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Letter to the Editor

Association of Trunk Muscle Strength and Scoliosis among Korean Children

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Dear Editor-in-Chief

Radiologically, scoliosis refers to a form of spinal deformity with a Cobb's angle of at least 10° (1). Particularly, idiopathic scoliosis is one of the most common spinal diseases in children and is highly prevalent. Therefore, early screening and prevention of scoliosis among elementary school students would be one of the most critical methods for appropriate and timely treatment and health maintenance.

The prevalence of scoliosis is closely related to the muscle strength level. Low trunk muscle strength is a major cause of core stability problems, and core-stability exercise rehabilitation can be performed for restoring the trunk strength to resolve this. Notably, it is known that enhancing core muscles using exercise rehabilitation can improve scoliosis (2). Various studies (all in 3) on idiopathic scoliosis in elementary school students, related emotional and social problems, and effective treatment methods have continuously been studied in foreign countries. However, large-scale studies on children with idiopathic scoliosis are lacking in Korea, and there is currently no study investigating the prevalence of scoliosis according to the level of back muscle strength.

Thus, we aimed to investigate the effect of the trunk muscle strength on scoliosis in elementary school students in Korea in 2017 and provide basic data for the prevention of scoliosis and early intervention.

Of the initial 771 children from a metropolitan area of Korea, 9 children who did not undergo any examinations related to physical fitness, body composition, or scoliosis were excluded. Finally, 762 children were enrolled as the participants of this study.

This study was approved by the Institutional Review Boards at Incheon National University IRB (No. 7007971-201612-003-01). The characteristics of the participants are shown in Table 1. The height, weight, and body composition of the participants were measured. The height was measured using an anthropometer (Seca, Germany), while the weight and body composition were measured using a body composition analyzer (Inbody 720, Biospace, Korea). Moreover, spinal structural analysis equipment without X-ray exposure (Formetric 4D, Dires International GmbH, Schlangenbad, Germany) was used to determine the structural deformities of the spine. The validity and reliability of the equipment were verified (4).

Table 1: Subject characteristics

Variables	*Male (n=519)*	*Female (n=243)*	*P-value*
Age (yr)	11.47±1.61	10.69±1.49	< 0.001
Weight (kg)	49.24±15.39	40.51±11.90	< 0.001
Height (cm)	153.63±13.67	146.51±11.59	< 0.001
Lean body mass (kg)	20.30±6.41	15.55±4.19	< 0.001
Body fat (kg)	11.73±7.49	10.65±5.78	0.030
Percent body fat (%)	22.62±9.57	25.06±7.74	< 0.001
Back Muscle Strength (kg)	56.18±23.32	38.81±13.20	< 0.001

Date and abbreviation are mean ± standard deviation. Abbreviations: BMI, body mass index

Lastly, the trunk muscle strength of the participants was measured using a digital instrument for measuring back strength (TKK5402, Takei Co., Japan). Statistical analyses in this study were conducted using SPSS, Windows version 21.0 (IBM Corp., Armonk, NY, USA). An independent *t*-test was used to compare and analyze the mean values of the factors according to sex. Furthermore, the trunk muscle strength levels were categorized as low-level muscle strength (LMS), mid-level muscle strength (MMS), and high-level muscle strength (HMS). The data were analyzed using logistic regression analysis after controlling for age and sex to determine the risk of scoliosis and were presented as odds ratio (OR) and 95% confidence interval (CI); *P*-values <0.05 were considered statistically significant.

Table 2 shows the prevalence of scoliosis in this study, wherein the participants were categorized into three groups according to their level of trunk muscle strength. After controlling for age, sex, weight, and body mass index, the prevalence of scoliosis in the MMS and HMS groups was found to be 0.88 times (OR: 0.88, 95% CI: 0.58–1.33) and 0.41 times (OR: 0.41, 95% CI: 0.24–0.72) lower than that of the LMS group, respectively.

Table 2: Odds ratio according to back muscle strength levels

Total(n=762)	*1st (n=259) Low-levels muscle strength*	*2nd (n=248) Mid-levels muscle strength*	*3rd (n=255) High-levels muscle strength*
OR (95% CI)			
Scoliosis	1	1.053 (0.71-1.54)	0.70 (0.48-1.01)
Age and gender-adjusted OR (95% CI)			
Scoliosis	1	0.93 (0.62-1.41)	0.51 (0.30-0.84)
Age, gender, weight and BMI-adjusted OR (95% CI)			
Scoliosis	1	0.88 (0.58-1.33)	0.41 (0.24-0.72)

Abbreviations: CI, confidence interval; OR, Odds ratio; BMI, body mass index

As reported in this study, a previous study has also shown that scoliosis could be improved and prevented through strength exercises (2). Moreover, improving the muscle strength can lower the Cobb's angle, a standard measure of scoliosis. However, further studies are warranted since there are very few studies investigating the association between muscle strength level and scoliosis prevalence. This study investigated the effect of the level of trunk muscle strength on the risk factors and incidence of scoliosis in Korean elementary school students.

In conclusion, improving the trunk muscle strength is one of the effective methods for the prevention and management of scoliosis.

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Conflict of interest

The authors declare that there is no conflict of interest.

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