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Global self-esteem, perceived athletic competence, and physical activity in children: A longitudinal cohort study

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ABSTRACT

Objectives: The Exercise and Self-Esteem Model is used as a theoretical framework to describe associations between global self-esteem and physical activity, mediated by perceived athletic competence. We know little about how these associations develop over time in elementary school children. We examined the change in, and associations between, global self-esteem, perceived athletic competence, and moderate-to-vigorous physical activity (MVPA) in children from kindergarten to grade 4. We also investigated if this change and these associations were different for boys and girls.
Design: A prospective longitudinal cohort-sequential design that consisted of two cohorts of children.
Method: Children in cohort I were followed from kindergarten to grade 2, and children in cohort II were followed from grade 2 to grade 4. Global self-esteem and perceived athletic competence were measured with the Self-Perception Profile for Children (SPPC) ($n = 292$; 148 boys), while MVPA was measured with proxy-reports for physical activity filled in by parents ($n = 184$; 88 boys).
Results: Global self-esteem, perceived athletic competence, and MVPA remained stable. Global self-esteem was the same in boys and girls, while boys reported higher levels of perceived athletic competence and were more physically active than girls. The change in global self-esteem was significantly associated with perceived athletic competence and MVPA in girls, but not in boys.
Conclusion: There are few developmental changes in global self-esteem, perceived athletic competence, and MVPA from kindergarten to grade 4. The change in global self-esteem was associated with perceived athletic competence and MVPA in girls, but not in boys.

Self-perceptions are important determinants of human behavior. A large body of previous research has demonstrated that self-perceptions are multidimensional and hierarchically ordered (see for review Marsh & Shavelson, 1985). Global self-esteem is found at the apex and is considered to be the overall evaluation of self (e.g., Harter, 2006; Marsh, 1990). Global self-esteem is generally regarded as an important index of well-being and mental health (e.g., Paradise & Kernis, 2002; Rosenberg, Schooler, Schoenback, & Rosenberg, 1995). High global self-esteem has been linked to satisfaction and happiness in later life, while low global self-esteem is associated with depression and anxiety (see for review Harter, 1999).

Global self-esteem is influenced by a number of more domain-specific self-perceptions (e.g., Marsh, 1990; Shavelson, Hubner, & Stanton, 1976) that are more predictive for specific behavior (Marsh & O'Mara, 2008). Sonstroem and Morgan (1989) addressed the hierarchical and multidimensional structure of global self-esteem in their Exercise and Self-Esteem Model (EXSEM) by focusing on the physical domain. In the original EXSEM (Sonstroem & Morgan, 1989), a bottom-up process is described in which mastering physical activities positively influences physical self-efficacy that, in turn, leads to an increase in perceived physical competence. This increase in perceived physical competence

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subsequently influences global self-esteem through the mediation of physical acceptance (Sonstroem & Morgan, 1989). However, in the expanded EXSEM (Sonstroem, Harlow, & Josephs, 1994) global self-esteem is influenced by two levels of self-perceptions. The higher, and more global, level is physical self-worth which is influenced by the lower and more specific subdomains: perceived sport competence, perceived attractive body, perceived physical strength, and perceived physical condition (Fox & Corbin, 1989). These subdomains can be further divided into specific self-efficacies that are associated with the actual physical skills, the lowest level of the model (Sonstroem et al., 1994).

The development and stability of global self-esteem

The stability of global self-esteem seems relatively low during early childhood (see for review Trzesniewski, Donnellan, & Robins, 2003). However, the authors based their results on rank-order stability (i.e., test–retest correlations) instead of investigating growth curves. Investigating growth curves provides insight in within-individual changes, while rank-order stability provides insight in between-individual changes. Subsequently, small changes in global self-esteem will result in a stable global self-esteem when using latent growth curves, while (the same) small changes in global self-esteem might result in an (incorrect) unstable global self-esteem when using rank-order stability. To our knowledge, global self-esteem has only been investigated once using latent growth curves in elementary school children (Wigfield & Eccles, 1994). Global self-esteem remained the same between grade 1 and grade 6. The authors argue that this stability is caused by the hierarchical structure of self-perceptions. More specifically, small changes in lower level self-perceptions will not affect the higher-level global self-esteem. Moreover, small changes (i.e., increases) in one lower level self-perception will cancel out small changes (i.e., decreases) in another lower level self-perception, resulting in a fairly stable global self-esteem (Marsh, 1990; Shavelson et al., 1976).

The development and stability of perceived athletic competence

Lower level self-perceptions are more specific and more subjected to developmental changes (Marsh, 1990). One of the lower level self-perceptions is perceived athletic competence, comparable to sport competence as described in the EXSEM. Perceived athletic competence declines during childhood (Cole et al., 2001; Fredricks & Eccles, 2002; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Wigfield et al., 1997). Wigfield et al. (1997) found this decline to be best described by a negative linear trend during elementary school (grade 1 to grade 6). Although already present during elementary school, this decline in perceived athletic competence accelerates in middle school (grade 7 and grade 8) (Fredricks & Eccles, 2002; Jacobs et al., 2002). However, not all research support the above-described pathway of decline. In the study by Cole et al. (2001) perceived athletic competence increased significantly during elementary school, and only dropped noticeably during the transition from elementary school to middle school (grade 6 to grade 7).

Although the starting point of decline in perceived athletic competence differs among existing longitudinal studies, all children had an overly optimistic perceived competence at the beginning of elementary school (e.g., Fredricks & Eccles, 2002; Jacobs et al., 2002). As children grow older, perceived athletic competence declines resulting in a more realistic self-perception. Marsh and Craven (1997) argue that this decline in perceived competence comes from an increase in performance-based feedback children receive from teachers and parents. In addition, as children's cognitive abilities develop, they become more capable of comparing their performance with their peers instead of with their own previous performance (Harter, 2006).

The development and stability of physical activity

There is extensive evidence that children participate less in moderate-to-vigorous physically active (MVPA) as they grow older (e.g., Basterfield et al., 2011; Cleland et al., 2010). Moreover, there is a large number of children in Western society that do not meet recommendations for MVPA (Aznar et al., 2011; Telford et al., 2013), while participation in MVPA is an important component of a healthy lifestyle. Also, participation in MVPA is, besides preventive against obesity, essential for social interaction and life satisfaction (e.g., global self-esteem) (Babiss & Gangwisch, 2009; Biddle & Asare, 2011).

Gender differences

Gender differences in global self-esteem are not yet present during elementary school (Wigfield & Eccles, 1994), but small gender differences start to appear during middle school in favor of boys (e.g., Morin, Maiano, Marsh, Nagengast, & Janosz, 2013). Kling, Hyde, Showers, and Buswell (1999) argue that these differences are due to the lower self-perceptions for body image in girls, although only small to moderate differences in body image between boys and girls were found in an extensive meta-analysis (Gentile et al., 2009). Another possible explanation for differences in global self-esteem between boys and girls is the lower perceived athletic competence in girls.

Gender differences in perceived athletic competence are already present in the first years of elementary school. Boys have a higher perceived athletic competence than girls in every grade of elementary and middle school (Cole et al., 2001; Fredricks & Eccles, 2002; Jacobs et al., 2002; Wigfield et al., 1997). Since the decline in perceived athletic competence is nearly identical for boys and girls, this gender difference is stable over time (e.g., Cole et al., 2001; Jacobs et al., 2002). Harter (2006) speculated that, historically, sports have been largely a male domain, and male sport figures would represent more powerful role models than female sport figures, causing gender differences in favor of boys.

Gender differences in MVPA are also present in the first years of elementary school, where boys are more physically active than girls (Basterfield et al., 2011; Cleland et al., 2010). Children become less physically active as they grow older, but this decline is greater in girls than in boys making girls less physically active in every grade of elementary and middle school (Basterfield et al., 2011; Cleland et al., 2010).

With the growing number of children that do not meet recommendations for MVPA investigating associations between global self-esteem, self-perceptions about physical activity (e.g., perceived athletic competence), and MVPA would provide vital information for intervention programs to promote MVPA, and in turn, enhance global self-esteem in children. The elementary school years are of special interest because children develop and consolidate a variety of motor activities that are necessary to participate in MVPA during this period. Furthermore, associations should be investigated longitudinally because constructs are subjected to developmental changes during childhood.

Our first aim was therefore to investigate the change in global self-esteem, perceived athletic competence, and MVPA in children from kindergarten to grade 4. We investigated if this change was different for boys and girls. Our second aim was to investigate longitudinal associations between the change in global self-esteem,

perceived athletic competence, and MVPA. Again, we investigated if associations were different for boys and girls.

We hypothesized that global self-esteem would remain stable over time and would be the same in boys and girls. We furthermore hypothesized that perceived athletic competence and MVPA would decline in children from kindergarten to grade 4. We expected boys to have higher scores for perceived athletic competence and to participate more in MVPA than girls in kindergarten. We expected these differences in perceived athletic competence between boys and girls to remain stable and differences in MVPA between boys and girls to become larger over time. Next, we hypothesized positive associations between the change in global self-esteem, perceived athletic competence, and MVPA. However, we expected these associations to be stronger between global self-esteem and perceived athletic competence, and between perceived athletic competence and MVPA, than between global self-esteem and MVPA because of the mediating effect that perceived athletic competence is believed to have. We expected these associations to be of similar magnitude in boys and girls.

Method

The current study is part of a larger "Move Along" [Beweeg je mee] longitudinal study, in which we investigate the change in, and associations between, motor performance, perceived competence, task values, global self-esteem, and physical activity in elementary school children. Data were collected once a year between January and June in 2011, 2012, and 2013. The Medical Research Ethics Committee of the University Medical Centre Utrecht approved this study. All families gave written informed consent for their child's participation. All children gave verbal assent as well.

Participants

Children

A total of 307 children participated in this 2-year longitudinal study. Ten children dropped out during the course of the study because of emigration ($n = 6$), moving to an unknown location ($n = 3$), or no longer wanting to participate for unknown reasons ($n = 1$). As we used latent growth curve modeling for our statistical analyses, equal numbers of responses from each participant were not required. Children with missing data were, therefore, not excluded from the analysis but contributed less to the result. Some children ($n = 13$) had to repeat a grade or were referred to a school for special education ($n = 2$) during the course of the study. Because we used grade as the time interval to investigate the change in perceived athletic competence and global self-esteem, we decided to exclude these children. Therefore, a total of 292 children (148 boys) divided over two cohorts were included in this study. Cohort I consisted of children in kindergarten ($n = 146$; 80 boys), while cohort II consisted of children in grade 2 ($n = 146$; 68 boys) at first assessment. The age of the children in cohort I ranged between 4 and 7 years and in cohort II between 7 and 9 years. Cohort I was composed of 121 Caucasian children and 25 children from non-western ethnic minorities (mainly Northern African children). Cohort II was composed of 119 Caucasian children and 27 children from non-western ethnic minorities (mainly Northern African children).

Parents

Two hundred ninety parents gave informed consent to fill in a 7-day activity diary. One hundred seventy-five activity diaries were returned at first assessment, 133 at second assessment, and 119 at third assessment. We excluded activity diaries where less than 50 percent was filled in ($n = 10$). A total of 184 parents completed activity diaries on at least one occasion (from cohort I: 94 parents; 52 boys; age range 4–6 years; $n = 84$ Caucasian children, $n = 10$ children from non-western ethnic minorities, from cohort II: 90 parents; 36 boys; age range 7–9 years; $n = 84$ Caucasian children, $n = 6$ children from non-western ethnic minorities) (see Table 1).

Measures

The current study used the Dutch version of the Self-Perception Profile for Children (SPPC) (Veerman, Straathof, Treffers, Van den Bergh, & ten Brink, 1997) to investigate perceived athletic competence and global self-worth and a 7-day activity diary to investigate MVPA. Other measures used in the "Move Along" [Beweeg Je Mee] study, but not reported in this article, are the How Am I doing questionnaire (Calame et al., 2009), a pedometer (Yamax CW700 DigiWalker), the Movement Assessment Battery for Children – Second Edition (MABC-2) (Henderson, Sugden, & Barnett, 2007), and the subscale "active recreational activities" of the Family Environmental Scale (FES) (Moos & Moos, 1994).

Perceived athletic competence and global self-esteem

The Dutch version of the Self-Perception Profile for Children (SPPC) (Veerman et al., 1997) consists of 36 questions divided over six subscales. In this study we used the subscales *athletic competence* and *global self-esteem*. Each question consists of two contradictory quotes. The child has to choose which quote describes him/her best. For example: 'some kids are really good at sports' or 'other kids are not so good at sports'. After choosing one of the quotes, the child has to indicate whether this was either 'a little bit true for me' or 'totally true for me'. The total score per subscale ranges between 6 and 24 points. Higher scores indicate a more positive perception for athletic competence and global self-esteem. The scales were developed for children between 8 and 12 years and have good validity and reliability (Muris, Meesters, & Fijen, 2003). However, the majority of children in cohort I of our study were younger than 8 years. We therefore investigated factor loadings of the questions on the subscale athletic competence and global self-esteem for the model that fitted the data best and found acceptable to high factor loadings indicating a valid measurement of perceived athletic competence and global self-esteem (see Supplementary Material Online).

Moderate-to-vigorous physical activity

Parents were asked to report their child's activities after school and on weekends daily for 7 consecutive days. The activity diary consists of 30-min time blocks between 15:00 and 19:00 on Monday, Tuesday, Thursday, and Friday, between 12:30 and 19:00 on Wednesday,[1] and between 08.00 and 19.00 on Saturday and Sunday. Every time block was scored based on Bouchard's method (Bouchard et al., 1983) to assess the energy expenditure of the activity. Scores range between 1 and 9, with higher scores indicating higher energy expenditure. Next, we categorized every time block as *MVPA* or *no physical activity*. Activities with a score of 6 (e.g., leisure activities outside) or higher were considered as *MVPA*, while scores below 6 were considered as *no physical activity*. We then summed up the number of time blocks that were categorized as *MVPA*. We divided the number of time blocks that were categorized as *MVPA* by the number of time blocks that were filled in. By doing so, we calculated the percentage of time that children participated in MVPA after school and on weekends. Proxy reports for physical activity appeared to be adequate and suitable (Manios, Kafatos, & Markakis, 1998). After the first author scored all activity diaries

[1] Children in Dutch elementary schools are free on Wednesday afternoons.

Table 1
Characteristics of the children.

	Total sample of children $n = 292$	Subset of children $n = 184$	
Gender % (n)			
Boys	51 (148)	48 (88)	
Girls	49 (144)	52 (96)	
Ethnicity % (n)			
Caucasian	82 (240)	91 (168)	
Non-Western Ethnic Minorities	18 (52)	9 (16)	
Cohorts % (n)			
Cohort I	50 (146)	51 (94)	
Cohort II	50 (146)	49 (90)	
Mean physical activity (SD)		Boys	Girls
Kindergarten		.33 (.10)	.28 (.10)
Grade 1		.34 (.14)	.27 (.12)
Grade 2		.36 (.12)	.31 (.10)
Grade 3		.35 (.16)	.33 (.13)
Grade 4		.37 (.14)	.29 (.14)

Note: Subset of children = children whose parents had completed activity diaries; KG = kindergarten.
$^{*}p < .05$.

two graduate students checked the scores of 118 activity diaries (28% of total) for errors. There was initial disagreement between the first author and the two graduate students in less than 1 percent of the cases. In addition, two other graduate students together scored 50 activity diaries (12% of total) to investigate inter-rater reliability with the first author. Inter-rater reliability between the first author and the two students was high ($r_p = .914$; $p < .001$).

Procedure

Thirteen elementary schools in a central province of the Netherlands (Utrecht) participated in the "Move Along" [Beweeg Je Mee] study. After receiving approval from the principals of the primary schools, the parents of all children in kindergarten and grade 2 received an information letter and informed consent forms ($n = 1145$). A total of 307 parents gave their informed consent and all 307 children gave their verbal assent at first assessment. The first assessment took place between January and June 2011. The following assessments took place as close as possible to the same date 12 and 24 months later.

Child assessment

Administration of the SPPC took place in a quiet room at school. Because the children in the current study were younger than the children in previous studies using this questionnaire, great care was taken (particularly during the first year of questionnaire administration) to ensure that the children understood the questions being asked. All questions were read out loud to all the children.

Parental assessment

The 7-day activity diaries were distributed in the same month for all children because of large known seasonal differences in the Netherlands. Parents received their 7-day activity diary in May and returned it in May or June because weather conditions are fairly comparable in these months and are generally good. Moreover, there is more variation in physical activity between children in months with more sun hours, like May and June (Carson & Spence, 2010; Tucker & Gilliland, 2007).

Analysis

We used a cohort-sequential design to investigate the change in global self-esteem, perceived athletic competence, and MVPA. This design provides a way to link cohorts to determine if there is a common developmental growth curve (e.g., Duncan, Duncan, Strycker, & Chaumeton, 2007). In this way, it is possible to connect several short-term longitudinal studies of different age cohorts to investigate the change in global self-esteem, perceived athletic competence, and MVPA over a longer period of time. For the change in global self-esteem and the change in perceived athletic competence, we used second-order latent growth curve models. This means that the growth curve was fitted on latent variables, so that measurement errors were taken into account. All analyses were performed using Bayesian statistics.

Firstly, we performed several preliminary analyses to make sure latent growth curve analyses could be investigated accordingly. Preliminary analysis consisted of testing for longitudinal measurement invariance of the indicators in this model, which is a prerequisite for comparing common factors across time (McArdle, 2009; Oort, 2001). Because we used Bayesian statistics, well-known fit indices (e.g., Chi-square, RMSEA, CFI) were not available. Instead, Deviance Information Criterion (DIC) was used to compare models with each other (Spiegelhalter, Best, Carlin, & van der Linde, 2002). We also tested for invariance in global self-esteem and perceived athletic competence for gender and age, and, finally, we tested for dependence due to the nested structure in the data because children were clustered within school.

Secondly, we conducted a linear growth model (McArdle, 1988; Meredith & Tisak, 1990) on both indicators for MVPA and common factors for global self-esteem and perceived athletic competence that assumed that the change in global self-esteem, perceived athletic competence, and MVPA can be modeled with an intercept (initial status) and slope (linear change), which can vary across children (the intercept and slope may have variance).

Thirdly, if significant variance on intercept or slope between children was found we added gender as a covariate to investigate whether gender could explain part of the variance in intercept and slope in global self-esteem, perceived athletic competence, and MVPA. Explained variance (R^2) of the intercept and slope was reported.

Finally, we investigated associations between the change in global self-esteem, perceived athletic competence, and MVPA. Using multigroup models, we tested whether these associations differed across gender.

Statistical analyses were performed in M*plus* 7.0, using Bayesian estimation with the default settings in the program. M*plus* provides 95% confidence intervals for parameter estimates, which gives a 95% probability that the population parameter will lie between the lower and upper value of the interval. For more information about Bayesian methods in general see Lynch (2007); for the specific

implementation in M*plus*, see Muthen (2010). M*plus* also provides *p* values for parameter estimates, which are related to the confidence intervals. They were evaluated against a significance level of .05.

Results

Preliminary analyses

All tables with the results of the preliminary analyses are reported in the Supplementary Material Online. Firstly, to test the factor structure of the SPPC subscales for global self-esteem and perceived athletic competence, for each subscale we investigated the model where all indicators were allowed to load freely on global self-esteem or perceived athletic competence ($n = 292$) (Model I). To check for invariance of the factor loadings and intercepts between grades, we investigated the same model again where we assumed factor loadings and intercepts to be the same for every year (Model II). With regard to global self-esteem, M*plus* was unable to arrive at a solution when fitting Model I, but was able to fit Model II (DIC = 10,964.842). With regard to perceived athletic competence, surprisingly, Model II showed a worse fit to the data (DIC Model I: 12,871.242; DIC Model II: 12902.255). However, because constrained factor loadings and intercepts are an important prerequisite for latent growth curves, we used Model II to perform all analyses.[2]

Secondly, we tested for invariance in global self-esteem and perceived athletic competence for gender and grade. Test statistics from these analyses can be found in the Supplementary Material III. We found that all items were measurement invariant across boys and girls in every grade, with the exception of one item in grade 1 where the factor loading was higher for girls. We also found that all perceived athletic competence items were invariant across boys and girls in every grade, with the exception of one item in kindergarten where the factor loading was also higher for girls. These small differences will not affect the results. With regard to age, we tested invariance in global self-esteem and perceived athletic competence between children in kindergarten and grade 4 as possible age differences were expected to be largest between the youngest and the oldest children. We found no measurement non-invariance in global self-esteem, but did find differences on two items in perceived athletic competence. The intercept of one item was higher in children in kindergarten, while intercept of the other item was higher in children in grade 4.

Thirdly, because the children were clustered within schools, it would be desirable to correct for the nested structure in the analysis. However, the option to correct for the multilevel structure is not available with Bayesian estimation in *Mplus*. Ignoring nestedness may lead to inflated type I errors (Snijders & Bosker, 1999). However, effects on parameter estimates in a factor model are found to be ignorable when ICC < .15, and the influence on standard errors is very small when ICC < .25 and ignorable when ICC < .05 (Pornprasertmanit, Lee, & Preacher, 2014). The item's ICC's for schools ranged between .00 and .19 for global self-esteem, between .01 and .13 for perceived athletic competence, and between .00 and .07 for physical activity.

Developmental changes

Global self-esteem (mean slope: .02, 95% CI: −.01, .04, $p = .170$), perceived athletic competence (mean slope: −.02, 95% CI: −.05, .01, $p = .154$), and MVPA (mean slope: .01, 95% CI: .00, .02, $p = .222$) stayed the same over time from kindergarten to grade 4.

We added gender to the model to investigate if gender explained some of the variance and slope between children. Global self-esteem was the same in boys and girls in kindergarten (b: −.02, 95% CI: −.14, .10, $p = .706$), but boys perceived themselves higher in athletic competence (b: −.19, 95% CI: −.35, −.04, $p = .008$) and participated more in MVPA (b: −.04, 95% CI: −.08, .00, $p = .042$) than girls in kindergarten.

The change in global self-esteem (b: .03, 95% CI: −.01, .08, $p = .132$), perceived athletic competence (b: .05, 95% CI: −.01, .11, $p = 114$), and MVPA (b: .00, 95% CI: −.02, .02, $p = .756$) was the same in boys and girls, although the average slope of perceived athletic competence for boys was significantly negative (mean slope boys: −.05, 95% CI: −.09, .00, $p = .038$). Results of the developmental changes are presented in Table 2.

Longitudinal associations

We investigated associations between the change in global self-esteem, perceived athletic competence, and MVPA by combining the separate growth models and looking at the covariance between the two change (slope) factors.

The change in global self-esteem was not significantly associated with the change in perceived athletic competence (*cov*: .00, 95% CI .00, −.01, $p = .218$). This association was not significant in boys (*cov*: .01, 95% CI: .00, .01, $p = .088$), but was significant in girls (*cov*: .03, 95% CI: .02, .06, $p = .000$). Subsequently, the association was significantly different between boys and girls ($cov_{boys} - cov_{girls}$: .27, 95% CI: .01, .06, $p = .000$).

To investigate associations with MVPA we were forced to use only global self-esteem and perceived athletic competence data of children whose parents had completed activity diaries ($n = 184$). As this was a subset of our sample, we investigated differences in prognostic factors between the sample of 292 children and the sample of 184 children. The samples of children were the same with regard to sex ($\chi^2(1, n = 292) = 1.33$, $p = .248$) and number of children per cohort ($\chi^2(1, n = 292) = .13$, $p = .716$), but the sample with 184 children consisted of significantly fewer children from non-western ethnic minorities than the sample with 292 children ($\chi^2(1, n = 292) = 22.49$, $p < .05$).

The change in perceived athletic competence was not significantly associated with the change in MVPA (*cov*: .00, 95% CI: .00, .00, $p = .112$). This association was not significantly associated with the change in MVPA in boys (*cov*: .00, 95% CI: .00, .01, $p = .324$), or in girls (*cov*: .00, 95% CI: .00, .01, $p = .676$). The association was also not significantly different between boys and girls ($cov_{boys} - cov_{girls}$: .00, 95% CI: −.01, .00, $p = .644$).

The change in MVPA was also not significantly associated with the change in global self-esteem (*cov*: .00, 95% CI: .00, .00, $p = .234$). This association was not significant in boys (*cov*: .00, 95% CI: .00, .01, $p = .498$), but was significant in girls (*cov*: .01, 95% CI: .00, .01, $p = .032$). However, the association was not significantly different between boys and girls ($cov_{boys} - cov_{girls}$: .00, 95% CI: .00, .01, $p = .264$).

Discussion

Developmental changes

As hypothesized, global self-esteem remained stable over time. This result is in line with the results found by Wigfield and Eccles (1994). However, unexpectedly, we found that perceived athletic competence remained stable over time. This in contrast with an extensive number of studies in which perceived athletic

[2] We also analyzed Model I and added gender as a covariate (Model Ia). The results of Model Ia were similar to the results of Model IIa.

Table 2
Parameter estimates and confidence intervals of the models with Gender predicting the latent intercept and slope of GSE, PAC and PA.

	GSE ($n = 292$)			PAC ($n = 292$)			PA ($n = 184$)		
	Est. (Unst.)	95% CI (Unst.)	Est. (Stand.)	Est. (Unst.)	95% CI (Unst.)	Est. (Stand.)	Est. (Unst.)	95% CI (Unst.)	Est. (Stand.)
Intercept (mean)	.00	–	.00	.00	–	.00	.32*	[.30, .34]	3.99*
Slope (mean)	.02	[−.01, .04]	.22	−.02	[−.05, .01]	−.31	.01	[.00, .02]	.19
Intercept with slope (covariance)	−.01*	[−.03, .00]	−.71*	.00	[−.04, .01]	−.42	.00	[.00, .00]	−.27
Intercept on gender (B)	−.02	[−.14, .10]	−.04	−.19*	[−.35, −.04]	−.31*	−.04*	[−.08, .00]	−.26*
Slope on gender (B)	.03	[−.01, .08]	.22	.05	[−.01, .11]	.33	.00	[−.02, .02]	−.05
R^2 intercept	.01			.10*			.06*		
R^2 slope	.05			.11			.01		

Note: Est. = estimate; CI = confidence interval; GSE = global self-esteem; PAC = perceived athletic competence; PA = physical activity; Unst. = unstandardized; Stand. = standardized.
*$p < .05$.

competence declined during childhood (e.g., Fredricks & Eccles, 2002; Jacobs et al., 2002; Wigfield et al., 1997). Although perceived athletic competence declines during childhood, the developmental change in perceived athletic competence is less clear during the elementary school period. Perceived athletic competence is found to decline during the elementary school period (Wigfield et al., 1997), but is also found to increase (Cole et al. 2001) during the elementary school period. Now, we found that perceived athletic competence remained stable during the elementary school period, indicating that more research is necessary to understand the developmental changes in perceived athletic competence during this period in childhood. An explanation for the stability of perceived athletic competence during our study period focuses on the age of the children. Because children were still fairly young, especially children in cohort I (e.g., from kindergarten to grade 2), we speculate that they were not yet comparing their performance with their peers, which is thought to be the primary reason for the decline in perceived athletic competence (Harter, 2006).

We also found, unexpectedly, that MVPA remained stable over time. This result is in contrast with an extensive number of studies that show that MVPA declines over time (e.g., Basterfield et al., 2011; Cleland et al., 2010). An explanation for the unexpected stability of physical activity during our study period focuses on a combination of cultural and age differences. Dutch children in kindergarten and the first years of elementary school are (strongly) encouraged to participate in organized sport activities (e.g., soccer and hockey) by their parents. Moreover, during elementary school the large majority of children in the Netherlands learn how to swim, and their main transportation between home, school, friends, and sport activities is by bike. We speculate that MVPA remained stable because of a (fairly) consistent cultural daily routine after school that is promoted by parents of younger children.

Longitudinal associations

Unexpectedly, we found no associations between the change in global self-esteem, perceived athletic competence, and MVPA. The findings are not consistent with the hypothesized associations as described in the EXSEM (Sonstroem et al., 1994). Other self-perceptions are possibly important to explain the association between global self-esteem and MVPA (Fox & Corbin, 1989).

With regard to the association between perceived athletic competence and MVPA, as argued before, we speculate that MVPA in younger Dutch children is strongly influenced by their parents. Therefore, younger children have less opportunity to choose their own physical activity behavior. As a result, perceived athletic competence, which is believed to enhance *intrinsic* motivation (Harter, 1981), might have a smaller influence on physical activity behavior in these younger children. Also, Eccles et al. (1983) points out in the Expectancy-Value model that significant others (e.g., parents) play an important role as providers of experience for children.

Differences between boys and girls

As hypothesized, we found that global self-esteem was the same in boys and girls, and that boys had higher scores for perceived athletic competence and participated more in MVPA than girls in kindergarten. Global self-esteem remained, as expected, stable over time in boys and girls. Perceived athletic competence declined over time in boys, but remained stable in girls. This change in perceived athletic competence was however not significantly different between boys and girls. We found, unexpectedly, a significant decline in boys, which was not significantly different compared with the more stable perceived athletic competence in girls. An explanation for this decline in perceived athletic competence in boys focusses on their participation in MVPA. Because boys participated more in MVPA than girls, they were also more exposed to situations in which they could compare their athletic performance with their peers, resulting in a decline in perceived athletic competence.

The difference in MVPA remained the same between boys and girls, while we hypothesized that this difference in MVPA between boys and girls would become larger over time. As mentioned before, we speculate that MVPA remained stable because of a fairly consistent cultural daily routine after school that is promoted by parents of younger children. Girls were possibly already on a minimum of MVPA as promoted by their parents when they were in kindergarten, causing participation in MVPA to remain stable over time.

Surprisingly, the change in global self-esteem and the change in perceived athletic competence, and the change in global self-esteem and the change in MVPA, was significant in girls, but not in boys. This result is (partly) in contrast to other longitudinal studies. Significant associations have been found in both boys and girls, with even stronger associations in boys (e.g., Schmidt, Blum, Valkanover, & Conzelmann, 2015). We have no clear explanation for our results. However, it has been suggested that girls are more likely to attribute success to their own ability and failure to a lack of their own ability (internal locus of control), while boys are more likely to attribute success and failure to powerful others or unknown causes (external locus of control) (Wigfield, Battle, Keller, & Eccles, 2002). In doing so, less participation in MVPA or lower levels of perceived athletic competence would impact global self-esteem in girls, but not in boys. Additionally, the change in perceived athletic competence and the change in MVPA were fairly similar in

boys and girls. This would explain why the association was not different in boys and girls, which was in line with our hypothesis.

Weaknesses and strengths of the study

Several limitations of the study have to be recognized. Firstly, we investigated MVPA using 7-day activity dairies completed by the children's parent(s). Some researchers argue that the validity and reliability of activity diaries are questionable (Chinapaw, Mokkink, van Poppel, van Mechelen, & Terwee, 2010). This is especially the case when *intensity* in physical activity is measured. However, we were interested in the *amount* of MVPA instead of the *intensity* of physical activity. We, therefore, dichotomized every time block as *MVPA* or *no physical activity* thereby introducing less variation and higher accuracy for the physical activity measurement. Using this approach we reached high inter-rater reliability with only (initial) disagreement between assessors in less than 1 percent of the time blocks. Secondly, we investigated only "after school MVPA" instead of the total amount of MVPA, which also includes school-based activity. We have therefore no complete picture of the child's total physical activity behavior, which possibly influenced the association between MVPA and both global self-esteem and perceived athletic competence. Thirdly, a large number of parents did not fill in the activity diary ($n = 108$; 37% of the sample initially approached). Associations with MVPA were therefore analyzed in only 184 children instead of the 292 children that participated in the Move Along study. Moreover, the ratio between children from non-western ethnic minorities and Caucasian children was significantly lower in the sample of parents who did not complete the activity diaries. We argue that there are two possible explanations for this result. To begin with, parents need to have a considerable understanding of the Dutch language to fill in the activity diaries, which might not have always been the case in parents from ethnic minorities. Also, children and adults from non-western ethnic minorities in the Netherlands are less physically active than Caucasian children and adults (Hildebrandt, Bernaards, Chorus, & Hofstetter, 2013). Parents from non-western ethnic minorities might therefore have felt less inclined to fill in activity diaries. Fourthly, we investigated *associations*, as opposed to directional effects, between the change in global self-esteem, perceived athletic competence, and MVPA. In the EXSEM, a skill-development pathway is hypothesized whereby participation in specific behavior (e.g., physical activity) will influence global self-esteem, through the mediation of more specific self-perceptions (e.g., perceived athletic competence). However, the opposite direction of effects, a self-enhancement pathway, is also possible (Harter, 2006), that is, a higher global self-esteem is hypothesized to lead to positive specific perceptions (e.g., perceived athletic competence), which will result in a greater likelihood of engaging in specific behavior (e.g., physical activity). Future research may focus on contrasting different models that may underlie the associations that we found. Finally, we investigated associations between the change in global self-esteem, perceived athletic competence, and MVPA on a between-person level. Technically, it is possible to investigate across construct associations between time point specific within-person deviations from the average growth curve (Lindwall, Asci, & Crocker, 2014). Although of interest, this was beyond the scope of our article.

In terms of the strengths of our study, firstly, this is one of the first studies that has investigated psychological constructs, such as perceived athletic competence and global self-esteem, in relation to MVPA in elementary school children. Secondly, we used a longitudinal design to investigate the change in, and associations between, global self-esteem, perceived athletic competence, and MVPA from a developmental perspective. Thirdly, we investigated the change in global self-esteem and perceived athletic competence on a latent level. By fitting the growth model on factors instead of scale scores, measurement error at the item level was taken into account by the measurement model (e.g., Preacher, Wichman, MacCallum, & Briggs, 2008).

In sum, this study expands the knowledge on the change in, and associations between, global self-esteem, perceived athletic competence, and MVPA in elementary school children. Global self-esteem, perceived athletic competence, and MVPA were stable between kindergarten and grade 4. Global self-esteem was the same in boys and girls, while perceived athletic competence and MVPA was higher in boys. Associations between the change in global self-esteem with perceived athletic competence and MVPA were significant in girls, but not in boys. We found large variance in the change in global self-esteem, perceived athletic competence, and MVPA, indicating that there were other determinants that influenced the developmental changes. Future research should focus on the determinants of these developmental changes in elementary school children. Early recognition and intervention with children with low MVPA and/or low global self-esteem might prevent problems in health related outcomes, life satisfaction, and depression in middle school and high school.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.psychsport.2015.06.009.

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