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Age-related Differences in Motor Coordination Among Young Soccer Players

Genç Futbolcularda Yaşa Bağlı Motor Koordinasyon Farklılıkları

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This study was produced from the Hasan Batuhan Dirik's master thesis entitled "Motor coordination levels of young soccer players in different age groups". Kırıkkale University, 2020.

ABSTRACT Objective: The purposes of this study were to determine the motor coordination levels of young soccer players and to examine the age-related differences. **Material and Methods:** Participants were 93 young (11.9±1.7 years) soccer players. According to their birth years, they were allocated to U10 (n=29), U12 (n=38), and U14 (n=26) categories. Body height and weight were measured and body mass index was calculated as dividing the body weight by the square of the body height. Körperkoordinationstest für Kinder (KTK) was used to assess the motor coordination of the participants. The KTK includes 4 subtests; walking backward, hopping on one leg, jumping sideways, and moving sideways. The raw scores for each subset were converted to the age-specific motor quotient. The sum of 4 items was used to calculate the total KTK motor quotient scores. Finally, the total KTK motor quotient scores were utilized to classify the motor coordination levels of players. **Results:** Results revealed that none of the players performed lower than the normal level in motor coordination. Furthermore, 10.8% of the participants performed above the normal level. Older players had significantly higher values on each KTK subtests for the raw scores when compared to younger players. However, no significant age-related differences were observed on motor quotient scores among groups. **Conclusion:** These findings indicated that young male soccer players in different age groups may have similar age-adjusted levels of motor coordination.

Keywords: Motor coordination; motor competence; soccer

ÖZET Amaç: Bu araştırmanın amacı, genç futbol oyuncularının motor koordinasyon seviyelerini belirlemek ve yaşa bağlı farklılıkları incelemektir. **Gereç ve Yöntemler:** Araştırma grubunu, 93 genç (11,9±1,7 yıl) futbol oyuncusu oluşturmuştur. Katılımcılar, doğum yılları göz önünde bulundurularak, U10 (n=29), U12 (n=38) ve U14 (n=26) kategorilerinde gruplandırılmıştır. Araştırma grubunun boy uzunluğu ve vücut ağırlığı ölçülmüş, vücut ağırlığının boy uzunluğunun karesine bölünmesi ile beden kitle indeksi hesaplanmıştır. Motor koordinasyon seviyelerinin belirlenmesinde, Körperkoordinationstest für Kinder (KTK) testi kullanılmıştır. KTK, 4 alt test içermektedir; geriye doğru yürüme, tek ayak atlama, yana sıçrama ve yana hareket etme. Alt testlerden elde edilen ham skorlar, yaşa özel motor katsayılarına dönüştürüldü. Dört alt testin skorlarının toplanması ile KTK toplam motor katsayı değeri hesaplandı. Son olarak, oyuncuların motor koordinasyon seviyelerini sınıflandırmak için toplam KTK motor katsayı skorları kullanıldı. **Bulgular:** Araştırma bulguları, oyunculardan hiçbirinin normal seviyeden daha düşük motor koordinasyon performansı göstermediğini ortaya koymuştur. Bununla beraber, katılımcıların %10,8'i normal seviyenin üzerinde performans sergilemiştir. Üst yaş grubunda yer alan oyuncular, tüm KTK alt testlerindeki ham değerlerde alt yaş gruplarındakilerden istatistiksel olarak anlamlı bir biçimde daha yüksek skorlar elde etmişlerdir. Bununla birlikte, gruplar arasında motor katsayısı puanlarında yaşa bağlı anlamlı bir fark gözlenmemiştir. **Sonuç:** Bu bulgular, farklı yaş gruplarındaki genç erkek futbol oyuncularının yaşa göre düzenlenmiş motor koordinasyon seviyelerinin benzer olabileceğini göstermiştir.

Anahtar Kelimeler: Motor koordinasyon; motor yeterlik; futbol

Motor coordination (MC) is the dexterity to coordinate movements of multiple body parts while the body is in motion.[1] Earlier studies have documented the impact of MC on fitness, physical activity, and adiposity in children.[2-4] Thus, assessment of MC during childhood is important to develop appropriate intervention strategies.[5,6] MC performance of children and adolescence can be evaluated with various bat-

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teries. The preference of the instruments generally depends on the designated purpose, age specificity, and test duration.[7]

One of the widely used test battery is Körperkoordinationstest für Kinder (KTK). The KTK was originally developed to identify children with and without motor impairment.[8] During the last decade, it has drawn substantial attention among sport scientists and used to examine the MC of young gymnasts, volleyball players, fencers, figure skaters, judokas, sailers, tennis players, and soccer players.[9-17] Moreover, it has been recommended as a tool to be used in the context of talent identification and selection of young athletes.[9,18,19]

Studies conducting on MC in young soccer players investigated the influences of playing level, biological maturation, playing position, and age.[17,19-23] Those studies on age effect reported a trend for raw scores in some KTK subtests (walking backward, jumping sideways, and moving sideways).[21-23] In other words, their results showed increased values with increasing age. However, it must be noted that not all of the subtests of KTK was measured in those aforementioned studies. Besides, to the best of author's knowledge, there is no evidence regarding the age-related differences in total KTK motor quotient scores among young soccer players. Therefore, the aim of the study was to determine the MC levels of players from consecutive age groups.

MATERIAL AND METHODS

PARTICIPANTS

The sample included nighty-three young (11.9±1.7 years) soccer players. According to their birth years, they were allocated to U10 (n=29), U12 (n=38), and U14 (n=26) age categories. The inclusion criteria were: (1) at least two years of experience in soccer training, and (2) 4.5 h/week of soccer practice. In accordance with the Declaration of Helsinki, all players and their parents were informed about the assessment protocols and purpose of the study, and written informed consent was obtained. The Non-interventional Researches Ethics Board of Kırıkkale University approved the study (No: 2019.12.08, 8.1.2020).

TABLE 1: Classification of motor coordination level according to motor quotient scores of Körperkoordinationstest für Kinder.

Motor quotient scores	Classification
131-145	High
116-130	Good
86-115	Normal
71-85	Moderate
56-70	Impairment

MEASUREMENTS

A portable stadiometer (Seca 213, Hamburg, Germany) was used to measure body height to the nearest 0.1 cm. A digital weighing scale, calibrated to the nearest 0.1 kg, was utilized to evaluate body weight. Body mass index was calculated (kg/m^2). A revised version of the KTK test battery was used to assess MC.[24] The KTK comprises four items; walking backward on beams (KTK_{Beam}), hopping on one leg (KTK_{Hop}), jumping sideways (KTK_{Jump}), and moving sideways on boards (KTK_{Board}). The raw scores for each item were converted to age-specific motor quotient. The sum of four items was used to calculate total KTK motor quotient ($Total_{KTKMQ}$) scores. The $Total_{KTKMQ}$ enables categorization of MC into consecutive five levels (Table 1).

STATISTICAL ANALYSIS

Statistical Package for Social Sciences (SPSS) for Windows was used to conduct data analysis. Descriptive statistics (mean±SD) were calculated for all study variables. A one-way ANOVA with Tukey post hoc test was conducted to analyze the age-related differences. The statistical significance level was set at $p<0.05$.

RESULTS

The descriptive statistics for the anthropometric measures by age groups and the ANOVA results are given in Table 2. The results revealed that all variables differed significantly ($p<0.01$) among groups. There is a trend of increasing mean values of variables with increasing age (Table 2).

The MC levels of young soccer players are presented in Table 3. The results showed that majority of the players (89.2%) were within normal level. Moreover, 10.8% scored above the normal level (Table 3).

TABLE 2: The descriptive statistics of the anthropometrics and the ANOVA results by age.

Age groups	U10 (n=29)	U12 (n=38)	U14 (n=26)	F	Post hoc	p value
Age (years)	9.8±0.6	12.2±0.5	14.1±0.7	368.956	14>12>10	0.001
Height (cm)	139.4±5.8	153.1±8.2	162.3±8.4	63.851	14>12>10	0.001
Weight (kg)	33.6±6.7	40.9±7.3	52.4±8.3	44.491	14>12>10	0.001
BMI (kg/m2)	17.2±2.5	17.4±1.8	19.8±2.1	13.131	14>12&10	0.001

BMI: Body mass index.

TABLE 3: Motor coordination levels of young soccer players.

KTK levels	U10	U12	U14	Total (n)	Total (%)
High	-	-	-	-	-
Good	2	7	1	10	10.8
Normal	27	31	25	83	89.2
Moderate	-	-	-	-	-
Impairment	-	-	-	-	-

KTK: Körperkoordinationstest für Kinder.

The mean and standard deviation values for KTK scores by age group and the ANOVA results are given in Table 4. The results showed age trends in raw scores for the KTK subtests. The participants in the oldest group performed significantly greater scores on all items than the participants in the youngest group. Furthermore, except for beam test, players in U12 performed significantly greater scores on the other items than players in U10. However, no significant difference was observed on total scores among age groups (Table 4).

DISCUSSION

The purpose of this cross-sectional investigation was to determine the age-related discrepancies in MC among young soccer players. The results showed that none of the players performed below normal in MC. The average KTK value of all participants was 105.1 (±8.3). Previous examinations reported relatively lower values for the non-athletic population.[5,25,26] For example, the mean KTK score of Belgian boys was found by Vandorpe et al. as 98.0 (±14.1).[26] On the other hand, similar findings were observed among young athletes from a variety of sports.[9,15,27] Supportively, positive association between sport participation and higher levels of MC has been well documented.[28,29] It seems that engagement in sporting activities provides an environment for children to enhance their motor competence.

Results regarding the raw scores for all KTK subsets indicated a significant age effect in favor of older players. This evidence is in accordance with the findings of the earlier investigations.[21-23] Greater scores were reported for relatively older soccer players on the walking backward, jumping sideways, and moving sideways items when compared to their younger counterparts.[21-23] However, it must be taken into account that not all of the subtests of KTK were measured in those aforementioned studies. Similarly, age-related increase in KTK subtests was noted for the school children aged 6-14 years by Antunes et

TABLE 4: Descriptive statistics and ANOVA results of different age groups for the KTK scores.

Age groups	U10 (n=29)	U12 (n=38)	U14 (n=26)	F	Post hoc	p value
KTK_{Beam}	44.4±11.1	50.8±11.7	59.8±9.2	13.863	14>12>10	0.001
KTK_{Hop}	68.1±6.1	73.1±4.3	73.3±4.8	10.758	14&12>10	0.001
KTK_{Jump}	72.4±5.7	78.3±10.6	78.7±7.1	5.139	14&12>10	0.008
KTK_{Board}	40.1±5.1	47.7±5.9	48.5±4.1	23.246	14&12>10	0.001
$Total_{KTKMQ}$	105.9±7.4	105.2±9.6	104.3±7.6	0.256	-	0.774

KTK: Körperkoordinationstest für Kinder.

al.[30] According to Malina et al., development of motor competence in children can be attributed to physical growth and biological maturity status.[31]

On the other hand, the results indicated that there were no significant age-related discrepancies in total KTK motor quotient scores. However, there is scarce information on the total MC scores of young soccer players. Nevertheless, consistent findings were obtained by Söğüt and D'Hondt et al.[32,33] for the young tennis players and healthy-weight children respectively. For example, Söğüt compared the levels of MC of the tennis players in different age groups (6-8, 9-11, 12-14) and found no significant age effect.[32]

There are some limitations to consider in the present study. Firstly, somatic maturity status, as a potential confounding factor of MC in adolescence, was not evaluated. In addition to MC, measurement of physical fitness and sport-specific characteristics would provide a more comprehensive understanding.

CONCLUSION

This study is original in the sense that it presents the motor skill coordination of young soccer players from different age categories. It is evident that there is no motor impairment was observed in any participant. The results also demonstrated age trends in the subtests of KTK. It can be concluded that young male soccer players in different age groups may have similar age-adjusted levels of MC. Besides, these findings emphasize the possible positive effects of organized sport practice on MC. Future studies are warranted to analyze longitudinal influences of regular soccer training on health-related physical fitness and motor competence skills in children.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Hasan Batuhan Dirik, Mustafa Söğüt;* ***Design:*** *Hasan Batuhan Dirik, Mustafa Söğüt;* ***Control/Supervision:*** *Mustafa Söğüt;* ***Data Collection and/or Processing:*** *Hasan Batuhan Dirik, Mustafa Söğüt;* ***Analysis and/or Interpretation:*** *Hasan Batuhan Dirik, Mustafa Söğüt;* ***Literature Review:*** *Hasan Batuhan Dirik, Mustafa Söğüt;* ***Writing the Article:*** *Hasan Batuhan Dirik, Mustafa Söğüt;* ***Critical Review:*** *Hasan Batuhan Dirik, Mustafa Söğüt;* ***References and Fundings:*** *Hasan Batuhan Dirik, Mustafa Söğüt;* ***Materials:*** *Hasan Batuhan Dirik, Mustafa Söğüt.*

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