



A motor creativity intervention in the Greek early childhood education settings: Effects on beliefs about health

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ABSTRACT: Motor creativity has been positively associated with preschool children learning. The present study was set out to develop a motor creativity intervention using healthy lifestyle stimuli and test its efficacy in enhancing preschool children's knowledge about health and changing their attitudes towards healthy nutrition and exercise. In Study 1, 101 preschool children were assigned into control and experimental groups. Children performed the Thinking Creatively in Action and Movement (TCAM) to measure motor creativity. The results of the repeated measures analysis of variance showed a significant increase in all dimensions of motor creativity in the experimental group. In Study 2, 138 preschool children were assigned into control and experimental groups. Children performed the TCAM, and completed the Health Lifestyle Evaluation Instrument and measures of attitudes towards healthy nutrition and exercise. The analysis of variance with repeated measures revealed a significant increase of knowledge towards health in the experimental group, but non-significant differences between the groups in the attitudes towards healthy nutrition and exercise. The findings provide valuable information about the effect of motor creativity in the learning process in kindergarten schools.

Keywords: fluency, imagination, originality, health, preschool children, motor creativity

Introduction

In modern western societies most children living in urban areas lack of free spaces and opportunities for motor play and are overprotected by their parents (e.g., driven to school, playing mostly indoors; Rosin, 2014). Together with their limited opportunities for movement and physical activities, children's increasing involvement with Information Communication Technologies (ICT) result in their becoming inactive, in increased screen time (television, tablet, computer, smartphone, etc.) and in reduced creativity (Underdown, 2007).

However, physical activity is essential for the normal growth and development of young children (Sutterby, 2009). Especially in early childhood, learning through using own body and movement is considered an integral part of children's learning (Grammatikopoulos, Gregoriadis, & Zachopoulou, 2012a). Recent research findings showed that early learning is largely based on motor development since children comprehend the concepts more easily when they are physically experienced (Promislow, 2005). Thus, physical education in early childhood constitutes an ideal field for developing a healthier lifestyle and adopting positive attitudes towards exercise and movement (Van Cauwenberghe, Labarque, Gubbels, De Bourdeaudhuij, & Cardon, 2012). It also has the potential to bridge the gap between children's need for motor play and creative expression and the more formal approaches to learning seen in schools (Wood & Attfield, 2005).

Motor development and creativity of young children are two interrelated development procedures, especially during the first years of children's lives (Runco, 2007). In 1981, Vygotsky (1981) suggested that the establishment of motor development affects creativity and that one procedure can be developed through the other. Learning is considered to be more effective when young children attempt to give meaning to something through experimentation, raising questions and searching for solutions (Klein, 1990). A representative result of these two developmental areas is motor creativity, which can be described as the children's effort to produce movements that provide solutions to motor problems (Zachopoulou, 2007). In addition, several research findings attest to the direct association between motor creativity and creative thinking (e.g. Cleland, & Gallahue, 1993; McBride, 1991). Perhaps this is the reason why many experts describe activities that combine movement and creativity as the safest route for empowering children's motivation or changing attitudes or lifestyle (Cleland & Gallahue, 1993).

Promoting healthy lifestyles in preschool education through physical education

Despite the fact that the first years of a child's life are considered to be a milestone for the systematic promotion and adoption of a healthy lifestyle (Grammatikopoulos, Gregoriadis, & Zachopoulou, 2012b), most efforts to prevent childhood obesity and to introduce healthier ways of life were, until recently, focused largely on school-aged children (de Bourdeaudhuij et al., 2011). It is only the last years that educational researchers and health professionals seem to shift their attention to younger children (Vidoni & Ignico, 2011) because of the continuing prevalence of obesity and the developed significance of early childhood. Goldfield, Harvey, Grattan, & Adamo (2012) highlight that habits like healthy dietary and exercise are more easily adopted during preschool but become more difficult to be adopted, as children grow older.

In addition, unhealthy lifestyle issues, such as physical inactivity and unhealthy nutrition, are becoming a critical public health challenge with harmful and long-lasting consequences for children themselves, their families, and the communities (WHO, 2011). For instance, in the context of a global childhood obesity epidemic, even among preschool children, the importance of physical activity programs and interventions is gaining increasing attention regarding their possible contribution to reduce the prevalence of childhood obesity (Timmons, Naylor, & Pfeiffer, 2007).

Recent literature acknowledges that physical education programs have been associated with improvements in numerous physiological and psychological variables, like for example children's social skills (Hunter, 2006), moral development (Hellison & Martinek, 2006), motor development (Apache, 2005) and creative thinking (Zachopoulou, 2007). Moreover, research evidence suggests that physical education programs can contribute significantly towards the formation of positive attitudes for a more active lifestyle (e.g., Goldfield et al., 2012).

From an educational intervention perspective, research informs us that the most effective programs are those that do not only target at the development of children's specific skills, but those that aim at enriching children's awareness towards an issue (Byrne & Hills, 2007). For instance, Goldfield et al. (2012) mention that when attempting to address childhood obesity, more attention should be placed on changing the attitudes and behaviors of children that result to overweight rather than just providing ample opportunities for physical activities. Importantly, the attitude-behavior association is stronger when participants form their attitude on the basis of behavior-relevant information and when they have constant access to these behaviors (Glasman &

Albarracin, 2006). When teachers organize and provide a classroom environment that encourages physical activity and provides activities with explanations of consequences and reflection, they may have a direct influence on the child. Adults can also influence children indirectly through systematic modeling of physical activity participation (Grammatikopoulos, et al., 2012b; Yeung & Hills, 2007).

Taras (2005) describes that among the wide range of factors that influence the lifestyle of a child, nutrition and dietary practices are considered as some of the most important. Other studies (Leslie et al., 1999; Parizkova & Hills, 2005) showed that attempts to increase physical activity levels in young children are more effective when occurring in parallel with the development of strategies and approaches to reduce inactive behaviors and to improve the diet style and nutrition. In addition, O'Dea (2003) found that promoting physical activity levels is associated with children's dietary practices. An older school-based intervention study also displayed a positive association between physical activity and healthful diet of children in primary school (Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hara, 1991).

Finally, in a systematic review regarding the effectiveness of interventions to promote physical activity, van Sluijs, McMinn, and Griffin (2007) found that multicomponent interventions that included various dimensions of a healthy lifestyle (e.g. child's attitude, level of physical activity at school, family involvement) have the potential to make an important difference to children's lifestyles. Addressing this need, in a kindergarten-based, family-involved intervention called ToyBoX, Manios et al. (2012) focused on the promotion of water consumption, healthy snacking, physical activity and the reduction of sedentary time in children's lives. This intervention, that used mostly in-class activities, provided a better insight on preschoolers' obesity related behaviors and identified some effective strategies for its prevention (Manios et al., 2014). In another early childhood intervention program called ESPEC (Zachopoulou, 2010) physical activities were used to help children to adopt a healthier and active lifestyle. The philosophy of this project drew upon the value of movement in preschooler's life and perceived movement as an essential learning tool for this age group. ESPEC showed that by using movement activities, children became more aware of the main components of a healthy lifestyle.

Moreover, a review of school-based interventions (de Bourdeaudhuij et al., 2011) summarized the evidence from eleven intervention studies that combined nutrition and physical activity approaches and targeted primary school-aged groups mainly. The results of this review suggested that the combination of educational and environmental components that focus on both sides of the energy balance provide better effects. This review also revealed a gap in the school-based interventions that aim at preventing or reducing obesity. Historically, the majority of interventions that attempted to prevent

children's obesity focused either on nutrition or physical activity separately with relatively low to modest impact on children's behavior (Wammes, Breedveld, Looman, & Brug, 2005). Only a few interventions took under consideration the overall obesogenic environment and tried to promote a healthy lifestyle related to physical activity and nutrition together (Brown & Summerbell, 2009). But even these interventions that focused on both physical activity and nutrition and attempted to change individual-level behavioral determinants such as increasing awareness, didn't take into account that motor creativity could be the ideal path to influence or change a child's behavior.

Young children have a natural predisposition and enthusiasm to participate in movement activities and physically active play and also have an unlimited amount of creative potential and motivation for problem solving. Under this perspective, motor creativity could function as a powerful vehicle when trying to motivate children or influence their attitudes, something that no intervention, to the best of our knowledge, has utilized so far. This is also the reason why the intervention program described in the current study used motor creativity as the basic vehicle through which an effort was made to improve young children's dietary practices.

The present study

The purpose of this study was to investigate the impact of a motor creativity intervention that was implemented in the Greek early childhood education focusing at children's awareness for a healthier lifestyle. More specifically, the aim of this study is to test the efficacy of a motor creativity intervention integrating aspects of healthy lifestyle, such as nutrition and exercise, to preschool age children aiming to improve their knowledge and attitudes towards healthy lifestyle. Based on the above mentioned literature review motor development can assist preschool children's learning and attitude formation (Zachopoulou, 2010). Motor creativity has been proliferated as a powerful tool in empowering children's motivation or changing attitudes or lifestyle (Cleland & Gallahue, 1993). Therefore, it was hypothesized that a motor creativity intervention would enhance knowledge towards health and develop positive attitudes towards healthy nutrition and physical activity participation.

Study 1

Earlier motor creativity interventions have relied solely on motor activities. In the present study, the motor creativity intervention employed incorporated motor activities in

relation to healthy lifestyle. A primary objective of the study was to verify that such an intervention would increase children's motor creativity. It was hypothesized that the use of nutrition- and exercise-related stimuli in the intervention will increase the efficacy of the motor skills used and that the intervention will positively influence children's motor creativity.

Method in Study 1

Sample

In this study 101 pre-school children participated ($M_{age} = 4.71$ $SD = .47$, 52 females). A power analysis revealed that this sample size is sufficient to test the objectives of the study (power = 0.99). Children were attending typical public kindergarten schools in Thessaloniki, an urban city in Northern Greece. The kindergarten schools were selected through a stratified sampling approach. Lists of all kindergarten schools were obtained from the regional educational authorities. Initially, two areas of the city were selected and then one school in each area. Principals of the selected schools were approached and informed about the purpose and the procedures of the study. All schools participated in the present study were having mixed age classes (age range from 4 to 6).

Measures

For the evaluation of children's motor creativity, this study used the adapted Greek version (Zachopoulou, Makri, & Pollatou, 2009) of the Thinking Creatively in Action and Movement (TCAM; Torrance, 1981). The test includes four activities measuring three dimensions of motor creativity. The first, third and fourth activities measure fluency and originality, whereas the second activity measures imagination. This test was preferred over others due to its prior adaptation and use with Greek preschool children.

In the first activity the stem question was 'How many ways?' and the experimenter asks the child to run or walk across the room in as many ways as he/she can come up with. In the second activity the stem question was 'Can you move like?' presents to the child six pretend situations; in the four of them the researcher asked the child to move pretending a certain animal or object (tree, rabbit, fish and snake) whereas in the remaining two the child is engaged in roles related to other behaviors (driving a car and pushing an elephant off a desired object). In the third activity the stem question was 'What other ways?' and the experimenter asked the child to demonstrate all the ways he/she can come up with in order to put a paper cup in a trashcan. In the fourth activity the stem question was 'What might it be?' and the task the child is asked to do is to play with and find different uses of a paper cup.

The scoring of the motor creativity dimensions was based on Torrance (1981) recommendations and prior use of the test in Greece (Zachopoulou et al., 2009). The sum of the different responses recorded on score sheets in the first, third and fourth activities provided the index of Fluency. Originality was calculated via the comparison of participants' responses with the tests' norms of the most frequent responses provided by Torrance (1981). Imagination scores were estimated with a five-point scale ranging from 1 (no movement) to 5 (excellent imitation).

Experimental design

Schools were randomly assigned into control and experimental groups. The school was used as the unit of assignment in order to avoid a distortion of data caused by the interaction among children in different classes of the same school belonging into different groups. Thus, one kindergarten school served as the experimental school and the other one as the control group. The experimental group consisted of 39 children (Mage = 4.69, SD = .46, 19 females), whereas the control group of 62 children (Mage = 4.72, SD = .48, 33 females). Children in the schools of the experimental condition participated in physical education lessons with the motor creativity intervention. The intervention included 20 lessons. Each lesson lasted 35-40 minutes and was implemented by trained personnel. This approach was preferred as the teachers were not familiar with motor skill development practices and the promotion of motor creativity. Each lesson included seven exercises of approximate duration of 5-6 minutes each.

All exercises were designed to improve children's motor creativity. In each lesson four exercises included stimuli related to nutrition and exercise. For instance, children were asked to find different ways to maintain balance using two body limbs (knowledge of body), find different ways to balance a balloon on their body while moving (motor coordination), dramatize a story taking place in a garden with fruits and vegetables as key roles (knowledge about fruits and vegetables), and resemble the imaginary movement of healthy and unhealthy foods (motor coordination). Children in the schools of the control condition attended the typical physical education lesson that last also 35-40 minutes and includes physical activities and plays typically used in physical education lessons. These lessons can usually be described as relatively teacher-centered lessons that follow the general guidelines of the Greek ECE curriculum and include both command and practice styles (Mosston & Ashworth, 2008). The implementation of the intervention took place the spring semester of the academic year 2012–2013.

Procedure

The study design is in line with the Code of Ethics in Research of the Aristotle University of Thessaloniki. Permission from the Ministry of Education, Research and Religious Affairs was obtained to conduct the study. School principals and educators of the selected schools were informed about the purpose and procedures of the study and agreed to participate. School principals in the intervention condition informed the parents about the implementation of an innovative approach in teaching physical education and requested consent for their children to participate in the intervention. All parents provided consent. In the control condition, school principals informed parents that their school was selected to participate in a study about motor creativity and beliefs about healthy lifestyle and requested consent for participation of the children in the test. All parents provided consent.

The administration of the TCAM test followed the standardized test instructions (Torrance, 1981). Children were tested individually, in the multi-purpose room of the kindergarten school. The investigator and an assistant trained in implementing the test were present during all testing. None of them was informed about the group where the children had been assigned to. According to Zachopoulou et al. (2009), the investigator demonstrated each skill once, and provided standardized verbal instructions to each child. Children were encouraged to give maximum effort. Children's performance was recorded in a sheet by both the investigator and the assistant. The score sheets were compared at the end of the first measurement and demonstrated adequate inter-rater reliability (.88 for Fluency, .91 for Originality and .90 for Imagination). Children in both control and experimental groups performed the test before and immediately after the intervention. The test administered in a similar way in all measurement points in both groups.

Results in Study 1

Descriptive statistics

Means and standard deviations of the motor creativity dimensions in the total sample, the two groups are shown in Table 1.

TABLE 1 Means and standard deviations of the motor creativity dimensions in Study 1

	Total sample		Control group		Experimental group	
	M	SD	M	SD	M	SD
Fluency_pre	78.18	7.84	76.88	7.21	80.20	8.43
Originality_pre	76.17	24.97	74.31	25.48	79.07	24.18
Imagination_pre	92.79	17.32	90.42	18.18	96.48	15.38
Fluency_post	89.02	17.03	78.01	5.943	105.68	14.63
Originality_post	94.89	22.09	81.72	11.99	114.80	18.72
Imagination_post	102.19	16.61	93.40	14.00	115.48	10.19

Effect of the intervention on motor creativity

An analysis of variance with repeated measures on time was used to test for the effects of the intervention on the dimensions of motor creativity. With respect to Fluency, the results of the analysis indicated a significant group by time interaction, $F(1,97) = 158.96$, $p < .001$, $\eta^2 = .62$. Post hoc analyses revealed that scores in the control group remained stable across the pre- and post intervention measurement points ($M = 76.88$ and $M = 78.01$ respectively), whereas in the intervention group Fluency significantly increased in the post-intervention measurement ($M = 105.68$) as compared to the pre-intervention measurement ($M = 80.20$). Similar findings emerged for Originality. The analysis of variance with repeated measures on time revealed a significant group by time interaction, $F(1,97) = 31.53$, $p < .001$, $\eta^2 = .24$. The post hoc analyses indicated a significant increase on the scores of Originality at the intervention group ($M = 79.07$ at pre-intervention and $M = 114.80$ at post-intervention). At the control group a small and non-significant increase was observed ($M = 74.31$ at pre-intervention and $M = 81.72$ at post-intervention). Finally, the results of the analysis of variance with repeated measures on time demonstrated a significant group by time interaction for Imagination, $F(1,97) = 34.19$, $p < .001$, $\eta^2 = .26$. Similarly to the other dimensions of motor creativity, the post hoc analyses showed a significant increase on the scores of Imagination at the intervention group from pre- ($M =$

96.48) to post-intervention ($M = 115.48$). In the control group, scores of Imagination increased from pre- ($M = 90.42$) to post-intervention ($M = 93.40$) but not statistically significantly (Figure 1).

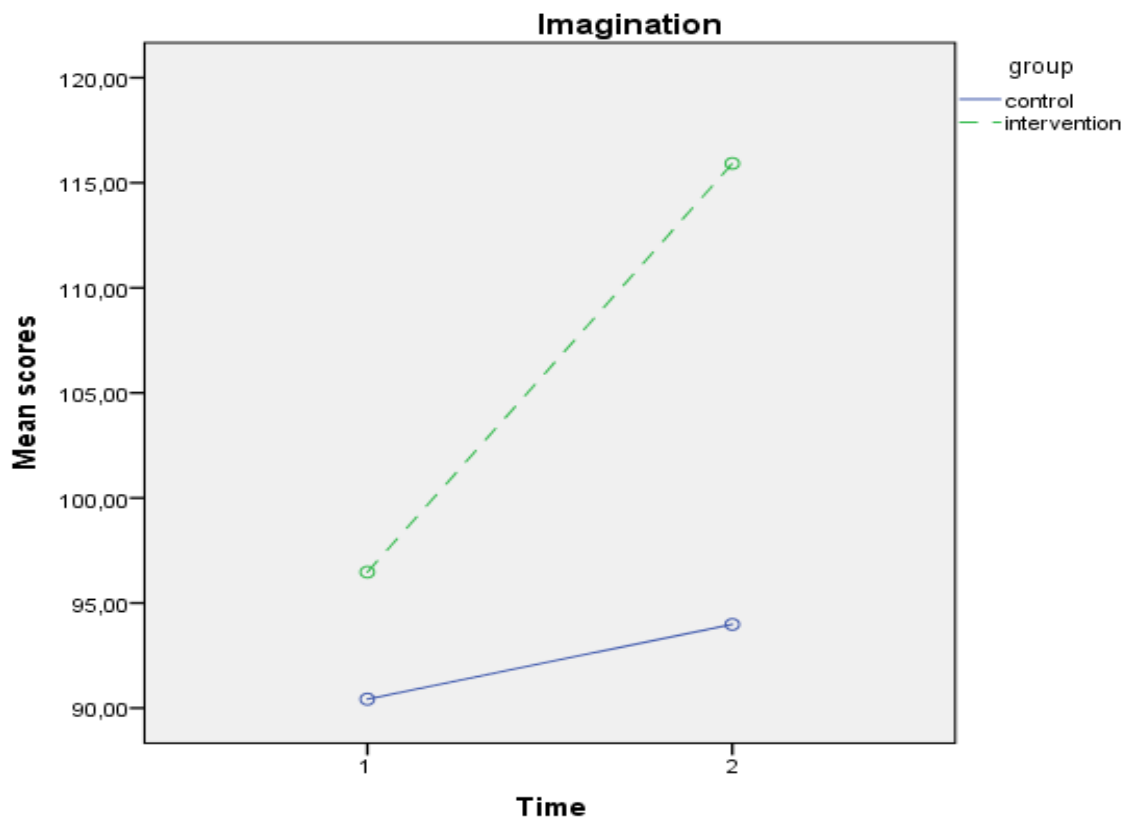


FIGURE 1 Interaction effects of the motor creativity dimensions in the intervention group and the control group

Study 2

Having established that a motor creativity intervention including healthy lifestyle stimuli can increase motor creativity, the second study investigated the effect of such an intervention on knowledge towards health, and attitudes towards healthy nutrition and exercise.

Method in Study 2

Sample

In the second study 138 pre-school children participated ($M_{\text{age}} = 4.78$, $SD = .42$; 69 females). Children were attending typical public kindergarten schools in Thessaloniki, an

urban city in Northern Greece. A similar to study 1 selection process was followed. Initially, three areas of the city were selected and then one school in each area. As in study 1, principals of the selected schools were approached and informed about the purpose and the procedures of the study. One kindergarten school didn't accept participation in the study and was replaced with another one in the same area. All the participating schools had mixed age classes (age range was from 4 to 6) and children were of medium socioeconomic level and representative of the children population of the city.

Measures

Knowledge about healthy lifestyle: The Health Lifestyle Evaluation Instrument (HLEI) developed by Grammatikopoulos et al. (2008) was used to measure children's knowledge about aspects of healthy lifestyle such as exercise and nutrition. The scale consists of 13 items (example item 'Which one of the following foods helps me build stronger bones?'), designed to assess the acquired knowledge of the children about healthy lifestyle. In each item two images were provided with a correct and a false food/behavior. Children were asked to indicate the image that correctly answers the question. A third, 'I don't know', option was also included. Each correct answer was assigned with one point, whereas the false and 'I don't know' answers with zero. The sum of correct answers provided the student's score on knowledge about health. Grammatikopoulos et al. (2008) provided evidence of the psychometric properties of the scale with preschool children.

Attitudes towards healthy lifestyle: This measure included two subscales reflecting aspects of a healthy lifestyle; healthy nutrition and exercise. Each subscale was measured with 2 adjectives (i.e., good-bad, useful-useless, easy-difficult and beneficial-harmful). The positive pole was represented with a happy emoticon and the negative one with an unhappy emoticon. Children were asked to circle the emoticon that best describes their opinion about the presented set of adjectives. Also, a 'Don't know' option was provided with a neutral emoticon. This approach has been used in the past with pre-school children and found effective in matching dimensions of health (healthy, not healthy) to emotional evaluations of health (healthy-good, not healthy-not good) (Privitera, Vogel, & Antonelli, 2013). A summative score was calculated for each variable with a minimum of 4 showing a very negative attitude towards healthy nutrition and exercise, and a maximum of 8 indicating a very positive attitude

Manipulation check: The Torrance TCAM test described in Study 1 was also used in this study to measure whether the intervention actually influenced children's motor creativity.

Experimental design

A similar to Study 1 procedure was used in this study to allocate the schools in the intervention and control conditions. The intervention group consisted 76 children (M = 4.84, SD = .36; 36 females), whereas the control group 62 children (M = 4.724, SD = .48; 33 females). The intervention included the 20 lessons described in Study 1 and was implemented in a similar way (i.e., same duration of lesson, implemented by trained personnel etc.). Several of the activities included in the lessons were altered and the organization of the activities was improved based on the experience gained from the application of the intervention in Study 1 and the feedback from the kindergarten teachers.

Procedure

Likewise in study 1, the study design conformed with the Code of Ethics in Research of the Aristotle University of Thessaloniki and permissions were obtained from the Ministry of Education, Research and Religious Affairs, school principals, educators of the selected schools and parents of the participating children. After obtaining the consent forms, the researchers checked the curricula and the plan with the scheduled to teach topics to ensure that no topics related to nutrition and physical activity would be taught prior or during the implementation of the intervention.

Trained personnel conducted the first measurement of motor creativity, knowledge about health, and attitudes towards healthy lifestyle. Data collection occurred in an adjacent room of the kindergarten school. The administration of TCAM was identical to Study 1. With respect to knowledge about health, and attitudes towards healthy lifestyle the investigator was reading the item and response options to the children and recorded their response on the score sheet. The procedure lasted approximately 35 minutes per child. In the next phase of the intervention the 20 lessons of the intervention were implemented. The intervention took place in the fall semester of the academic year 2013–2014 and lasted approximately 2 ½ months. Immediately after the intervention the second measurement of the tested variables occurred. The same procedure was followed for the schools in the control condition where the first and second measurements were performed in the fall semester with a time gap of 2 ½ months. The administration of the tests was identical in all measurement points in both groups.

Results in Study 2

Descriptive statistics – manipulation check

Means and standard deviations of the study's variables are shown in Table 2. The correlations among the study's variables are presented in Table 3. The effect of the intervention on motor creativity was tested via an analysis of variance with repeated measures on time. The results of the analysis indicated a statistical significant group by time interaction for all motor creativity dimension; Fluency, $F(1,131) = 58.35$, $p < .001$, $\eta^2 = .30$, Originality, $F(1,131) = 18.86$, $p < .001$, $\eta^2 = .12$, and Imagination, $F(1,131) = 26.01$, $p < .001$, $\eta^2 = .16$. In all dimensions, motor creativity was increased in the intervention group at the post-intervention measurement, whereas it remained unaffected in the control group (see Table 2).

TABLE 2 Descriptive statistics of Study 2 variables

	Total sample		Control group		Experimental group	
	M	SD	M	SD	M	SD
Fluency_pre	81.31	12.06	76.88	7.213	84.86	13.90
Originality_pre	79.38	25.06	74.31	25.48	83.46	24.12
Imagination_pre	94.81	17.15	90.42	18.18	98.34	15.50
Nutr_attitudes_pre	5.01	1.70	5.01	1.75	5.01	1.68
PE_attitudes_pre	4.87	1.47	4.89	1.39	4.85	1.54
Health knowledge_pre	9.69	2.04	9.44	2.10	9.91	1.97
Fluency_post	92.21	17.24	78.01	5.94	103.94	14.45
Originality_post	97.59	21.03	81.72	11.99	110.72	17.56
Imagination_post	104.48	16.22	93.40	14.00	113.64	11.58
Nutr_attitudes_post	4.33	1.00	4.11	.45	4.52	1.29
PA_attitudes_post	4.14	.57	4.00	.36	4.27	.68
Health knowledge_post	12.00	1.74	11.07	1.55	12.79	1.50

Note: Nutr_attitudes= attitudes towards healthy nutrition; PA_attitudes = attitudes towards exercise

TABLE 3 Correlations among the Study 2 variables

	2	3	4	5	6	7	8	9	10	11	12
1 Fluency_pre	.56**	.50**	.27**	.32**	.30**	.43**	.39**	.39**	-.12	-.06	.19*
2 Originality pre		.50**	.16	.17*	.25**	.36**	.30**	.37**	-.10	-.06	.23**
3 Imagination pre			.15	.10	.38**	.42**	.35**	.63**	-.03	.03	.26**
4 Nutrition attitudes_pre				.60**	.29**	.01	.03	.03	.11	.15	.04
5 PE_attitudes pre					.39**	.04	.02	.04	.12	.12	.16
6 Health knowledge_pre						.13	.11	.14	.12	.07	.46**
7 Fluency_post							.90**	.73**	-.19*	-.10	.16
8 Originality post								.64**	-.19*	-.11	.19*
9 Imagination post									-.10	-.02	.09
10 Nutrition attitudes_post										.56**	.19*
11 PA_attitudes post											.04
12 Health knowledge_post											

Note: Nutrition attitudes= attitudes towards healthy nutrition; PA_attitudes = attitudes towards exercise; * = $p < .01$; ** = $p < .001$

Effect of the intervention on the knowledge and attitudes towards healthy lifestyle

An analysis of variance with repeated measures on time was used to test for the effects of the intervention on knowledge and attitudes towards healthier lifestyle. With respect to health knowledge, the results of the analysis indicated a significant group by time interaction, $F(1,121) = 9.96$, $p < .001$, $\eta^2 = .07$. Post hoc analyses revealed that scores in the control group increased from the pre- to post intervention measurement points ($M = 9.44$ and $M = 11.07$ respectively), but the increase in the scores of the intervention group were statistically significantly larger in the post-intervention measurement ($M = 12.79$) as compared to the pre-intervention measurement ($M = 9.91$) (Figure 2).

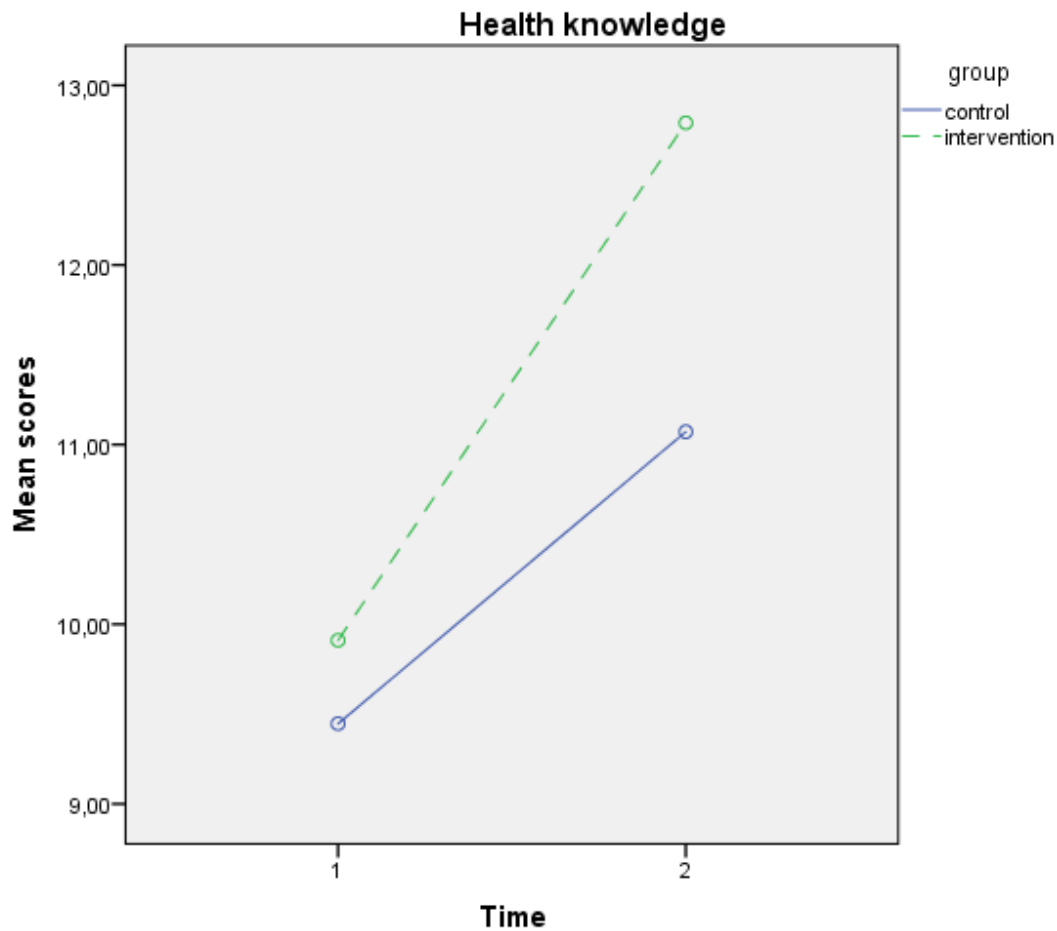


FIGURE 2 Interaction effects of health knowledge in the intervention group and the control group

As for the attitudes towards healthy nutrition, the results of the analyses didn't indicate a significant group by time interaction $F(1,120) = .83, p > .05, \eta^2 = .007$. A significant main effect on time emerged, $F(1,120) = 17.32, p < .001, \eta^2 = .12$, indicating a decrease of sample's scores from pre- to post-intervention measurement points ($M = 5.01$ and $M = 4.33$ respectively). No significant main effect on group emerged. Similar findings emerged for attitudes towards exercise. The results of the repeated measures analysis of variance didn't show a significant group by time interaction, $F(1,120) = .47, p > .05, \eta^2 = .004$, but a significant main effect on time, $F(1,120) = 23.26, p < .001, \eta^2 = .16$. Again, a decrease of sample's scores from pre- to post-intervention measurement points ($M = 4.87$ and $M = 4.14$ respectively) was found. No significant main effect on group emerged.

Discussion

The aim of Study 2 was to investigate the impact of a motor creativity intervention in promoting knowledge about health and changing preschool children's attitudes towards a healthy nutrition and exercise. The results of the analyses confirmed that the intervention was effective in developing children's motor creativity. In addition, the intervention increased children's knowledge about health. However, no significant changes were shown for children's attitudes either towards healthy nutrition or exercise.

As in Study 1, an intervention using healthy lifestyle stimuli seemed to influence significantly children's motor creativity. Such findings imply that motor creativity can be developed through posing problems and encouraging problem solving, and providing opportunities for discovery and making interpretations and discovering new things. This can be achieved independently of the type of stimuli provided during practice.

Moreover, the intervention was effective in increasing children's knowledge about health. This corroborates with previous evidence suggesting that playful activities can promote the learning process in preschool education (Kangas, 2010). Children's learning through playful activities can stimulate several abilities, such as fantasy, empathy, communication, symbolic thinking as well as collaboration and problem-solving (Pramling Samuelsson, & Johansson, 2006). Furthermore, the study's findings support previous evidence indicating that interventions, jointly addressing exercise and healthy nutrition, are effective in promoting healthy lifestyle in preschool children (de Bourdeaudhuij et al., 2011; Leslie et al., 1999; Parizkova & Hills, 2005; van Sluijs et al., 2007).

It is also important to note that this result was achieved through an intervention based on the development of motor creativity. Past evidence and theorizing has shown that motor creativity is associated with improved creative thinking and learning (Cleland & Gallahue, 1993; Klein, 1990; McBride, 1991; Vygotsky, 1981; Zachopoulou, 2007). This notion was supported in the present study and provides evidence that motor creativity may promote learning in several curricular areas. For instance, motor creativity activities including stimuli related to environment may effectively increase knowledge on this school curricular area. Thus, it is suggested that kindergarten teachers incorporate playful activities promoting motor creativity in their daily regimes (Pramling Samuelsson, & Johansson, 2006).

With respect to children's attitudes, the intervention was not effective in promoting more positive attitudes towards healthy nutrition or exercise. According to Goldfield et al. (2012) changing attitudes is an important step towards changing behavior. Playful physical activities have been proven effective in the past in developing positive attitudes

towards exercise in the past (Digelidis, Papaioannou, Laparidis, & Christodoulidis, 2003). Therefore, it was expected that an intervention program including playful and motor creative activities would enhance children's positive attitudes towards exercise and healthy nutrition. However, this was not supported in the present study. A plausible explanation may lie on the short duration of the intervention. The intervention lasted approx. 10 weeks including two hours per week. Hence, it is possible that the intervention wasn't dense enough to produce changes in children's attitudes. This is also corroborated by the fact that in kindergarten schools physical education and nutrition-related projects are inherent parts of the school curriculum. Hence, children were already familiar with playful physical activities and information about healthy nutrition. In this respect, a longer duration of the intervention (i.e., a yearlong implementation) might have been more effective in influencing children's attitudes.

Other possible interpretations for the lack of attitude change may lie on the school curriculum and the measurement of attitudes. In kindergarten schools the curriculum allows to some extent teachers to include physical education units and projects towards promoting healthy nutrition. Thus, it is possible that the teachers of the sample had implemented in the past such activities. This might have resulted in children being familiar with these behaviors and already develop positive attitudes towards exercise and healthy nutrition. In addition, attitudes were measured via a two-response option scale providing the two poles of the adjective at hand (i.e., good-bad). This scale might have forced children to report the one pole closer to their evaluation and may be wasn't big enough to allow for greater variability in children's responses. That is, this measure could identify a child with a negative attitude towards exercise, for instance, who developed a positive evaluation towards this activity. Hence, this response options may haven't been sensitive enough to capture low to moderate changes in children's attitudes.

The study is not free of limitations. First of all, the curricula of the schools in the control group haven't been systematically observed. Although a thorough discussion with the principal and the teachers was made to ensure that they won't implement any activities not planned promoting healthy nutrition or exercise, the research team didn't systematically observe the learning process in these schools. In addition to this, there was no detailed recording of any school activities related to healthy lifestyle before the implementation of the intervention (or the first measurement in control schools).

Future studies should address this issue by keeping diaries of the school activities throughout the school year in order to identify the potential influence of school activities to the tested variables. In addition, a two-option semantic differentiation scale was used to measure attitudes. This decision was made in order to ensure that preschool children would be able to clearly differentiate the two poles of each adjective. However, this limits

the variability in children's responses. Following studies should investigate the effectiveness of measures with bigger response range. Despite these limitations, this study is among the few that have implemented a motor creativity intervention aiming at increasing knowledge on a specific school topic and changing preschool children attitudes towards exercise and healthy nutrition. The results of the study support the use of playful and creative activities as a mean to improve the learning process. Preschool teachers should include such activities in their teaching regimes, as they seem to be effective in teaching curricular areas other than motor skill development.

References

- Apache, R. R. G. (2005). Activity-based intervention in motor skill development. *Perceptual and Motor Skills*, 100(3 Pt 2), 1011–1020.
- Brown, T., & Summerbell, C. (2009). Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obesity Reviews*, 10(1), 110–141.
- Byrne, N. M., & Hills, A. P. (2007). The importance of physical activity in the growth and development of children. In A. P. Hills, N. A. King and N. M. Byrne (Eds.), *Children, obesity and exercise. Prevention, treatment and management of childhood and adolescent obesity* (pp. 50–60). London: Routledge.
- Cleland, F. E., & Gallahue, D. L. (1993). Young children's divergent movement ability. *Perceptual and Motor Skills*, 77(2), 535–544.
- deBourdeaudhuij, I., van Cauwenberger, E., Spittaels, H., Opper, J-M., Rostami, C., Brug, J., van Lenthe, F., Lobstein, T., & Maes, L. (2011). School-based interventions promoting both physical activity and healthy eating in Europe: a systematic review within the HOPE project. *Obesity Reviews*, 12(3), 205–216.
- Digelidis, N., Papaioannou, A., Lapidis, K., and Christodoulidis, T. (2003). A one-year intervention in 7th grade physical education classes aiming to change motivational climate and attitudes towards exercise. *Psychology of Sport and Exercise*, 4(3), 195–210.
- Van Cauwenberghe, E., Labarque, V., Gubbels, J., De Bourdeaudhuij, I., & Cardon, G. (2012). Preschooler's physical activity levels and associations with lesson context, teacher's behaviour, and environment during preschool physical education. *Early Childhood Research Quarterly*, 27(2), 221–230.
- Glassman, L. R., & Albarracing, D. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude behavior relation. *Psychological Bulletin*, 132(5), 778–882.
- Goldfield, G. S., Harvey, A., Grattan, K., & Adamo, K. B. (2012). Physical activity promotion in the preschool years: A critical period to intervene. *International Journal of Environmental Research and Public Health*, 9(4), 1326–1342.

- Grammatikopoulos, V., Gregoriadis, A., & Zachopoulou, E. (2012a). Acknowledging the role of motor domain in creativity in early childhood education. In O. N. Saracho (Ed.), *Contemporary perspectives on research in creativity in early childhood education* (pp. 159–176). Charlotte, NC: Information Age Publishing.
- Grammatikopoulos, V., Gregoriadis, A., & Zachopoulou, E. (2012b). Improving children's attitudes and awareness toward a healthy lifestyle in early childhood: A five-European country intervention program. In J.A. Sutterby (ed.), *Early Education in a Global Context. Advances in Early Education and Day Care*, 16, (pp. 109–126). Emerald Group Publishing Limited.
- Grammatikopoulos, V., Konstantinidou, E., Tsigilis, N., Zachopoulou, E., Tsangaridou, N., & Liukkonen, J. (2008). Evaluating preschool children knowledge about healthy lifestyle: Preliminary examination of the healthy lifestyle evaluation instrument. *Educational Research and Review*, 3(11), 351–352.
- Hellison, D., & Martinek, T. (2006). Social and individual responsibility programs. In: D. Kirk, D. Macdonald, and M. O'Sullivan (Eds.), *The Handbook of Physical Education* (pp. 610–626). London: Sage Publications.
- Hunter, L. (2006). Research into elementary physical education programs. In D. Kirk, D. Macdonald, and M. O'Sullivan (Eds.), *The Handbook of Physical Education*, (pp. 580–595). London: Sage Publications.
- Kangas, M. (2010). Creative and playful learning: Learning through game co-creation and games in a playful learning environment. *Thinking Skills and Creativity*, 5(1), 1–15.
- Klein, J. (1990). Young children and learning. In W. J. Stinson (Ed.), *Moving and learning for the young children* (pp. 23-30). Reston, VA: American Alliance for Health, Physical Education, Recreation and Dance.
- Leslie, J., Yancy, A., McCarthy, W., Albert, S., Wert, C., Miles, O., & James, J. (1999). Development and implementation of a school-based nutrition and fitness promotion program for ethnically diverse middle-school girls. *Journal of American Dietetic Association*, 99(8), 967–970.
- Manios, Y., Grammatikaki, E., Androutsos, O., Chinapaw, M. J., Gibson, E. L., & Buijs, G., ... ToyBox-study group. (2012). A systematic approach for the development of a kindergarten-based intervention for the prevention of obesity in preschool age children: The ToyBox-study. *Obesity Reviews*, 13(s1), 3–12.
- Manios, Y., Androutsos, O., Katsarou, C., Iotova, V., Socha, P., Geyer, C., Moreno, L., Koletzko, B., & de Bourdeaudhuij, I., on behalf of the ToyBox-study group (2014). Designing and implementing a kindergarten-based family-involved intervention to prevent obesity in early childhood: the ToyBox-study. *Obesity Reviews*, 15 (s3), 5–13.
- McBride, R. E. (1991). Critical thinking - An overview with implications for physical education. *Journal of Teaching in Physical Education*, 11(2), 112–125.
- O'Dea, J. A. (2003). Why do kids eat healthful food? Perceived benefits of and barriers to healthful eating and physical activity among children and adolescents. *Journal of the American Dietetic Association*, 103(4), 497–501.
- Parizkova, J., & Hills, A. P. (2005). *Childhood obesity: Prevention and management* (2nd ed.). Boca Raton, FL: CRC Press.

- Pramling Samuelsson, I., & Johansson, E. (2006). Play and learning—inseparable dimensions in preschool practice. *Early Child Development and Care*, 176(1), 47–65.
- Privitera, G. J., Vogel, S. I., and Antonelli, D. E. (2013). Performance on a food health assessment using emoticons with pre-literacy-aged children. *American Journal of Educational Research*, 1(3), 110–114.
- Promislow, S. (2005). *Making the brain–body connection*. Vancouver, BC: Enhanced Learning and Integration.
- Rosin H. (2014). The overprotected kid. *The Atlantic*, 19.(March 2014), Retrieved on February 10, 2017 from <https://www.theatlantic.com/magazine/archive/2014/04/hey-parents-leave-those-kids-alone/358631/>
- Runco, M. A. (2007). *Creativity, theories and themes: Research, development, and practice*. Burlington, MA: Elsevier Academic Press.
- Simons-Morton, B. G., Parcel, G. S., Baranowski, T., Forthofer, R., & O'Hara, N. M. (1991). Promoting physical activity and a healthful diet among children: results of a school-based intervention study. *American Journal of Public Health*, 81(8), 986–991.
- Sutterby, J. (2009). What kids don't get to do anymore and why? *Childhood Education*, 85(5), 289–292.
- Taras, N. (2005). Nutrition and student performance at school. *Journal of School Health*, 75(6), 199–213.
- Timmons, B. W., Naylor, P.-J., & Pfeiffer, K. A. (2007). Physical activity for preschool children-how much and how? *Applied Physiology, Nutrition and Metabolism*, 32(Suppl. 2E), 122–134.
- Torrance, E. P. (1981). Empirical validation of criterion-referenced indicators of creative ability through a longitudinal study. *Creative Child & Adult Quarterly*, 6(3), 136–140.
- Underdown, A. (2007). *Young children's health and well-being*. New York, NY: Open University Press.
- Van Sluijs, E. M. F., McMinn, A. M., & Griffin, S. J. (2007). Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. *British Medical Journal*, 335(6), 703–707.
- Vidoni, C., & Ignico, A. (2011). Promoting physical activity during early childhood. *Early Child Development and Care*, 181(9), 1261–1269.
- Vygotsky, L.S. (1981). The genesis of higher mental functions. In J. V. Wersch (Ed. and Trans.). *The concept of activity in soviet psychology* (pp. 61–80). Armonk: M.E. Sharpe.
- Wammes, B., Breedveld, B., Looman, C., & Brug, J. (2005). The impact of a national mass media campaign in the Netherlands on the prevention of weight gain. *Public Health Nutrition*, 8(8), 1250–1257.
- Wood, E., & Attfield, J. (2005). *Play, learning and the early childhood curriculum*. Sage.
- World Health Organization. (2011). *Childhood overweight and obesity. Programmes and projects*. Retrieved on January 13, 2012 from <http://www.who.int/dietphysicalactivity/childhood/en/>

- Yeung, J., & Hills, A. P. (2007). Childhood obesity. In A. P. Hills, N. A. King & N. M. Byrne (Eds.), *Children, obesity and exercise. Prevention, treatment and management of childhood and adolescent obesity* (pp. 1–10). London: Routledge.
- Zachopoulou, E. (2007). Early years physical education. Expression of children's creative thinking through physical education activities. *Bulletin of the International Council of Sport Science and Physical Education (ICSSPE)*, 51, 14–21.
- Zachopoulou, E. (2010). Description of the early steps project. In E. Zachopoulou, J. Liukkonen, I. Pickup and N. Tsangaridou (Eds.), *Early steps physical education curriculum. Theory and practice for children under 8* (pp. 195–202). Champaign, IL: Human Kinetics.
- Zachopoulou, E., Makri, A., & Pollatou, E. (2009). Evaluation of children's creativity: psychometric properties of Torrance's 'Thinking Creatively in Action and Movement' test. *Early Child Development and Care*, 179(3), 317–328.