



Impact of Physical Fitness Changes During Young Childhood on Social and Emotional Skills in Elementary School Years



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1. Background and Purpose

Physical activities in children have various educational effects, particularly on non-cognitive skills, which have been recently emphasized. Non-cognitive skills are an important factor of well-being, and it has been reported that these skills are particularly low among Japanese children. The Organization for Economic Co-operation and Development (OECD) considers non-cognitive abilities as social and emotional skills (SES) and has proposed a measurement scale; however, research on their relationship with physical activity and physical fitness is insufficient. Therefore,

this study examined the impact of physical fitness improvement during young childhood on SES during the elementary school years, further investigated the mediating effects of physical activity preferences and physical fitness during the elementary school years on SES

【Participants】

The participants in this study were 117 fifth-grade elementary school students who participated in annual physical fitness tests during young childhood and remained traceable until 2024.

【Measurement Items】

(When participants were young child)

Physical fitness tests consisting of seven items were administered when the children were 3 and 5 years old class.

(When participants were in 5th-grade level)

We conducted an eight-item physical fitness test and the OECD's SES Scale; physical activity preference was assessed using a questionnaire.

【Analysis procedures】

Explanatory variable ⇒ physical fitness changes during young childhood.

Mediating variables ⇒ physical fitness and physical activity preferences at the 5th-grade level.

Dependent variable ⇒ each SES factor in 5th-grade.

We conducted the following analysis in accordance with the Baron and Kenny's standard procedure (Baron & Kenny, 1986).

Step 1: Examine the direct effect of the explanatory variable on the dependent variable using regression analysis.

➡ Regression Analysis

Step 2: Examine the mediating path from the explanatory variable to the mediating variable and from the mediating variable to the dependent variable. ➡ Regression Analysis

Step 3: A mediation analysis was conducted using a structure equation modeling.

➡ Structure equation modeling

Results I : Factor structure of SES

Before proceeding with the main analysis, the factor structure of the SES was confirmed by factor analysis.

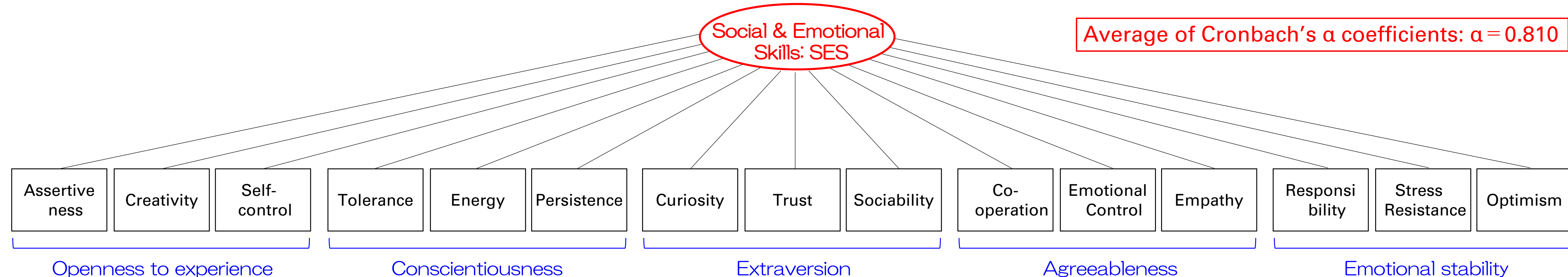


Fig 1. Factor structure of SES scale

Factor analysis was applied to the SES short version data, and a simple structure of 15 factors was confirmed. The total explained variance was 63.0%, and high reliability coefficients were confirmed for all aspects. The SES short version was proposed to adequately assess SES.

2. Summary of Results

☆ The direct effects of physical fitness changes during young childhood on each SES factor

The direct effects on SES of "assertiveness", "energy", "sociability", "co-operation", and "empathy" were confirmed for changes in the 25m run and ball throw.

☆ The mediating path from physical fitness changes to physical fitness and physical activity preferences and from these to each SES factor in 5th-grade

Changes in ball throw during young childhood showed significant regression coefficients for 5th-grade physical fitness and physical activity preference. Fifth-grade physical activity preference showed significant regression coefficients for "assertiveness," "sociability," and "cooperation". Significant regression coefficients were obtained for both 5th-grade physical activity preference and physical fitness for the "energy" factor.

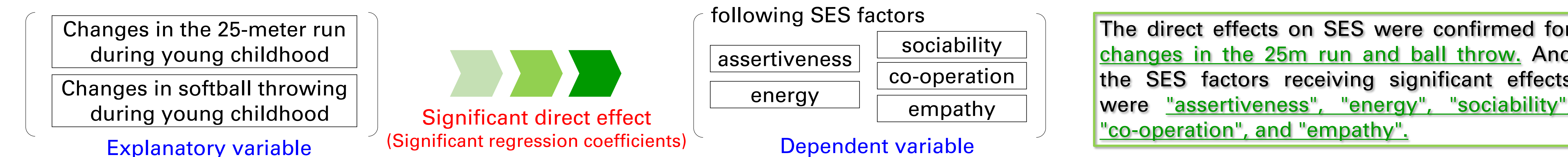
☆ The Mediating Effect of physical fitness and physical activity preferences on the effect of physical fitness changes during young childhood on SES

Mediation analysis results confirmed a significant mediating effect of physical activity preference other than "empathy". Regarding "energy," 5th-grade physical fitness was also confirmed to have a significant mediating effect.

Discussion & Conclusion : Improvements in 25-meter run and ball throw during young childhood were suggested to be effective in enhancing SES by fifth grade. Additionally, enhanced physical activity preferences by fifth grade were suggested to be an important mediating factor for SES improvement.

Results II : Examine the direct effect

The direct effects of physical fitness changes during young childhood on each SES factor in 5th-grade were examined using regression analysis.



Results III: Examine the mediating path

The mediating path from physical fitness changes during young childhood to physical fitness and physical activity preferences at the 5th-grade level and from physical fitness and physical activity preferences at the 5th-grade level to each SES factor in 5th-grade were examined.

Tab 1. The mediating path from physical fitness changes during young childhood to physical fitness and physical activity preferences at the 5th-grade level

dependent variables (y) ... in 5th grade	explanatory variables (x) ... during young childhood	regression coefficients (p-value)
physical activity preferences	Changes in the 25-meter run	0.119
	Changes in softball throwing	0.009*
physical fitness	Changes in the 25-meter run	0.055
	Changes in softball throwing	0.001*

Tab 2. The mediating path from physical fitness and physical activity preferences at the 5th-grade level to each SES factor in 5th-grade

dependent variables (y) ... in 5th grade	explanatory variables (x) ... in 5th grade	regression coefficients (p-value)
assertiveness	physical activity preferences	0.007*
	physical fitness	0.348
sociability	physical activity preferences	0.003*
	physical fitness	0.386
co-operation	physical activity preferences	0.026*
	physical fitness	0.950
energy	physical activity preferences	0.020*
	physical fitness	0.001*

Changes in ball throw during young childhood showed significant regression coefficients for 5th-grade physical fitness and physical activity preference. Regarding the 25m run, slightly not significant. Fifth-grade physical activity preference showed significant regression coefficients for "assertiveness," "sociability," and "cooperation". Significant regression coefficients were obtained for both 5th-grade physical activity preference and physical fitness for the "energy" factor.

Results IV: Mediation analysis

We conducted a mediation analysis, setting the explanatory variable as physical fitness changes during young childhood, the mediating variables as physical fitness and physical activity preferences at the 5th-grade level, and the dependent variable as each SES factor in 5th-grade.

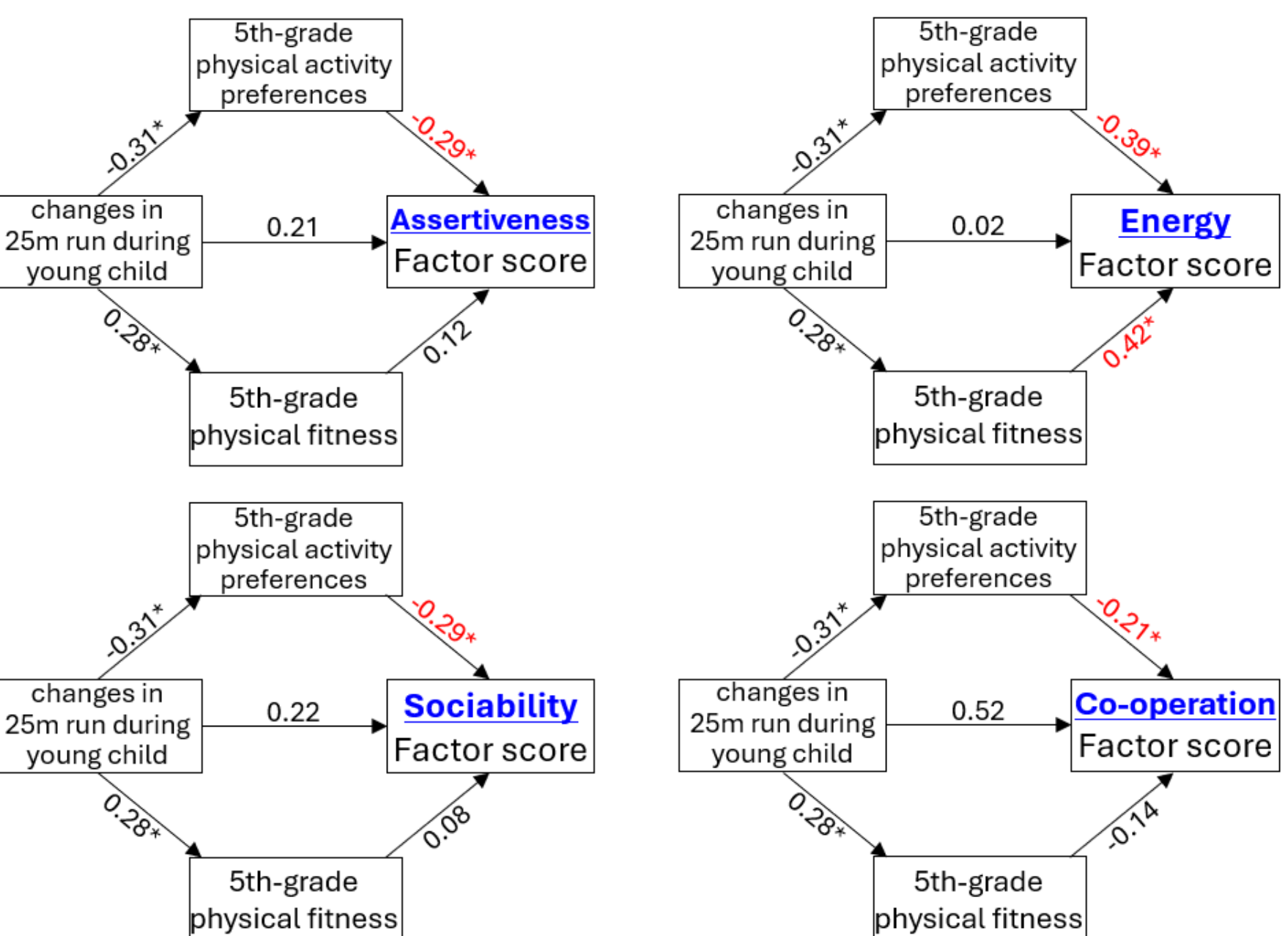


Fig 2. Results of mediation analysis regarding changes in 25m run.

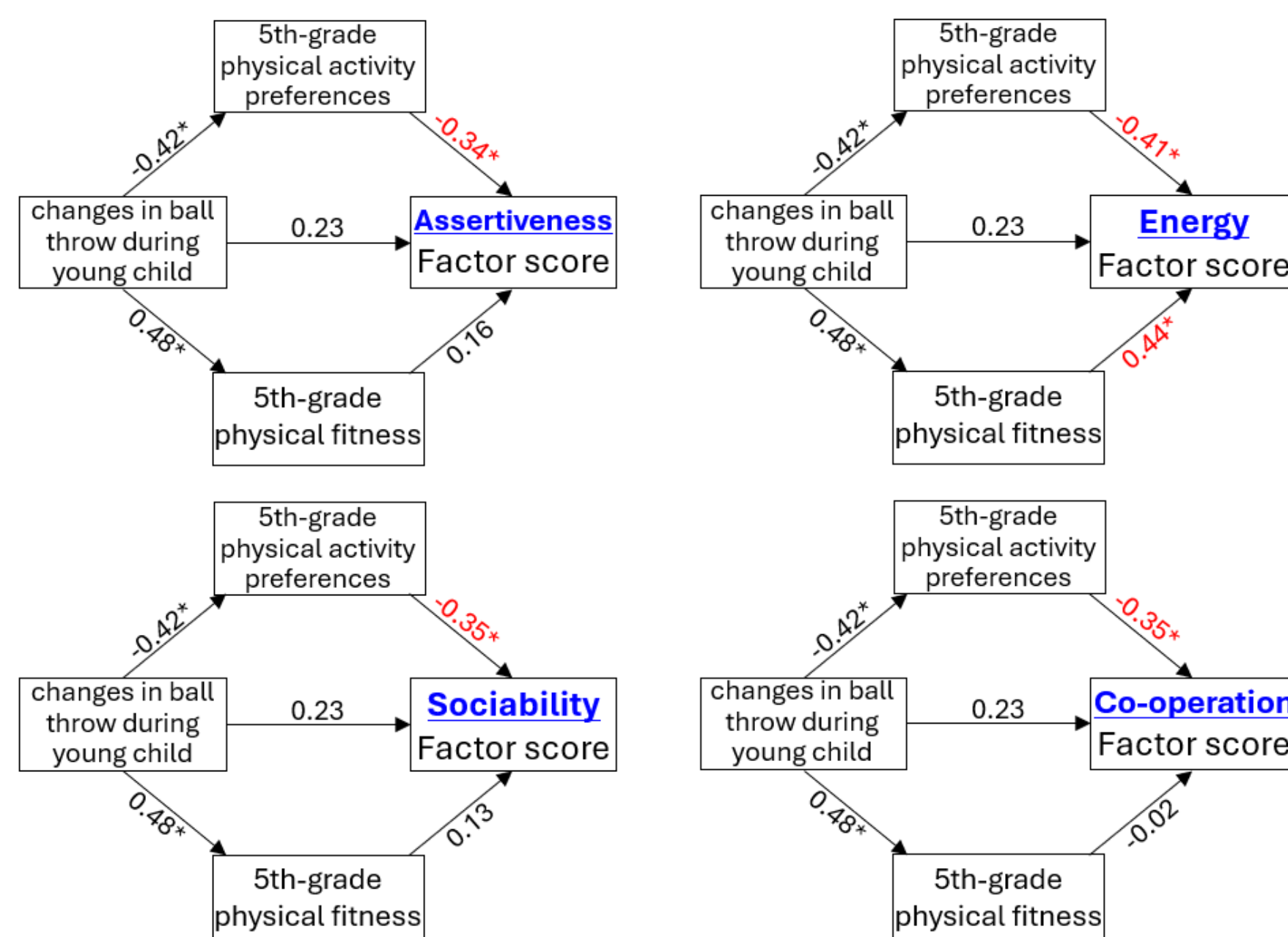


Fig 3. Results of mediation analysis regarding changes in softball throw.

Mediation analysis results confirmed a significant mediating effect of physical activity preference other than "empathy". Regarding "energy," 5th-grade physical fitness was also confirmed to have a significant mediating effect.

Improvements in 25-meter run and ball throw during young childhood were suggested to be effective in enhancing SES by fifth grade. Additionally, enhanced physical activity preferences by fifth grade were suggested to be an important mediating factor for SES improvement.