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How Important is Physical Activity Training Participation for Children with Higher or Lower Athletic Competence Beliefs?

[1]Giulia Bardaglio, [1]Danilo Marasso, [1]Emanuela Rabaglietti, [2]Enrique Ortega, and [12]Silvia Ciairano

[1]Motor Science Research Center
(SUISM – Scuola Universitaria Interfacoltà in Scienze Motorie), University of Torino, Italy.
[2]Laboratory of Developmental Psychology,
Department of Psychology, University of Torino, Italy.

Correspondence Author: Giulia Bardaglio

Abstract

Some studies have investigated the relationship between children's athletic competence beliefs and actual motor competence while engaged in physical activity. However, it is not clear whether or not participation in physical activity training has lesser or greater effectiveness for children with higher or lower beliefs of their own athletic competence. This knowledge would allow for the implementation of different kinds of physical activity trainings, tailored around the children's beliefs, in order to get the highest possible improvement of motor skills. This study investigated whether children's levels of athletic competence beliefs would interact with their increase in coordinative motor skills proficiency after a specific physical activity training. The participants in the training were 116 children (7-10 years old), randomly divided into an experimental (53% females) and control group (49% females). We collected pre- and post-test measures of the children's coordinative motor skills and we also assessed their athletic competence beliefs at the pre-test. The physical activity training increased the children's motor skills, and children with lower athletic competence beliefs benefited more than their classmates with higher athletic competence beliefs. When the athletic competence beliefs are low, good physical activity training can overcome its negative effect on actual motor skills, both in boys and girls.

Keywords: childhood, athletic competence beliefs, coordinative motor skill, physical education, primary school

INTRODUCTION

Coordinative motor skills contribute to the resolution of movement tasks in a rational and creative way in the various fields of sport and daily life (e.g. climbing stairs, grasping objects, walking, jumping; Weineck, 2009). The development of coordinative motor skills is a continuous process during all the life span, but the late childhood, between the ages of 7 and 11 years, is certainly a "sensitive period" for the learning of movement coordination (Hirtz and Starosta, 2002). In fact it is especially during childhood that coordinative motor skills can be trained by applying specific trainings (Gallotta et al., 2009). However, we also know that many factors can decrease the likelihood of children's participation in physical activity trainings. Among all possible factors, our study will be focused on the individual level, and in particular on whether and how the competence-related beliefs of the children may interact with the training experience contributing to modify its efficacy.

Individual competence-related beliefs, in the field of physical and sport activity as well as in other fields, can be translated into estimates of expectations for one's future performance. With respect to developmental changes in the relationship between beliefs and actual competence, children's beliefs tend to become more precise through primary school years as children get older (Eccles, Wigfield, Harold, and Blumenfeld, 1993). At about 7 to 8 years of age, the accuracy of the relation between beliefs and real competence increases because a child's cognitive abilities enable he/she to accomplish more realistic evaluations (Stodden et al., 2008). Some studies have examined the relationship between children's athletic competence beliefs and actual motor competence while engaged in physical activity (Barnett, Morgan, Van Beurden, and Bear, 2008; Sollerhed, Apitzsch, Rastam, and Ejlertsson, 2008). Generally speaking these studies demonstrated that children who have high levels of competence beliefs also have high levels of actual coordinative motor skills. However, we do not know whether or not participation in physical activity training has lesser or greater effectiveness for children with higher or lower beliefs of their own athletic competence. This knowledge would allow for the implementation of different kinds of physical activity trainings, tailored around the children's beliefs, in order to get the highest possible improvement of motor skills. In addition, we need this knowledge in order to make a physical activity training the most effective for the children's physical and psychological wellbeing.

The gender differences in children's competence-related beliefs are already known (Cairney et al., 2012). The extent of this difference varies by age and seems to become more marked as children get older. Generally speaking, boys showed higher competence beliefs than girls in the sport domain (Eccles et al., 1993). Also Wigfield et al., (1997) found gender differences for sport competence beliefs, usefulness, importance, and interest across the 3 years of their longitudinal study. Otherwise, more recently Fanunza, Fadda, and Guicciardi (2007) did not find any gender differences for athletic competence beliefs in an Italian sample of children aged between 8 and 11 years.

In sum, we aimed to answer two research questions: First, whether or not any gender difference exists with regard to the athletic competence beliefs of children. As anticipated, existing findings are contradictory. However, in the light of the italian study (Fanunza Fadda, & Guicciardi, 2007) we are inclined to hypothesize that there will be no gender differences with respect to athletic competence beliefs. Second, we want to explore whether children's levels of athletic competence beliefs would interact with their increase in coordinative motor skills proficiency after a specific school-based physical activity training. In fact, we are inclined to hypothesize that participation in a training could compensate for and probably even overcome the effect that the level of athletic competence beliefs has on the actual level of coordinative motor skills, thereby enabling children with lower beliefs to profit more from the training than those with higher beliefs and to reach similar levels of motor competence. This expectation is also based on the fact that in the present study we use a special physical activity training, which is specifically designed for addressing the needs of school-age children and is conducted by qualified instructors.

METHODS

Participants

The participants were 116 children attending the second and third grades of four primary schools in a province of northwest Italy. The experimental group (53% female) included 53 children whose mean age was 8.62 years (DS=.53); the control group (49% female) included 63 children whose mean age was 8.41 years (DS=.60). We extracted the four schools randomly from all the primary schools of the province, and they all feature similar levels of general socio-economic conditions, also in terms of the number of pupils, and services in and outside the school. Two schools were assigned to the experimental condition and two schools to the control group condition. The main socio-demographic characteristics of the participants are described in Table 1. Within all socio-demographic information, the analysis found no significant difference between the experimental group and the control group. Moreover, the overall situation is similar to that of the general population of the same province (ISTAT, 2010).

Table 1. Socio-demographic description of the sample (%)

		Group	
Variable	**Category**	Control *N (%)*	Experimental *N (%)*
Gender	Female	30 (48)	29 (55)
	Male	33 (52)	24 (45)
Nationality	Italy	52 (83)	45 (83)
	Other countries	11 (17)	8 (17)
Family structure	Non divorced	48 (76)	40 (75)
	Divorced	15 (24)	13 (25)
Father's level of education	Only Compulsory Education	12 (19)	15 (28)
	More than Compulsory School	51 (81)	38 (72)
Mother's level of education	Only Compulsory Education	7 (11)	7 (13)
	More than Compulsory School	54 (89)	44 (87)
Father 's job	Intellectual professions (manager, politician)	7 (11)	5 (9)
	Technical and administrative professions (state employee)	29 (46)	27 (51)
	Manual professions (craftsman, worker)	19 (30)	15 (29)
	Unemployed	8 (13)	6 (11)
Mother's job	Intellectual professions (Manager, politician)	9 (14)	7 (13)
	Technical and administrative professions (State employee)	26 (41)	23 (43)
	Manual professions (craftsman, worker)	12 (20)	10 (19)
	Housewife/unemployed	16 (25)	13 (25)
Age	Mean (SD)	8.67 (.43)	8.61 (.36)

PROCEDURE AND MEASURES

The coordinative motor skills of all children were assessed at the pre-test by trained individuals using a systematic observation checklist (Bardaglio et al, 2012). Indeed, the observation protocol included a camera and the simultaneous presence of three observers, all doctoral students who are experts in physical education. All children were also administered a self-report questionnaire at the pre-test to assess their perceptions of their athletic competence (Eccles et al., 1993). The questionnaire was administered in class. Following this, children in the experimental group were exposed to a school-based physical activity training, while children in the control group participated only in curricular physical activity. At the end of the physical activity training, during the post-test the coordinative motor skills of all children were again assessed using the same systematic observation checklist administered at the pre-test. The proportion of agreement between the scores assigned by the different coders was

considered very high, measuring about 95%. In the case of a disagreement, the coders were invited to justify their choices and, after a short discussion, in all cases they came to an agreement (D'Odorico, 1990). Due to the clustering of students within schools and possible intra-school correlation between students, a general linear mixed model was applied in the analysis. We conducted a general linear mixed model in which coordinative motor skills at the post-test were used as the predicted variable. Predictors in the model included coordinative motor skills at the pre-test, perceived athletic competence, intervention group status, and the interaction term of intervention group status*perceived athletic competence. Gender and parental job type were used as covariates in the analysis.

Our research was approved by the Official Ethics Group of the University of Torino, which is our university's established organism for ethics issues. Because the children were minors, we collected all the required informed consent from their parents, as well as the trainers, according to the ethical principles for research of the Italian Psychological Association. We also collected the active consent from the children themselves.

Athletic Competence Beliefs Items. The seven competence beliefs items asked the children how good they are in sport and physical activities, how good they are relative to other things they do, how good they are relative to other children in their class, how well they expect to do in their sport future, how good they are at tumbling and gymnastics, how good they are at throwing and catching a ball, and how good they would be at learning a new sport (Eccles et al., 1993). The items were answered using a 7-point Likert-style response scale from 1 (low) to 7 (excellent), and the items have good psychometric properties. The Cronbach's alpha of the scale is .78, indicating the scale is reliable (see Eccles and Wigfield, 1995; Eccles et al., 1993).

Coordinative Motor Skills Scale. The coordinative motor skills of children were measured through a systematic observation checklist. The validation of this instrument and the observation protocol are provided in our recent study (Bardaglio et al., 2012). The instrument is called the Coordinative Motor Skills Scale (CMSS), which was used to evaluate the coordinative motor skills of children during a simple and popular team game called Dodgeball. In particular, the motor skills observed in this situation are the four most common motor skills of these types of games: passing the ball, shooting the ball, movement without the ball in attack, and movement without the ball in defense (Lombardozzi, Musella, Balducci, and Barigelli, 2001; Blomqvist, Vänttinen and Luhtanen, 2006). The CMSS is comprised of eight items obtained from the combination of these four fundamental motor skills along with two coordinative motor skills: motor control ability and motor adaptation ability (Blume, 1981). The descriptors of these eight items are illustrated in Table 2. The items are evaluated using a dichotomous scale, reporting the presence or the absence of each descriptor. The responses of the CMSS test were added, obtaining a total score value of coordinative motor skills for each child.

Table 2. Descriptors of the 8 items of the Coordinative Motor Skills Scale (CMSS)

Items	Descriptors
1. *Pass-motor control ability*	He/she throws the ball, regulating the action, with force and trajectory to assume that the ball arrives in the hands of the teammate.
2. *Pass-motor adaptation ability*	He/she chooses to pass the ball to the teammate closest to the half way line in reference to the field layout of the opponents.
3. *Shooting-motor control ability*	He/she throws the ball, regulating the gesture, with force and trajectory to assume the success of the shooting.
4. *Shooting-motor adaptation ability*	He/she chooses to hit with the ball the opponent closest to the half way line in reference to the field layout of the others opponents.
5. *Attack-motor control ability*	He/she moves and positions to receive the ball and attack, always keeping eye contact with teammate in possession of the ball.
6. *Attack-motor adaptation ability*	He/she chooses to move, in the position closest to the half way line in reference to the field layout of the opponents, in order to receive the ball and attack.
7. *Defence- motor control ability*	He/she is positioned to receive the ball from opponents always keeping the front facing the opponent in possession of the ball.
8. *Defence- motor adaptation ability*	He/she chooses the defensive position farther than the half way line in reference to the opponent in possession of the ball that is attacking.

Physical Activity Training

The physical activity training presented in this study consisted of a specific intervention made to implement the coordinative motor skills of primary school children. The specific goal of this training is to increase the level of coordinative motor skills in team games by introducing activities that are mainly play-educational and that are appropriate for children, in concordance with trainings promoting physical activity in schools that are present in the literature (Dobbins et al., 2009). The physical activity training consists of 16 1-hour physical activity lessons that are held in the gym once a week for a period of approximately 4 months. Four instructors who have earned their degrees in motor sciences and are properly prepared to teach children between 6 and 10 years old, conducted the lessons following a manual of activities that complies with the theoretical and methodological principles of learning coordinative motor skills during childhood (Weineck, 2009). The trainers implemented 90% of the manual.

RESULTS

Regarding the first question, whether any gender difference exists in children's levels of athletic competence beliefs in the pre-test, the analysis of the *t*-test for independent samples did not show any significant difference between boys and girls as far as the total scores of the athletic competence beliefs are concerned (M=38.93, SD=7.07 for boys; M=36.47, SD=6.99 for girls; t=1.88, g.d.l.=114, p=.063).

Next, we proceeded to split the sample according to the level of athletic competence beliefs through a median. In this way, the discriminative level was fixed to 39.0 in relation with the total score value obtained on the questionnaire. The sample was thus divided into two groups: The first group comprised the 47% of children who have low perceived competence, while the second group comprised the 53% of children with high perceived competence. With respect to the possible intra-school correlation between students within schools, the school level intra-class correlation was 0.1079, indicating that our subjects' scores within schools were not independent and thus that a general linear mixed model was indeed required. Thus, a general linear mixed model was used in order to investigate whether children's levels of athletic competence beliefs would interact with their increase in coordinative motor skills proficiency after a specific school-based physical activity training. Analyses showed that being in the experimental condition was statistically significantly associated to higher coordination of motor skills (β = -6.480.41, p=.01). It is worth noting that in both the experimental and control groups, an increase of coordinative motor skills in team games is noticeable over time (see Figure 1), however the increase was more noticeable in children who participated in the physical activity training (M_{t1}=11.47, M_{t2}=14.42 for children in the experimental group; M_{t1}=10.95, M_{t2}=12.13 for children in the control group).

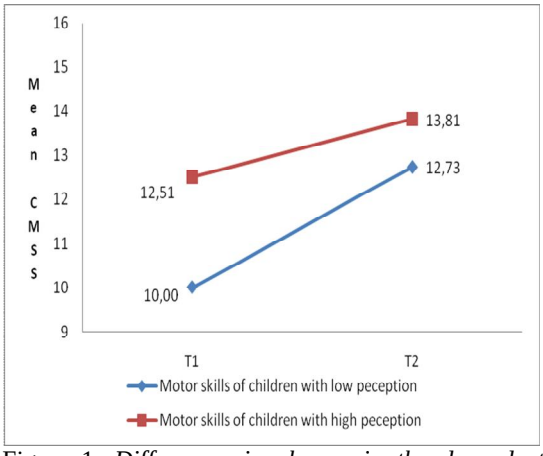

Figure 1. *Differences in change in the dependent variable (coordinative motor skills of children in team games) between groups (experimental or control condition)*

Our analyses also showed that the interaction between treatment group assignment and perceived athletic competence on motor ability was a statistically significant (β = 2.48, p < 0.05). Furthermore, our results showed that those with lower perceived athletic competence showed greater increases in coordinative motor skills among those assigned to the intervention condition (see Figure 2). Over time, a more noticeable progression occurred among children in the experimental group with a low level of athletic competence beliefs (M_{t1}=9.52; M_{t2}=14.22) than children with a high level of athletic competence beliefs (M_{t1}=13.42; M_{t2}=14.62). Moreover, children in the experimental group with a low level of athletic competence beliefs developed more even with respect to the two levels of athletic competence beliefs of the control group (M_{t1}=10.15, M_{t2}=11.22 for children with a low level of athletic competence beliefs; M_{t1}=11.75, M_{t2}=13.03 for children with a high level of athletic competence beliefs).

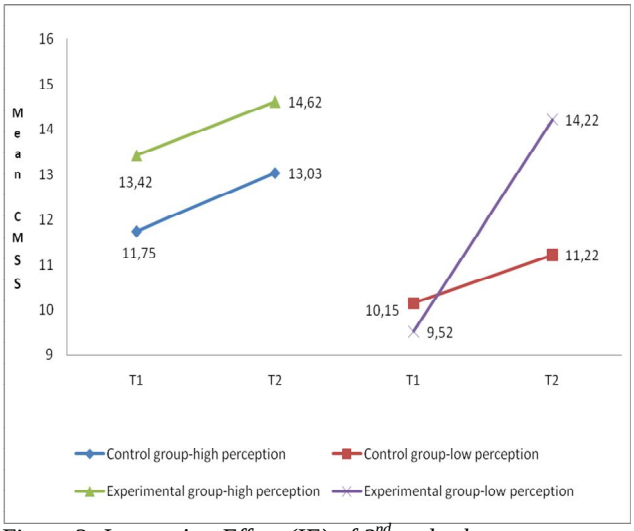

Figure 2. *Interaction Effect (IE) of 2nd order between time, experimental condition (experimental group and control group), and level (low or high) of athletic competence beliefs for the dependent variable (coordinative motor skills of children in team games)*

DISCUSSION

The present study wanted to verify if gender differences exist in a sample of Italian children. Furthermore, we want to verify whether or not participation in physical activity training has lesser or greater efficacy for children with higher or lower beliefs of athletic competence. Regarding whether any gender differences exist in children's levels of athletic competence beliefs, there were no significant differences between boys and girls. We confirmed the results from the most recent Italian study (Fanunza, Fadda, and Guicciardi, 2007). It is possible that girls in Italy are more encouraged to practice physical activities, as indicated in an ISTAT survey (2007),

and that both girls and boys are less bound to stereotyped physical activities (Guicciardi and Saracino, 2003).

Regarding whether children's levels of athletic competence beliefs would interact with their increase in coordinative motor skills proficiency after a specific physical activity training, the results showed that participation in a physical activity program had a higher effect on coordinative motor skills of children with lower beliefs of athletic competence.

In agreement with some authors (Rudisill, 1989; Harter, 1978), children with higher levels of athletic competence beliefs feel able to execute tasks and they should benefit more from the intervention in respect to children with lower beliefs. However, these studies have not considered the fact that a physical activity training could change this relationship. In the present study we confirmed our hypothesis and the results showed that participation in a physical activity training, designed and led by qualified instructors, may have compensated for the effect that the level of athletic competence beliefs has on the level of coordinative motor skills. This has allowed the children with lower beliefs to profit more from the training than those with higher beliefs and to reach similar levels of motor competence.

CONCLUSION

It seems reasonable to hypothesize that children with lower beliefs have taken advantage more from the training than those with higher beliefs for two different but not reciprocally exclusive reasons that deserve further examination: First, it is likely that the instructors' attention was more noticeably oriented toward those children with a lower level of athletic competence beliefs who also had low motivation, low level of motor skills, and probably experienced more difficulties during the physical activity training. Second, children with higher competence beliefs were probably also more motivated, more self-taught, and they had less need for the instructors' support compared to peers with lower beliefs. We certainly need further studies to confirm this finding as well as assessing the role of the specific personal characteristics of the instructors, such as the educational style they have adopted (Vacirca, Giannotta, and Ciairano, 2010).

The current study has some limitations. First, the small number of participants and the fact they came from a single province limit the possibility of generalizing results to the entire national population. In addition, some factors that could have had an impact were not taken into account. For instance, the motivational level of pupils could largely influence the improvement of motor skills after an intervention (Harter, 1978).

Despite these limitations, our study has highlighted the relationship between athletic competence beliefs and the improvement of coordinative motor skills, particularly in a structured physical activity training. Furthermore, this study focused on athletic competence beliefs, which seems to be as essential as the actual motor competence.

Finally, physical activity trainings, tailored to children's beliefs, should include individualized activities according to the children's needs. All children should have the opportunity to reach the minimum standard of learning usually provided with primary school programs in western countries. At the same time, the trainers should provide "recovery" activities for children with lower beliefs, who also have low levels of motor skills, and at the same time allow children with higher beliefs to further increase their competence with "reinforcing" activities. This is important in order to make physical activity trainings the most effective for the physical and psychological wellbeing of children.

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