



Carta al Editor

DANCE PARTICIPATION AND ACADEMIC PERFORMANCE IN YOUTH GIRLS

Dear Editor,

Dance is a predominant type of physical activity among girls (1). Dance characteristics imply skills associated to health-related physical fitness (2-4), as well as others such as learning and memory, mental representation, imagination and creativity, which are related to cognitive development (2,5,6). Although dance has been shown to influence physical health among youth girls (2,3), whether dance may influence academic performance and cognition in youth remains to be elucidated. The objective of this work was to examine the association between participation in dance and academic performance in youth girls. Participants were part of the UP&DOWN study (7). Children and adolescents were recruited from schools in Cádiz and Madrid (Sapin), respectively. A total of 2,225 youth (1,188 children) participated in the UP&DOWN study. Parents and school supervisors were informed by letter about the study, and written informed consent was provided. The present study included 714 youth girls aged 11.83 ± 2.50 years. Body mass index (BMI) was determined by standardized methods and calculated as weight/height squared (kg/m^2). Physical activity and participation in dance were assessed with the Physical Activity Questionnaire for Adolescents/Children (PAQ-A/C) (7). Academic performance was assessed through grades reported by every school;

four main indicators were used: a) Mathematics; b) Language; c) average of Mathematics and Language; and d) Grade point average (8). Table I presents the association between dance participation and academic performance segmented by age group, since we found an interaction between age group and dance participation in relation to academic performance. Child girls who participated in dance had significantly higher scores in all academic indicators than those who did not participate in dance after adjustment for age, maternal education and BMI. In model 2, after further adjustment for other physical activities these associations remained significant (all $p < 0.05$). However, among adolescent girls, dance participation was not associated with academic performance ($p > 0.05$). When analyzing separately younger (12.28 ± 0.60) and older adolescents (15.30 ± 0.65) the results were similar ($p > 0.05$). In the scientific literature, there are few studies related to dance benefits and academic performance in youth since most studies are focused on total physical activity (9). An intervention study of aerobic dance in 208 children, including boys and girls, had similar results. After 30 minutes of aerobic dance three times per week during one year, the intervention group ($n = 85$) improved cardiorespiratory fitness and math scores (2). Our results show a positive association between participation in dance and higher levels of academic performance only in child girls. Recent research suggests that during sensitive periods plasticity is heightened and the brain primes to process particular stimuli in each stage (10). It is possible that during childhood brain is more sensitive to dance-related

Table I. Differences in academic performance according to dance participation in youth girls

	Children (n = 277)				Adolescents (n = 437)			
	Yes Mean \pm SD	No Mean \pm SD	<i>P</i> _{Model 1}	<i>P</i> _{Model 2}	Yes Mean \pm SD	No Mean \pm SD	<i>P</i> _{Model 1}	<i>P</i> _{Model 2}
<i>n</i>	154	123			211	226		
Math (1-5)	3.58 \pm 1.21	3.14 \pm 1.32	<i>0.006</i>	<i>0.006</i>	2.87 \pm 1.36	2.92 \pm 1.35	0.459	0.326
Language (1-5)	3.84 \pm 1.14	3.38 \pm 1.23	<i>0.003</i>	<i>0.002</i>	3.18 \pm 1.27	3.16 \pm 1.31	0.917	0.977
Math & Language (1-5)	3.71 \pm 1.12	3.26 \pm 1.22	<i>0.003</i>	<i>0.002</i>	3.03 \pm 1.21	3.04 \pm 1.18	0.718	0.568
Grade point average (1-5)	3.90 \pm 0.85	3.53 \pm 0.92	<i>0.001</i>	<i>0.001</i>	3.39 \pm 0.96	3.42 \pm 0.91	0.748	0.628

Statically significant values are in italics. Model 1: Analyses were adjusted by age (years), maternal education (university level/below university level) and BMI (kg/m^2). Model 2: Adjustments for model 1 plus other physical activities (PAQ-A/C score without dance participation).

stimuli than in adolescence. However, the design that was used limited the possibility to draw any conclusions on the causal direction of the associations. Further research is need but this evidence suggests that dance programs might be important for successful academic performance in girls, mainly during childhood.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the youth, parents and teachers who participated in this study. The UP&DOWN Study was supported by the DEP 2010-21662-C04-00 grant from the National Plan for Research, Development and Innovation (R+D+i) MICINN. The authors declare that there are no conflicts of interest.

Sara Higuera-Fresnillo¹, David Martínez-Gómez¹, Carmen Padilla-Moledo², Julio Conde-Caveda² and Irene Esteban-Cornejo¹

¹*Department of Physical Education, Sports, and Human Movement. Autonomous University of Madrid. Madrid, Spain.*

²*Department of Physical Education. School of Education, University of Cadiz. Cadiz, Spain
(sara.higuera@uam.es)*

REFERENCES

1. O'Neill JR, Pate RR, Liese AD. Descriptive epidemiology of dance participation in adolescents. *Res Q Exerc Sport* 2011;82:373-80.
2. Gao Z, Hannan P, Xiang P, Stodden DF, Valdez VE. Video game-based exercise, Latino children's physical health, and academic achievement. *Am J Prev Med* 2013;44:240-6.
3. Higuera-Fresnillo S, Esteban-Cornejo I, González-Galo A, Bellvis-Guerra G, Martínez-Gómez D. The association of dance participation with body fat and physical fitness among youth girls. *Nutr Hosp* 2015;32:1396-7.
4. Karpati FJ, Giacosa C, Foster NE, Penhune VB, Hyde KL. Dance and the brain: A review. *Ann NY Acad Sci* 2015;1337:140-6.
5. Bläsing B, Calvo-Merino B, Cross ES, Jola C, Honisch J, Stevens CJ. Neurocognitive control in dance perception and performance. *Acta Psychol* 2012; 139:300-8.
6. Sevdalis V, Keller PE. Captured by motion: Dance, action understanding, and social cognition. *Brain Cogn* 2011;77:231-6.
7. Castro-Piñero J, Carbonell-Baeza A, Martínez-Gómez D, Gómez-Martínez S, Cabanas-Sánchez V, Santiago C, et al. Follow-up in healthy schoolchildren and in adolescents with Down syndrome: Psycho-environmental and genetic determinants of physical activity and its impact on fitness, cardiovascular diseases, inflammatory biomarkers and mental health; the UP&DOWN Study. *BMC Public Health* 2014;14:400.
8. Esteban-Cornejo I, Tejero-González CM, Martínez-Gómez D, Cabanas-Sánchez V, Fernández-Santos JR, Conde-Caveda J, et al. Objectively measured physical activity has a negative but weak association with academic performance in children and adolescents. *Acta Paediatr* 2014;103:11:501-6.
9. Esteban-Cornejo I, Tejero-González CM, Sallis JF, Veiga OL. Physical activity and cognition in adolescents: A systematic review. *J Sci Med Sport* 2014;18:534-9.
10. Fuhrmann D, Knoll LJ, Blakemore SJ. Adolescence as a sensitive period of brain development. *Trends Cogn Sci* 2015;19:558-66.