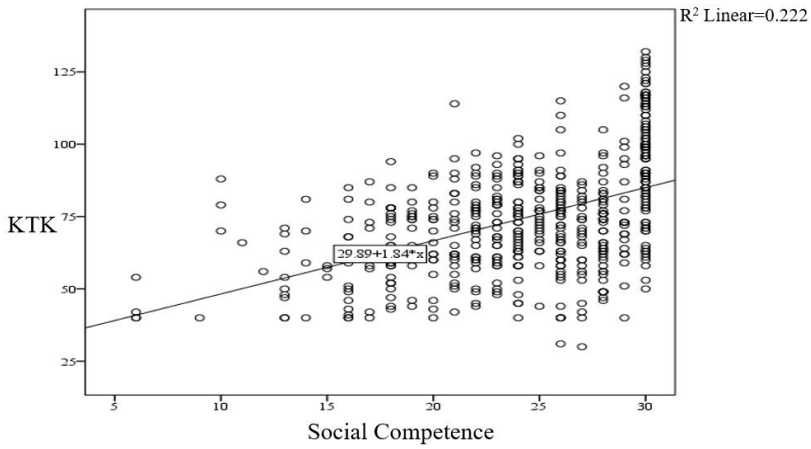

Figure 5. **SCATTERPLOT WITH Y-INTERCEPT FOR MQ AND PSCS SCORES**

Motor skills as a predictor of physical education predisposition

A regression analysis was conducted to determine if the motor skills of the students could predict their physical education predisposition. The results were significant, with motor skills explaining 33% of the variance in physical education predisposition (R^2=0.33; F(1.521)=255.01, p<0.01). The simple linear regression formula for this relationship was Social Competence=32.15+0.15 * Motor Skill.

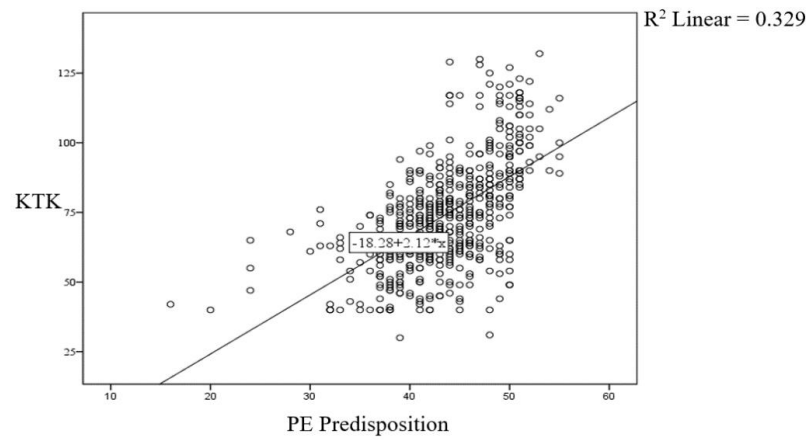

Figure 6. **SCATTERPLOT WITH Y-INTERCEPT FOR MQ AND PEPS SCORES**

DISCUSSION

The aim of this research was to examine the role of motor skills in secondary school students' physical education predisposition and social competence. According to previous studies that have investigated motor skills using the KTK, MQ scores tend to vary by gender (Vandorpe *et al*., 2012; Jaakkola *et al.*, 2017; Adriyani *et al.*, 2019). Similar to the results of the current study, Antunes *et al*. (2015) and Mores *et al*. (2019) reported that males tend to have higher scores than females. In contrast, Söğüt (2016) reported that females scored higher than males in a study conducted with similar age groups. As the current study was carried out with Turkish children, it is possible that factors, such as socio-cultural structure and social gender relations contributed to the male students having higher MQ scores than the female students. In Turkey, male students have higher participation rates in licensed sports, a greater predisposition towards physical education and sports and higher self-efficacy than female students (Kangalgil *et al.*, 2006; Koca, 2006; Ministry of Youth and Sports, 2016).

The results of this study showed that the motor skills of female students did not significantly differ across age groups. Although this result may be surprising when compared to the results of other studies, data from the local youth sports ministry indicates that the participation of girls in sports is very low in the studied region of north-east Turkey (Turkey Youth and Sports Ministry, 2018). However, the increase in the motor skills of male students is in line with other motor skill studies. In another study conducted with a sample of Turkish children, it was observed that motor skills increased with age for both males and females (Iri *et al*., 2017). The sport participation levels of female students in Turkey's central and western regions may explain these results (Turkey Youth and Sports Ministry, 2018).

School is an important environment in terms of physical education and physical activities; therefore, it can be argued that the physical resources of schools are associated with the amount of school time the students spend doing physical activities. In a study by Sallis *et al*. (2001), it was found that the physical resources and equipment of schools positively affected the amount of time both male and female students spent doing physical activities in classes and extra-curricular physical activities under the supervision of a physical education teacher. The results of the current study support these findings.

In another study conducted by Zask *et al*. (2001), it was concluded that the equipment facilities used for physical education classes did not affect the amount of time students spent doing physical activities. This is one of the few studies that do not support the results of the current research. For example, in a recent study by Black *et al*. (2019), it was reported that a lack of school equipment negatively affected students' participation in physical activities in adulthood. Similarly, Nwaogu and Oyedele (2019) stated that the development of school sports equipment for effective physical education in secondary schools had a reinforcing effect on participation in sports. Ward *et al*. (2006) argued that improving a school's physical education resources in line with the curriculum increased the physical activity of female high school students.

Chaves *et al*. (2016) also stated that the physical conditions of schools in terms of physical education and sports activities had a positive impact on the development of the students' motor skills. In the current research, it was found that students attending schools with good or medium physical facilities had better motor skills than students with access to limited facilities. This result is supported by numerous previous studies (Katz *et al.*, 2008; Haug *et al.*, 2010; Willenberg *et al*., 2010; Kulinna *et al.*, 2012; Santos *et al.*, 2013; Lanckriet *et al*., 2017).

Kalkavan *et al*. (2012) looked at the perceived competence and fun in physical activities of students (aged 11–14 years) according to the health-related physical fitness model that supports this finding where the increase observed in the physical performance related to the students' motor skills will positively influence their perceived abilities towards physical education and activities. Similarly, Loprinzi *et al*. (2015) stated that early motor skill competence is a mediator of physical activity in children and adults and that appropriate strategies should be used to increase motor skill development in childhood. Motor skill development can increase the attitudes of children towards physical education and self-efficacy. This assessment may be supported by similar studies and by our research results (Pfeiffer *et al*., 2006; Conner *et al.*, 2011; O'Neill *et al*., 2014; Crane *et al.*, 2015; Liong *et al.*, 2015; Slykerman *et al.*, 2016).

Alp (2017) investigated the relationship between children's motor performance and quality of life and found that motor development significantly improved with age for the children aged 8–10 years and that the gross motor skills of male students were better than those of female students. These results are similar to those of the current research, and it can be said that the determination of a positive meaningful improvement in the quality of life of children together with motor development, supports the relationship between motor skill and social competence. Similarly, the findings of Lemonia *et al.* (2017) showed a positive and significant relationship between teenagers' social skills and quality of life in terms of dancing and physical activities, which is in line with the current assessment of motor skills and social competence.

Hops (1983) looked at which observable behaviours contributed to the development of social competence in children and found that motor competence was one of these behaviours. Prebianchi (2002) found that poor social competence in the school environment may negatively affect the educational life of children and their life outside of school and stated that motor skill development might have a positive effect on children's social competence. Many studies have argued that children who have poorer motor skill development than their peers are more likely to encounter psychological problems that can be considered more depressive, less successful and more uncomfortable regarding overcoming emotional hardships (Skinner & Piek, 2001; Dewey *et al*., 2002; Cummins *et al.*, 2007; Piek *et al.*, 2008). This may also have negative consequences in terms of children's competence in social skills.

The significant relationship between the motor skills and social competence of secondary-school students that was found in the current study was also observed in a study by Smyth and Anderson (2000). They found that children in the UK with poor motor skills had higher levels of loneliness and lower levels of social interaction compared to other children. This relationship was also found in Canada by Dewey *et al*. (2002), who showed that children with poor motor skills encountered more social problems.

CONCLUSION

In the current research, it was found that physical education and facilities in schools have a significant impact on children's motor skills. Therefore, it would be beneficial to improve the physical resources of schools so students can participate more in physical activities and sports. This issue should be taken into account by the respective authorities during the planning of new schools.

It was found that motor skill performance, which plays an important role in student participation in physical education and activities, not only contributed to the physical development of secondary-school children, but also to their participation in physical education classes and their social skills. Therefore, the importance of motor skill competence should be

taken into consideration by families and the relevant institutions. It is recommended that the necessary arrangements be made to create awareness that skill learning is an important factor for participation in sports and transferring this participation into adulthood.

There have been few studies that have examined the relationship between motor skills and social skills. More studies should be conducted to generalise the results of the current study.

LIMITATIONS

Although our results are promising, further research is necessary to investigate the underlying relationship between motor skills, physical education and social skills. In future studies, the relationships of the KTK subtest scores with physical education predisposition and social competence should be examined as this study did not look at the subtest scores separately. Another limitation is that the results are limited to the study sample. The research was conducted in schools partially chosen by the local education directorate. This hinders the generalisability of the research results. The sample consisted of students located in the north-eastern region of Turkey, and the results are limited to the socio-cultural structure of this region.

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