Motor ability and self-esteem: the mediating role of physical self-concept and perceived social acceptance

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Abstract

Objectives: One important issue in sport and exercise psychology is to determine to what extent sports and exercise can help to increase self-esteem, and what the underlying mechanism might be. Based on the exercise and self-esteem model (EXSEM) and on findings from the sociometer theory, the mediating effect of physical self-concept and perceived social acceptance on the longitudinal relationship between motor ability and self-esteem was investigated. **Design**: Longitudinal study with three waves of data collection at intervals of ten weeks each. **Method**: 428 adolescents (46.3 % girls, M_{age} = 11.9, *SD* = .55) participated in the study, in which they performed three motor ability tests and completed paper-and-pencil questionnaires for physical self-concept and perceived social acceptance, as well as for self-esteem, at all three measuring points. **Results**: Using structural equation modelling procedures, the multiple mediation model revealed both physical self-concept and perceived social acceptance to be mediators between motor ability and self-esteem in the case of boys. In girls, on the other hand, the mediation between motor ability and self-esteem only takes place via physical self-concept. **Conclusions**: Gender differences in the relationship between motor ability and self-esteem suggest gender-specific interventions aimed at promoting self-concept.

Key-words: sport competence, self-perceptions, adolescents, gender, structural equation modelling

Motor ability and self-esteem: the mediating role of physical self-concept and perceived social acceptance

Global self-esteem is traditionally seen as a central indicator for mental health and an explanatory variable for human behaviour (Rosenberg, 1965). People with high self-esteem are more emotionally stable, less prone to experiencing depression and display higher academic achievements (Marsh & O'Mara, 2008). From a multidimensional perspective on the self, which is now widely accepted in many psychological disciplines, global self-esteem marks the apex of the hierarchically organized and multidimensionally structured self-concept (Shavelson, Hubner, & Stanton, 1976). Moving from the top to the bottom, the term 'self-concept' is reserved for evaluations in discrete domains such as academic, social, emotional and physical domains, and thus refers to domain-specific self-perceptions or self-conceptions (Harter, 2012). In recent years, various scientific disciplines (e.g. educational, sport or developmental psychology) have adopted a multidimensional perspective by the fact that domain-specific self-perceptions are more suitable for predicting specific behaviour (Marsh & O'Mara, 2008), that it is easier to influence specific facets through interventions (Schmidt, Valkanover, Roebers, & Conzelmann, 2013), and that they are more strongly related to corresponding external criteria (Möller, Pohlmann, Köller, & Marsh, 2009). In addition, a multidimensional perspective of the self allows the relationship between domain-specific self-perceptions and global self-esteem to be examined, as well as their interdependence.

Physical self-concept as a mediator between motor ability and self-esteem

Especially in the physical domain, there is interest in understanding the positive effect that sports and physical activities can have on global or specific domains of self-concept (Spence, McGannon, & Poon, 2005). In this context, the question arises, what mechanism is operating behind this relationship? One model that addresses this mechanism, adopting a multidimensional perspective, is the exercise and self-esteem model (EXSEM; Sonstroem & Morgan, 1989). The original EXSEM describes the mechanism as a bottom-up process in

which mastery of a physical activity initially strengthens physical self-efficacy, thus leading to an increase in perceived physical competence, and ultimately influences global self-esteem through the mediation of physical acceptance. The expanded model (Sonstroem, Harlow, & Josephs, 1994) includes two levels of perceived physical competence (operationalized by the Physical Self-Perception Profile, PSPP): general physical self-worth as a more global domain, and perceived sport competence, physical condition, an attractive body and strength as more specific subdomains in the hierarchical model of global self-esteem. The EXSEM has been repeatedly tested empirically, particularly on adult samples but never in children and adolescents (Caruso & Gill, 1992; Elavsky, 2010; Fox, 2000; Levy & Ebbeck, 2005; Sonstroem, et al., 1994). However, even if no empirical studies have tested the EXSEM in child samples – and this is not the aim of the present study either – it nevertheless seems probable that the connection between the constructs will be similar there too. In particular, both the original and the expanded EXSEM emphasize that the positive effect exerted by physical self-concept, defined as the degree of satisfaction with one's own body (Marsh, Richards, Johnson, Roche, & Tremayne, 1994), on global self-esteem plays an outstanding role in the outlined process (Fox, 2000). No matter at which developmental level and no matter in which country it is examined, physical self-concept is consistently found to be strongly related to global self-esteem in both girls and boys (Harter, 2012). On some occasions, physical self-concept has been found to act as a mediator between physical activity and self-esteem in adolescents (Bowker, 2006; Haugen, Säfvenbom, & Ommundsen, 2011), lending further support that the mechanism proposed by the EXSEM is also relevant for younger populations.

Physical self-concept as a predictor of global self-esteem is fed not only by the amount of physical activity but, particularly in childhood, from other sources too. Thus correlates of physical activity, such as lack of body fat, physical fitness or motor ability, are positively associated with physical self-concept (Haugen, Ommundsen, & Seiler, 2013; Vedul-Kjelsås,

Sigmundsson, Stensdotter, & Haga, 2011). Of these, particularly motor ability, which is conceptualised as a person's ability to perform different motor skills (Kent, 2006), takes on a special position in the development of children and adolescents (Skinner & Piek, 2001). It not only influences physical self-concept as a domain-specific form of self-esteem, but also more global determinants of mental health: it is known, for example, that children with poor motor abilities tend to have lower self-esteem or generally display less life satisfaction (Piek, Baynam, & Barrett, 2006). Furthermore, besides a certain level of motor skills, a certain level of motor abilities is necessary in order to take part in physical activities in the first place, which in turn promote positive health outcomes (Stodden et al., 2008; Vedul-Kjelsås et al., 2011). This is reflected by the fact that children and adolescents with strong motor abilities are more physically active than those with poor motor abilities (Hands, Larkin, Parker, Straker, & Perry, 2009). Although motor ability appears to play such an important role for successful development in childhood and adolescence, and is linked to both physical self-concept and global self-esteem, we are not aware of any studies in which motor ability has been included in a mediation model predicting global self-esteem. This is even more astonishing when one considers that one of the hypotheses explaining the relationship between physical activity and self-esteem is an improvement in actual motor abilities, which in turn leads to enhanced physical self-concept and ultimately influences general self-esteem (Fox, 2000). For this reason, this study will focus on the contribution to global self-esteem made by motor ability as mediated through physical self-concept. In doing so, physical self-concept will be assumed to be one of two potential mediator between motor ability and self-esteem.

Perceived social acceptance as a mediator between motor ability and self-esteem

In addition to the physical component, there is a second important factor that seems to determine the level of self-esteem, especially in early adolescence: perceived social acceptance (Harter, 2012). Believing that one is liked by others has a positive impact on self-

esteem. On the other hand, an absence of support from parents or peers can lead to pathologically low levels of self-esteem. Thus, perceived social acceptance is, in addition to physical self-concept, another important predictor of global self-esteem in early adolescence (Granleese & Joseph, 1994). According to the sociometer hypothesis (Leary, Terdal, Tambor, & Downs, 1995), self-esteem even serves as a monitor for social acceptance. This hypothesis is supported by findings which show that self-esteem varies depending on the responses of others (Denissen, Penke, Schmitt, & van Aken, 2008; Thomaes et al., 2010). The latter authors found, for example, that peer approval significantly increases whereas peer disapproval significantly decreases the self-esteem of 11-year-olds, showing that children's self-esteem depends strongly on how much they are liked by their peers.

The majority of children and adolescents report regularly taking part in sports during their leisure time and physical activity often reaches a peak during the transition into adolescence, about 11 to 14 years of age in boys and 10 to 12 years of age in girls (Malina & Little, 2008). One way of gaining peer acceptance is to be competent in an activity that is valued highly by children of the same age (Evans & Roberts, 1987). Therefore, participation in sports can be a context in which children can satisfy their need for affiliation, acceptance and popularity among their peers. Previous research has shown that children's physical activity, and their perceived and actual motor competence, are associated with perceived social acceptance (Daniels & Leaper, 2006).

There is striking evidence that being good at sports and being physically skilful are important factors, primarily for male popularity (Chase & Dummer, 1992; Chase & Machida, 2011; Evans & Roberts, 1987). Boys tend more often to play in large groups, whereas girls engage more in dyadic interactions and maintain more intimate relationships (Rose & Rudolph, 2006; Smith, Van Gessel, David-Ferdon, & Kistner, 2013). The priority of peer status increases between childhood and adolescence, and this need for a reputation is more pronounced in boys than girls (LaFontana & Cillessen, 2010). This finding can be explained

with reference to the role of peer groups in the course of development. As children become adolescents, they increasingly rely on peers for social comparison and emotional support (Harter, 2012). Not surprisingly, being rejected or disliked by peers can also lower self-esteem. Therefore, perceived social acceptance can be assumed to be another possible mediator between motor ability and self-esteem, especially in boys.

Multiple mediation model

So while several studies have examined the connection between physical activity, participation, physical self-concept and self-esteem (Caruso & Gill, 1992; Elavsky, 2010; Fox, 2000; Levy & Ebbeck, 2005; Sonstroem et al., 1994) and have in some cases also performed mediation analyses in the process (Bowker, 2006; Haugen et al., 2011), we are only aware of a single study in which the mediating effect of perceived social acceptance between physical activity and self-esteem has been studied (Daniels & Leaper, 2006). Their analyses of longitudinal data showed that peer acceptance partially mediated the relationship between sport participation and global self-esteem in girls as well as in boys. However, hitherto no study has examined peer acceptance as a potential mediator between motor ability and self-esteem. On top of this, when studying mediation mechanisms, the usual practice is only to calculate single mediation models, i.e. to include either physical self-concept *or* perceived social acceptance as a mediator. However a review of the existing literature shows that both variables, i.e. physical self-concept *and* perceived social acceptance, could potentially serve as mediators for the connection between motor ability and self-esteem. Considering the empirical evidence concerning the interrelatedness of physical self-concept and perceived social acceptance with motor ability and self-esteem, it is therefore desirable to include both variables in a multiple mediation model. From a methodological point of view, one of the advantages of multiple mediation models is that they allow one to determine "to what extent specific M variables mediate the X→Y effect, conditional on the presence of other mediators in the model" (Preacher & Hayes, 2008, p. 881). This therefore means that

the relative magnitude of specific indirect effects (i.e. mediation effects) can be determined, which is not possible, by contrast, using a single mediation model.

Based on the empirical studies listed, as well as the outlined theoretical and methodological considerations, two hypotheses were tested in the present study: *(1) Both physical self-concept and perceived social acceptance act as mediators between motor ability and global self-esteem.* A knowledge of the relationship between these variables is crucial, on the one hand as a means of understanding the fundamental processes, and on the other hand for designing concrete interventions aiming to promote children's self-esteem. To this end, a multiple mediation model will be formulated that takes both mediators into account at the same time. Since testing mediation in cross-sectional data can produce biased and potentially misleading estimates of the mediational process (Cole & Maxwell, 2003), the analysis will be conducted on longitudinal data, obtained at three different times. Because self-concept (unlike traits, for example) is a personality variable that is stable in the short to medium term, a time interval of 10 weeks was chosen between the measuring points. *(2) The hypothesised relationship between motor ability and global self-esteem differs between boys and girls.* To test this hypothesis, two separate models will be set up, for boys and for girls, and a multi-group analysis will be performed. This allows gender to be studied as a potential moderator.

Method

Design

A large sample of 11–13-year-olds were followed over the course of half a school year and tested in terms of their motor ability, physical self-concept, perceived social acceptance, and self-esteem at three measuring points at intervals of ten weeks. Since all variables were assessed at all measuring points (Wave 1, Wave 2, Wave 3), the multiple mediation model was tested taking into account initial levels of physical self-concept and perceived social acceptance (using baseline measures from Wave 1), and self-esteem (using baseline measures from Wave 1 and Wave 2). To ensure that the sample was representative and the two groups

were comparable with respect to general activity habits and social background, self-reported physical activity and socioeconomic status were assessed as background variables during Wave 1.

Participants

The sample analysed consisted of 428 5th grade pupils (46.3 % girls, M_{age} = 11.9, *SD* = .55) from 23 different schools in urban and rural areas around the city of Bern, Switzerland, where three physical education lessons per week are compulsory. Since there is evidence for differences between rural and urban settings, for example in the physical activity or physical fitness level of children (Joens-Matre et al., 2008), the schools included were chosen so that approximately the same number of them were located in urban (*n* = 11) and rural areas (*n* = 12). Analyses of the physical activity level (*M* = 2.82, *SD* = .81) and the socioeconomic status (*M* = 6.33, *SD* = 1.66; ranging from 1 to 9) provide evidence that the present sample is representative for a large population of same-aged children from different social classes. The 230 boys (M_{age} = 11.9, *SD* = .58) differed as expected from the 198 girls (M_{age} = 11.8, *SD* = .49) in the amount of weekly physical activity ($t(426) = 3.62$, $p < .0005$, $d = .74$), with boys (*M* = 3.10, *SD* = .83) being more active than girls (*M* = 2.50, *SD* = .79), but not with respect to their socioeconomic status (M_{boys} = 6.36, *SD* = 1.61; M_{girls} = 6.25, *SD* = 1.71; $t(426) = .63$, $p = .527$, $d = .07$). Out of the original dataset, with *N* = 464, 18 cases had to be excluded due to missing values for sex. To detect multivariate outliers, the Mahalanobis distance values were calculated as χ^2 at $p < .001$ with 14 degrees of freedom (equal to the number of latent variables; Fidell & Tabachnick, 2003). Based on the table of critical values for chi-squared distributions, 18 cases having a Mahalanobis distance greater than 36.123 were identified as probable multivariate outliers and were therefore excluded. However, the pattern of results did not change when they were included in the analysis.

Measures

Motor ability. Motor ability was tested using three motor ability tests aimed at measuring physical abilities (strength, endurance, coordination and speed) as completely as possible.

The *Standing Long Jump* (Adam, Klissouras, Ravazollo, Renson, & Tuxworth, 1998) was used to measure the explosive power of the lower extremities. The test score (best of two tries) was the distance achieved in metres. Evidence for the reliability and validity of the test in 9- to 19-year-olds has been provided by Cauderay, Narring, and Michaud (2000).

The *Hagedorn Parcours* (Riepe, 1996) was used to assess temporal coordination and speed. This parsimonious test was chosen because the required apparatus can be found in any Swiss sports hall. Subjects had to complete an obstacle course as quickly as possible. The test score is the time achieved in seconds. The validity has been checked using correlation with other measures of physical fitness. Thus in 3rd to 5th grade students, the test score shows a correlation of r = .44 with their physical education grades and of r = -.41 with their BMI (Trautwein, Gerlach, & Lüdtke, 2008).

The *Multistage 20 Meter Shuttle Run Test* (Léger, Mercier, Gadoury, & Lambert, 1988) was used to measure endurance. Participants had to run back and forth along a 20 m course and touch the 20 m line with their foot when a sound signal was emitted from a pre-recorded tape. The frequency of the sound signals was increased every minute, by 0.5 km/h, starting with a speed of 8.5 km/h. The test ended when participants failed twice in succession to reach the line before the signal sounded. The test score is the time achieved in seconds. Evidence for the reliability and validity of the test in 12- to 15-year-olds has been provided by Liu, Plowman, and Looney (1992).

Physical self-concept. In order to measure physical self-concept, a short form of the General Physical Scale of the German Physical Self-Description Questionnaire (PSDQ; Stiller & Alfermann, 2007) was applied. In developing the German full version (70 items, 11

dimensions), Stiller and Alfermann (2007) translated the original PSDQ (Marsh et al., 1994) into German using the forward-backward principle. The present study used the same 3 items as used in the Short Version of the Physical Self Description Questionnaire (PSDQ-S, Marsh, Martin, & Jackson, 2010), a sample item being: “Physically, I am happy with myself”. Since Freund, Tietjens, and Strauss (2013) have demonstrated better psychometric properties for the four response categories format in children and adolescents, the response format was adjusted for age-appropriate use, exchanging the original 6-point Likert scale for a 4-point Likert scale that ranged from 1 (strongly disagree) to 4 (strongly agree). The test-retest reliability with a time interval of ten weeks was $r = .73$ for the present sample. Cronbach’s alpha was .83 at Wave 1 and .85 at Wave 2.

Perceived social acceptance. The measure “Selbstkonzept der sozialen Akzeptanz” (*Self-Concept of Social Acceptance*, Fend, Helmke, & Richter, 1984) was used to assess the perceived social acceptance by one’s peers. Fend et al. (1984) translated the 6 items from the social competence subscale of Harter’s Perceived Competence Scale for Children (Harter, 1982) and changed the response scale from a four-point structured alternative format to a 4-point Likert scale. The factor loadings of the individual items ranged between .50 and .68, with a Cronbach’s alpha of .78. The short form of the scale consisted of 3 items with one example of a negative item being: “No matter what I do, somehow I’m just not popular among classmates”. All items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The test-retest reliability with a time interval of ten weeks was $r = .70$ for the present sample. Cronbach’s alpha was .79 at Wave 1 and .81 at Wave 2.

Self-esteem. The German version (von Collani & Herzberg, 2003) of the Rosenberg Self-Esteem Scale (Rosenberg, 1965) was used to measure global self-esteem. The short form of the scale consisted of 3 items, one example of which is: “On the whole, I am satisfied with myself”. All items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The test-retest reliability for the present sample was $r = .68$ and $r = .74$

respectively with a time interval of ten weeks and $r = .63$ with a time interval of twenty weeks. Cronbach's alpha was .74 at Wave 1, .80 at Wave 2 and .83 at Wave 3.

Background variables. The Physical Activity Questionnaire for Children (PAQ-C; Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997) was used to measure general levels of physical activity. The PAQ-C is a 7-day self-administered recall measure that provides a summary physical activity score derived from nine items. The response format varies by item, but each is scored on a 5-point scale, a sample item being: "In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were very active?" Response options range from: "None" (1 point) to "6 or 7 times last week" (5 points). Cronbach's alpha was .79 for the present sample. Further evidence for the reliability and validity of the questionnaire in 8- to 16-year-olds has been provided by Crocker et al. (1997).

The Family Affluence Scale II (FAS II; Boudreau & Poulin, 2009) was used to assess the socioeconomic status. The scale consists of 4 questions asking children about things they are likely to know about in their family (car, bedrooms, vacations, and computers). A sample item is: "Does your family own a car, van or truck?" Response options are: no (0 points); yes, one (1 point); yes, two or more (2 points). The response format varies by item. The prosperity index (ranging from 0 to 9) was calculated from the sum of the three items. Evidence for the reliability and validity has been provided by Boudreau and Poulin (2009).

Procedure

The first step was to inform the canton and city authorities about our research plans and obtain formal permission to approach school principals. The second step was to write to all school principals in and around the city informing them about the goals of the project, the assessment methods and the time plan. After receiving their principals' permission, 23 interested fifth-grade teachers were contacted, who agreed to commit themselves to participating in the project. Three waves of data were collected at intervals of 10 weeks, in order to analyse the relationship between motor ability, physical self-concept and perceived

social acceptance, and self-esteem. Motor ability tests were carried out by (half day) trained research assistants in the gym. Self-report questionnaires were completed under the supervision of teachers during a regular school lesson. Both the principals of the schools and the parents of the children signed an informed consent form approved by the Institutional Review Board prior to participating in the study. All data were treated confidential.

Statistical analyses

All statistical analyses were conducted using SPSS Version 21 and AMOS Version 21. In a preliminary analysis, all data were tested for normal distribution and potential gender differences, using independent *t*-tests. Correlation analyses were used to investigate the relationships between all variables separately for boys and girls.

In order to test the main hypotheses of the study – that physical self-concept and perceived social acceptance mediate the relationship between motor ability and self-esteem – structural equation modelling procedures were performed (using full-information maximum likelihood methods for model estimation). First and foremost, two conditions were tested to ensure that multi-group analyses are permissible: the models to be compared must exhibit configural as well as measurement invariance (Byrne, 2010). Configural invariance exists if the factor-loading patterns are the same across the groups to be compared and if the models fit the data well (based on the evaluation of multiple fit indices). Measurement invariance exists if the χ^2 difference test between the two models is not significant. Based on simulation studies, Cheung and Rensvold (2002) conclude that the χ^2 difference test is too restrictive and recommend that only CFI differences larger than .01 should be considered relevant; hence the CFI difference was also calculated. In order to test the hypothesized mediation effects, bias-corrected bootstrap analyses (95% BC confidence level; Bollen & Stine, 1992) were performed, to reveal the indirect effects as significantly different from zero (Shrout & Bolger, 2002). Since bootstrap procedures require complete data sets, missing values were simply imputed by applying AMOS's regression imputation. Finally, multi-group analyses were

performed to test whether the two structural models, for boys and for girls, differ significantly from one another. This final step corresponds to testing whether gender serves as a potential moderator within the multiple mediation model.

To assess model-data fit, standard indices were calculated and compared with the criteria for acceptable fit recommended by Schermelleh-Engel, Moosbrugger and Müller (2003): the chi-square statistic; comparative fit index (CFI, with values equal to .95 or better); the root mean square error of approximation (RMSEA, which should be .08 or less); and the standardized root mean square residual (SRMR, with .10 or less for a good model fit). To facilitate the comparison with other studies, all path coefficients are presented as standardized estimates. A significance level of .05 was set for all tests. When effect size was calculated, it was interpreted by means of Cohen's (1988) definition of small, medium, and large effects (Cohen's d = .20, .50, .80).

Results

Preliminary Analyses

[Insert Table 1 here]

Table 1 shows descriptive statistics and mean differences between all the variables by gender, and bivariate correlations between all the latent variables by gender. All variables were normally distributed with skewness values of -1.48 to .67 and kurtosis values of -1.12 to 2.00. Independent *t*-tests revealed that boys outperformed girls in all three motor ability tests used. The reported effect size can be described as medium to large. Furthermore, boys are more satisfied with their bodies than girls are, and have higher levels in general self-esteem than girls, as represented by a small effect. All differences in favour of boys agree with previous findings and will not be discussed further (for motor ability see Carraro, Scarpa, & Ventura, 2010; Hands et al., 2009; for self-esteem and physical self-concept see Gentile et al., 2009).

To examine the relationships between motor ability, physical self-concept, perceived social acceptance and self-esteem, correlation analyses were conducted separately for males and females. The direction of the correlations reported in Table 1 was as expected: For the boys, all the main study variables were positively correlated with each other in the low to medium range. For girls, a lower correlation was found between motor ability and perceived social acceptance. Besides the auto-correlations of repeatedly tested variables, for both genders, the strongest association was between physical self-concept and self-esteem, indicating the importance of satisfaction with one's body and appearance for global self-esteem during adolescence.

Configural invariance was demonstrated, since the number of factors and the factor-loading patterns were the same across the two groups of boys and girls, and both models fitted the data well (Table 2). Measurement invariance was demonstrated, since the χ^2 difference test between the configural and the measurement model (with equality constraints on factor loadings) was not significant ($\Delta\chi^2 = 18.35$, $df = 16$, $p = .304$) and the more recent and practical approach revealed the ΔCFI = .001 to be smaller than the recommended <.01 criterion (Cheung & Rensvold, 2002). The factor loadings between the configural and the measurement model can therefore be considered to be equal. Hence, multi-group analyses are permissible.

Primary Analyses

To test the main study hypotheses – whether physical self-concept and perceived social acceptance mediated the effect between motor ability and self-esteem – structural equation modelling procedures were performed with one model each for boys and for girls, while controlling for previous physical self-concept (W1), perceived social acceptance (W1) and self-esteem (W1 and W2). Both tested models display a good model-data fit, with CFI, RMSEA and SRMR satisfying the common critical values (see Table 2).

[Insert Table 2 here] / [Insert Figure 1 here]

In the boys' group (Model 1), consistently significant relationships are seen between the predictor motor ability and the two mediators, perceived social acceptance and physical self-concept, as well as between the two mediators and the dependent variable self-esteem (see Figure 1). As hypothesised, motor ability is positively connected both with perceived social acceptance and with physical self-concept. The direct effect of motor ability on perceived social acceptance appears to be greater than its direct effect on physical self-concept. The two variables, perceived social acceptance and physical self-concept, are in turn significantly related to self-esteem, whereby physical self-concept has a distinctly stronger effect on global self-esteem. The direct path from motor ability to self-esteem is not significant. In order to test whether physical self-concept and perceived social acceptance mediate the relationship between motor ability and self-esteem, the indirect effects (equal to the products of the associated paths) have to be analysed. The results show that both perceived social acceptance ($\beta = .05$, $p = .010$) and physical self-concept ($\beta = .06$, $p = .013$) exhibit full mediation. The overall indirect effect (equal to the sum of the two indirect effects) is also significant ($\beta = .11$, $p = .002$).

For the girls (Model 2), a significant connection is seen both between motor ability and the mediator physical self-concept, and between physical self-concept and self-esteem. However, the connection between motor ability and perceived social acceptance is missing, as is that between perceived social acceptance and self-esteem. The direct path from motor ability to self-esteem is not significant. When the mediation is tested, via an analysis of the indirect effects, a significant overall indirect effect is noted here too ($\beta = .07$, $p = .031$). This is explainable exclusively by the indirect effect via physical self-concept ($\beta = .07$, $p = .043$), because the indirect effect via perceived social acceptance does not reach significance in girls ($\beta = .00$, $p = .968$).

In order to compare the two models between the groups of boys and girls, a multi-group analysis was carried out (all regression path constraints), which reveals that the two

models differ significantly from one another ($\Delta\chi^2 = 28.85$, $df = 16$, $p = .025$). This means, therefore, that gender serves as a significant moderator in the multiple mediation model. In summary, it can be asserted that both physical self-concept and perceived social acceptance serve as mediators between motor ability and self-esteem in boys. In girls, on the other hand, the mediation between motor ability and self-esteem only takes place via physical self-concept.

Discussion

The aim of the present study was to explore the longitudinal relationship between motor ability, physical self-concept, perceived social acceptance and self-esteem. In particular, it examined whether the relationship between motor ability and self-esteem is mediated by physical self-concept or perceived social acceptance, and whether the pattern of correlations is different for boys and for girls in early adolescence. It emerged that both physical self-concept and perceived social acceptance serve as mediators between motor ability and self-esteem in boys, whereas only physical self-concept performs this role in girls. Since the two models being compared differed significantly from one another, gender has been identified as a moderator in the investigated relationships.

Physical self-concept as a mediator between motor ability and self-esteem

Physical self-concept was found to be a mediator of the relationship between motor ability and self-esteem, in both boys and girls. While most mediational model studies have used sports activity as a predictor variable (Bowker, 2006; Haugen et al., 2011), the current study used motor ability. In the process, it was possible for the first time to show using longitudinal data that the mediation postulated in adolescents also occurs when motor ability is included as a predictor variable. This is certainly one of the strengths of this study, when one considers that other studies connecting motor ability with self-esteem mostly report correlational findings (Skinner & Piek, 2001; Piek et al., 2006; Vedul-Kjelsås et al., 2011). Although the pattern of our results is in line with the study of Vedul-Kjelsås et al. (2011)

showing higher correlations between physical self-concept and self-esteem than between motor ability and physical self-concept, it should be noted that our correlations between all the constructs studied are much lower. This fact confirms the theoretical and methodological assumption that longitudinal studies including auto-correlations of variables that have been measured at the earlier measurement point reduce the probability of inflated regression weights when using structural equation modelling (Little, Preacher, Selig, & Card, 2007). Nevertheless, once again, motor ability has been identified as an important factor influencing both domain-specific self-perceptions, such as physical self-concept (Hands et al., 2009; Haugen et al., 2013), as well as general self-perceptions, such as global self-esteem (Vedul-Kjelsås et al., 2011). Therefore, its importance within the physical self-system has to be kept in mind, for example, when designing sports-related interventions aimed at increasing self-esteem. Because based on the assumptions of the EXSEM (Sonstroem & Morgan, 1989) and the corresponding empirical evidence (Fox, 2000; Sonstroem et al., 1994), sports activity only leads to an increase in physical self-concept when it is mediated through better physical abilities. Interventions designed to promote positive self-perceptions only by means of an increased amount of physical activity, without keeping an eye on improving motor ability, could therefore possibly have a less pronounced effects on self-concept.

Within the examined mediation process, the high correlation between physical self-concept and self-esteem in both boys and girls needs to be discussed. This finding highlights the importance of satisfaction with one's own body and appearance during adolescence for global self-esteem and overall well-being (Bowker, 2006; Haugen et al., 2011; Vedul-Kjelsås et al., 2011), whereby Harter (2012) actually postulates an inextricable link between these two constructs. Early adolescence is certainly a crucial developmental phase, in which physical changes occur and uncertainties arise about one's altered body. In this context, the detrimental role of the media over the past decade – by offering unhealthy messages about ideal body size, thinness and attractiveness – has been discussed in relation to lower physical self-

concept and thus self-esteem (Harter, 2012; Levine & Murnen, 2009). In order to help children and adolescents to develop a healthy physical self-image, it is necessary to explicitly put into perspective the exaggerated and unrealistic standards set by the media. Even if one's body deviates from the norm, it should be possible to find it beautiful and to accept it. On the other hand, lack of body fat, physical fitness or motor ability are key correlates that are associated with physical self-concept in complex ways (Haugen et al., 2013; Vedul-Kjelsås et al., 2011). Hence it is not only that increased physical activity leads to greater fitness and better motor ability, but conversely that a certain level of motor ability and physical fitness are necessary in order to participate in sports activities (Stodden et al., 2008). Competence-oriented physical activity interventions at school could ensure that children and adolescents do not become trapped early on in this downward spiral between low physical self-concept and low self-esteem.

Perceived social acceptance as a mediator between motor ability and self-esteem

Perceived social acceptance was identified as a mediator between motor ability and self-esteem only among boys, but not among girls. From the perspective of the sociometer hypothesis (Leary et al., 1995), this result is astonishing, since empirical studies have found global self-esteem to depend on the sense of social acceptance to the same extent for both sexes (Denissen et al., 2008). The observed gender difference is also surprising in the context of developmental studies of the self (Granleese & Joseph, 1994), which show that perceived social acceptance is another powerful predictor of global self-esteem after physical self-concept. However, when one considers how adolescent boys and girls differ in terms of their game-playing and group behaviour, this might be viewed as a potential explanation of the present findings. Whereas girls spend more time on dyadic interactions, boys tend to play in larger groups (Rose & Rudolph, 2006; Smith et al., 2013), whereby they differ not only in terms of the time spent in these social constellations, but also in terms of the importance they attribute to the overall group and the resulting reputation. Boys care much more about their

status within the peer group than do girls (LaFontana & Cillessen, 2010), which could explain its stronger influence on their self-esteem.

A methodological explanation for the zero correlation between perceived social acceptance and self-esteem in girls could be that, by using Harter's (1982) social competence subscale, we were assessing the perceived social acceptance within the peer group as a whole. Other studies distinguish between perceived same-sex and opposite-sex social acceptance (Lyu & Gill, 2012). Considering that girls maintain more intimate relationships mainly with same-sex peers, perceived same-sex peer acceptance may be more strongly related to global self-esteem than "general" perceived social acceptance. Future studies could therefore include instruments to measure general *and* gender-specific perceived social acceptance. Furthermore, one might speculate that assessing social acceptance not with questionnaires but with sociometric methods, for example, would have led to different results. Boys seem to have less accurate perceptions of their social acceptance than girls (Smith et al., 2013), maybe as a consequence of the aforementioned different playing and interaction behaviour. Spending more time in intimate, dyadic interactions provides girls with more information about how much they are liked or disliked. Accordingly, boys may have more difficulties obtaining clear information, since their peer interactions are more centred on play activities. For example, in a recreational football game, boys may be selected onto a team because of their motor abilities and not because they are liked by their peers. So, it could be difficult for boys to distinguish between being selected and being liked. This could explain why their personal assessment of social acceptance is not as accurate as that of the girls. We have, however, not included any objective measures in our study that allow us to answer this question. Multi-informant approaches (combining peers', teachers' and self-perceived social acceptance, for example) might be an interesting way of disentangling this problem.

While no connection was apparent between motor ability and perceived social acceptance in girls, these two variables are substantially linked in boys. This gender-specific

difference in the connection between motor ability and perceived social acceptance could be explained as follows. Even though physical activity is an important domain in adolescence for both sexes, boys not only get more involved in physical activity and have a higher general affinity for sports than girls; motor ability is also quite clearly a greater source of popularity for boys than it is for girls (Chase & Dummer, 1992; Chase & Machida, 2011; Evans & Roberts, 1987). A boy who is good at sports has a higher status within his class and is more popular both among his own sex and among the opposite sex, as has already been demonstrated in earlier studies (Adler, Kless, & Adler, 1992; Eder & Kinney, 1995). In contrast to this, the most important determinant of social status for a girl seems to be attractiveness (Chase & Machida, 2011). For sports-related interventions that aim to exert a positive influence on domain-specific self-concept, this could lead to a gender-specific design: because whereas in boys improving motor ability also increases perceived social acceptance, this is not enough in girls to achieve a positive influence on perceived social acceptance. Perhaps it is necessary not only to promote motor ability in girls, but also to choose a didactic implementation that puts more emphasis on cooperation. For example, Marsh and Peart (1988) showed that a fitness program with two different didactic implementations had different effects on domain-specific self-esteem in high school girls: a cooperative fitness program enhanced physical ability self-concept and physical appearance self-concept, whereas a competitive program lowered them.

Limitations and future directions

Even though the present study has been able to provide additional insights into the underlying mechanisms operating between motor ability and self-esteem, it does have certain limitations. Additional variables presented in the EXSEM could, for example, have given an even more comprehensive insight into the interrelationship under investigation. Thus neither the amount of physical activity, nor the self-efficacy, nor the perceived physical competence was included in the models. It was therefore not possible to test the entire EXSEM

(Sonstroem & Morgan, 1989), even though the mediation via physical self-concept does of course represent further empirical evidence for the assumed operating mechanism of the model. In addition to the objective measures of motor ability, one could also measure and control factors that may explain differences between boys and girls on motor ability and self-perceptions: e.g. puberty or body mass index. Such variables should, therefore, be taken into account in future studies, in order to better understand the important interrelationship between motor ability, perceived social acceptance, physical self-concept and global self-esteem.

The present study is also limited in that the findings are representative only for children in late childhood. With a larger sample size, including younger children and maybe adolescents, age could be investigated as another possible moderator in the assessed relationships. Thus, one can imagine that the interrelationship between the investigated constructs changes during children's development, for example because social acceptance by peers is less important in early than in late childhood (Harter, 2012). With the present sample, however, no implications can be drawn for younger or older children. Nevertheless, it has to be stated that the investigated sample includes children from all social classes, permitting interferences about the relationship between motor ability, perceived social acceptance, physical self-concept and global self-esteem in the population of same-aged children.

In sum, the central findings of our longitudinal study using structural equation modelling to perform a multiple mediation model revealed that, in boys, both physical self-concept and perceived social acceptance are mediators between between motor ability and self-esteem, whereas in girls only physical self-concept mediates the relationship.

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Tables and Figures

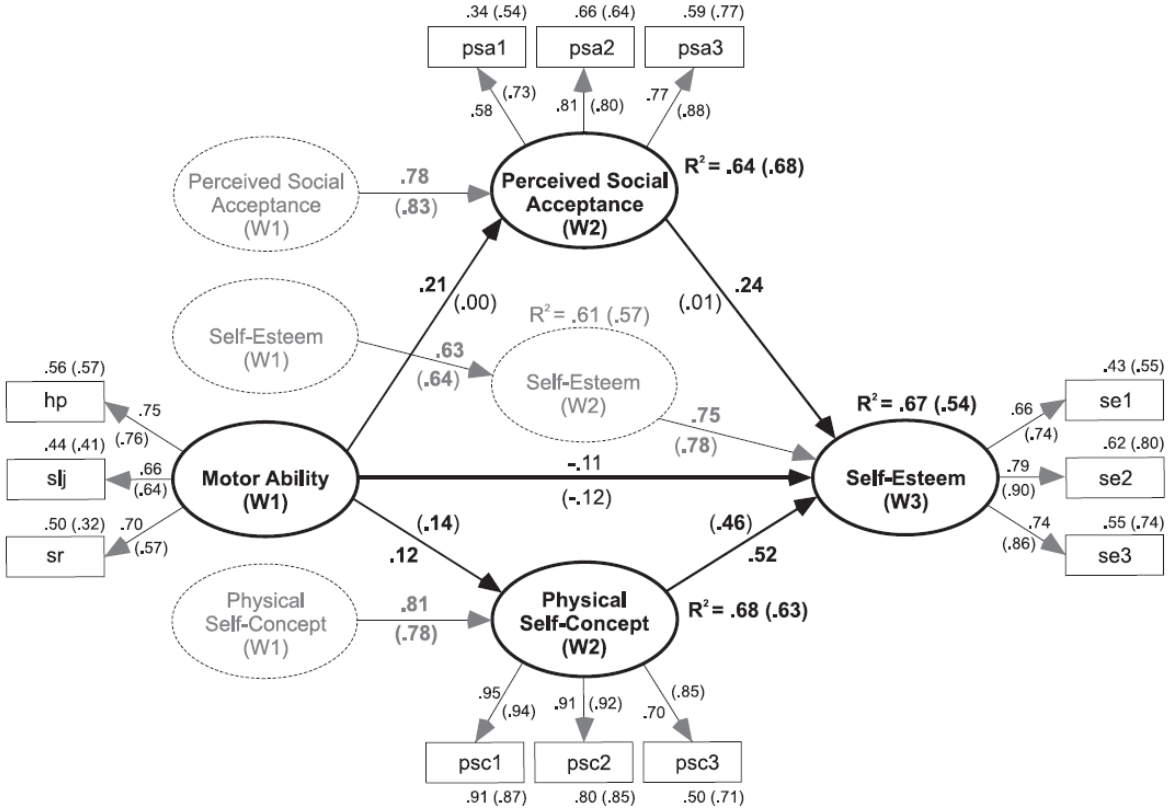

Figure 1. Path diagram of the two models, with motor ability as the predictor variable, perceived social acceptance and physical self-concept as mediators, and self-esteem as the outcome variable. All reported path coefficients (bold when significant, $p < .05$, in parenthesis for girls) are standardized estimates. For a better overview, the manifest variables are not shown in auto-correlated latent variables (dashed lines).

Table 1

Descriptive statistics and mean differences using independent t-tests between all variables by gender, and Pearson correlations for the latent variables

Variable	Descriptive statistics and mean differences by gender						Pearson correlations by gender							
	Boys (n = 230)	Girls (n = 198)	Total (n = 428)	t	p	d	1	2	3	4	5	6	7	8
1 Motor ability (z-stand.)	**.28 (.77)**	**-.27 (.67)**	**.00 (1.00)**	**7.73**	**<.0005***	**.76**	**-**	**.11**	**.16***	**.16***	**.07**	**.07**	**.11**	**.17***
hagedorn parcours	31.10 (4.42)	33.33 (4.06)	32.12 (4.39)	5.36	<.0005*	.51								
standing long jump	1.60 (.20)	1.46 (.18)	1.54 (.20)	7.52	<.0005*	.73								
shuttle run	374 (130)	307 (118)	343 (129)	5.53	<.0005*	.54								
2 Physical self-concept (W1)	**3.52 (.60)**	**3.37 (.70)**	**3.45 (.66)**	**2.46**	**.014***	**.23**	**.17***	**-**	**.77***	**.07**	**.15***	**.63***	**.65***	**.53***
3 Physical self-concept (W2)	**3.55 (.60)**	**3.39 (.73)**	**3.48 (.67)**	**2.41**	**.016***	**.24**	**.23***	**.70***	**-**	**.08**	**.19***	**.52***	**.76***	**.66***
4 Perceived social acceptance (W1)	**3.31 (.63)**	**3.23 (.64)**	**3.28 (.64)**	**1.13**	**.258**	**.13**	**.26***	**.18***	**.08**	**-**	**67***	**.11**	**.19***	**.12**
5 Perceived social acceptance (W2)	**3.27 (.69)**	**3.28 (.73)**	**3.28 (.71)**	**.056**	**.956**	**.01**	**.29***	**.17***	**.32***	**.67***	**-**	**.17***	**.27***	**.17***
6 Self-esteem (W1)	**3.53 (.50)**	**3.41 (.60)**	**3.47 (.55)**	**2.23**	**.026***	**.22**	**.06**	**.55***	**.52***	**.11**	**.17***	**-**	**.64***	**.63***
7 Self-esteem (W2)	**3.52 (.53)**	**3.37 (.58)**	**3.45 (.56)**	**2.73**	**.007***	**.27**	**.16***	**.58***	**.76***	**.20***	**.27***	**.64***	**-**	**.72***
8 Self-esteem (W3)	**3.56 (.53)**	**3.42 (.56)**	**3.50 (.53)**	**2.43**	**.016***	**.26**	**.16***	**.53***	**.66***	**.12**	**.36***	**.63***	**.72***	**-**

Note. *p < .05; means with standard deviations in parentheses; latent variables in bold, manifest variables in normal type; the motor ability test score is z-standardized; hagedorn parcours = test score in seconds; standing long jump = test score in meters; shuttle run = 20 meter shuttle run test score in seconds; W = wave; in correlations, girls lie above and boys below the diagonal.

Table 2

Goodness of fit statistics for the estimated models compared with recommendations for model evaluation by Schermelleh-Engel et al. (2003).

Model	χ^2	*p* (df)	χ^2/df	CFI	RMSEA	SRMR
A.S.		≥ .05	≤ 3	≥ .95	≤ .08	≤ .10
Configural model	628.92	<.0005 (459)	1.37	.972	.029	.043
Measurement model	647.27	<.0005 (475)	1.36	.971	.029	.043
Model 1 – boys	320.25	<.0005 (227)	1.41	.968	.042	.043
Model 2 – girls	302.68	.001 (227)	1.33	.975	.041	.043

Note. A.S. = Accepted Standard for Good Fit; *CFI* = Comparative Fit Index; *RMSEA* = Root Mean Square Error of Approximation, *SRMR* = Standardized Root Mean Square Residual.