

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

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## Abstract

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

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

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21 social acceptance

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

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

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

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

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

72 Sigmundsson, Stensdotter, & Haga, 2011). Of these, particularly motor ability, which is  
73 conceptualised as a person's ability to perform different motor skills (Kent, 2006), takes on a  
74 special position in the development of children and adolescents (Skinner & Piek, 2001). It not  
75 only influences physical self-concept as a domain-specific form of self-esteem, but also more  
76 global determinants of mental health: it is known, for example, that children with poor motor  
77 abilities tend to have lower self-esteem or generally display less life satisfaction (Piek,  
78 Baynam, & Barrett, 2006). Furthermore, besides a certain level of motor skills, a certain level  
79 of motor abilities is necessary in order to take part in physical activities in the first place,  
80 which in turn promote positive health outcomes (Stodden et al., 2008; Vedul-Kjelsås et al.,  
81 2011). This is reflected by the fact that children and adolescents with strong motor abilities  
82 are more physically active than those with poor motor abilities (Hands, Larkin, Parker,  
83 Straker, & Perry, 2009). Although motor ability appears to play such an important role for  
84 successful development in childhood and adolescence, and is linked to both physical self-  
85 concept and global self-esteem, we are not aware of any studies in which motor ability has  
86 been included in a mediation model predicting global self-esteem. This is even more  
87 astonishing when one considers that one of the hypotheses explaining the relationship  
88 between physical activity and self-esteem is an improvement in actual motor abilities, which  
89 in turn leads to enhanced physical self-concept and ultimately influences general self-esteem  
90 (Fox, 2000). For this reason, this study will focus on the contribution to global self-esteem  
91 made by motor ability as mediated through physical self-concept. In doing so, physical self-  
92 concept will be assumed to be one of two potential mediator between motor ability and self-  
93 esteem.

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

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

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

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

117         There is striking evidence that being good at sports and being physically skilful are  
118 important factors, primarily for male popularity (Chase & Dummer, 1992; Chase & Machida,  
119 2011; Evans & Roberts, 1987). Boys tend more often to play in large groups, whereas girls  
120 engage more in dyadic interactions and maintain more intimate relationships (Rose &  
121 Rudolph, 2006; Smith, Van Gessel, David-Ferdon, & Kistner, 2013). The priority of peer  
122 status increases between childhood and adolescence, and this need for a reputation is more  
123 pronounced in boys than girls (LaFontana & Cillessen, 2010). This finding can be explained

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

### 129 **Multiple mediation model**

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





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

### 179 **Participants**

180 The sample analysed consisted of 428 5th grade pupils (46.3 % girls,  $M_{age} = 11.9$ ,  $SD = .55$ )  
181 from 23 different schools in urban and rural areas around the city of Bern, Switzerland, where  
182 three physical education lessons per week are compulsory. Since there is evidence for  
183 differences between rural and urban settings, for example in the physical activity or physical  
184 fitness level of children (Joens-Matre et al., 2008), the schools included were chosen so that  
185 approximately the same number of them were located in urban ( $n = 11$ ) and rural areas ( $n =$   
186  $12$ ). Analyses of the physical activity level ( $M = 2.82$ ,  $SD = .81$ ) and the socioeconomic status  
187 ( $M = 6.33$ ,  $SD = 1.66$ ; ranging from 1 to 9) provide evidence that the present sample is  
188 representative for a large population of same-aged children from different social classes. The  
189 230 boys ( $M_{age} = 11.9$ ,  $SD = .58$ ) differed as expected from the 198 girls ( $M_{age} = 11.8$ ,  $SD =$   
190  $.49$ ) in the amount of weekly physical activity ( $t(426) = 3.62$ ,  $p < .0005$ ,  $d = .74$ ), with boys  
191 ( $M = 3.10$ ,  $SD = .83$ ) being more active than girls ( $M = 2.50$ ,  $SD = .79$ ), but not with respect  
192 to their socioeconomic status ( $M_{boys} = 6.36$ ,  $SD = 1.61$ ;  $M_{girls} = 6.25$ ,  $SD = 1.71$ ;  $t(426) = .63$ ,  
193  $p = .527$ ,  $d = .07$ ). Out of the original dataset, with  $N = 464$ , 18 cases had to be excluded due  
194 to missing values for sex. To detect multivariate outliers, the Mahalanobis distance values  
195 were calculated as  $\chi^2$  at  $p < .001$  with 14 degrees of freedom (equal to the number of latent  
196 variables; Fidell & Tabachnick, 2003). Based on the table of critical values for chi-squared  
197 distributions, 18 cases having a Mahalanobis distance greater than 36.123 were identified as  
198 probable multivariate outliers and were therefore excluded. However, the pattern of results  
199 did not change when they were included in the analysis.

200 **Measures**

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

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

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

215 The *Multistage 20 Meter Shuttle Run Test* (Léger, Mercier, Gadoury, & Lambert,  
216 1988) was used to measure endurance. Participants had to run back and forth along a 20 m  
217 course and touch the 20 m line with their foot when a sound signal was emitted from a pre-  
218 recorded tape. The frequency of the sound signals was increased every minute, by 0.5 km/h,  
219 starting with a speed of 8.5 km/h. The test ended when participants failed twice in succession  
220 to reach the line before the signal sounded. The test score is the time achieved in seconds.  
221 Evidence for the reliability and validity of the test in 12- to 15-year-olds has been provided by  
222 Liu, Plowman, and Looney (1992).

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

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

236       **Perceived social acceptance.** The measure “Selbstkonzept der sozialen Akzeptanz”  
237 (*Self-Concept of Social Acceptance*, Fend, Helmke, & Richter, 1984) was used to assess the  
238 perceived social acceptance by one’s peers. Fend et al. (1984) translated the 6 items from the  
239 social competence subscale of Harter’s Perceived Competence Scale for Children (Harter,  
240 1982) and changed the response scale from a four-point structured alternative format to a 4-  
241 point Likert scale. The factor loadings of the individual items ranged between .50 and .68,  
242 with a Cronbach’s alpha of .78. The short form of the scale consisted of 3 items with one  
243 example of a negative item being: “No matter what I do, somehow I’m just not popular  
244 among classmates”. All items were rated on a 4-point Likert scale ranging from 1 (strongly  
245 disagree) to 4 (strongly agree). The test-retest reliability with a time interval of ten weeks was  
246  $r = .70$  for the present sample. Cronbach’s alpha was .79 at Wave 1 and .81 at Wave 2.

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

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

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

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

## 270 **Procedure**

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

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

### 283 **Statistical analyses**

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

288 In order to test the main hypotheses of the study – that physical self-concept and  
289 perceived social acceptance mediate the relationship between motor ability and self-esteem –  
290 structural equation modelling procedures were performed (using full-information maximum  
291 likelihood methods for model estimation). First and foremost, two conditions were tested to  
292 ensure that multi-group analyses are permissible: the models to be compared must exhibit  
293 configural as well as measurement invariance (Byrne, 2010). Configural invariance exists if  
294 the factor-loading patterns are the same across the groups to be compared and if the models fit  
295 the data well (based on the evaluation of multiple fit indices). Measurement invariance exists  
296 if the  $\chi^2$  difference test between the two models is not significant. Based on simulation  
297 studies, Cheung and Rensvold (2002) conclude that the  $\chi^2$  difference test is too restrictive and  
298 recommend that only CFI differences larger than .01 should be considered relevant; hence the  
299 CFI difference was also calculated. In order to test the hypothesized mediation effects, bias-  
300 corrected bootstrap analyses (95% BC confidence level; Bollen & Stine, 1992) were  
301 performed, to reveal the indirect effects as significantly different from zero (Shrout & Bolger,  
302 2002). Since bootstrap procedures require complete data sets, missing values were simply  
303 imputed by applying AMOS's regression imputation. Finally, multi-group analyses were

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

307 To assess model-data fit, standard indices were calculated and compared with the  
308 criteria for acceptable fit recommended by Schermelleh-Engel, Moosbrugger and Müller  
309 (2003): the chi-square statistic; comparative fit index (CFI, with values equal to .95 or better);  
310 the root mean square error of approximation (RMSEA, which should be .08 or less); and the  
311 standardized root mean square residual (SRMR, with .10 or less for a good model fit). To  
312 facilitate the comparison with other studies, all path coefficients are presented as standardized  
313 estimates. A significance level of .05 was set for all tests. When effect size was calculated, it  
314 was interpreted by means of Cohen's (1988) definition of small, medium, and large effects  
315 (Cohen's  $d = .20, .50, .80$ ).

## 316 Results

### 317 Preliminary Analyses

318 [Insert Table 1 here]

319 Table 1 shows descriptive statistics and mean differences between all the variables by  
320 gender, and bivariate correlations between all the latent variables by gender. All variables  
321 were normally distributed with skewness values of -1.48 to .67 and kurtosis values of -1.12 to  
322 2.00. Independent  $t$ -tests revealed that boys outperformed girls in all three motor ability tests  
323 used. The reported effect size can be described as medium to large. Furthermore, boys are  
324 more satisfied with their bodies than girls are, and have higher levels in general self-esteem  
325 than girls, as represented by a small effect. All differences in favour of boys agree with  
326 previous findings and will not be discussed further (for motor ability see Carraro, Scarpa, &  
327 Ventura, 2010; Hands et al., 2009; for self-esteem and physical self-concept see Gentile et al.,  
328 2009).

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

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

#### 346 **Primary Analyses**

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

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

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

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

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



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

### 386 **Discussion**

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

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

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

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

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

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

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

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

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

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

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

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

### 503 **Limitations and future directions**

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

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

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

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

531

532

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535

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Tables and Figures

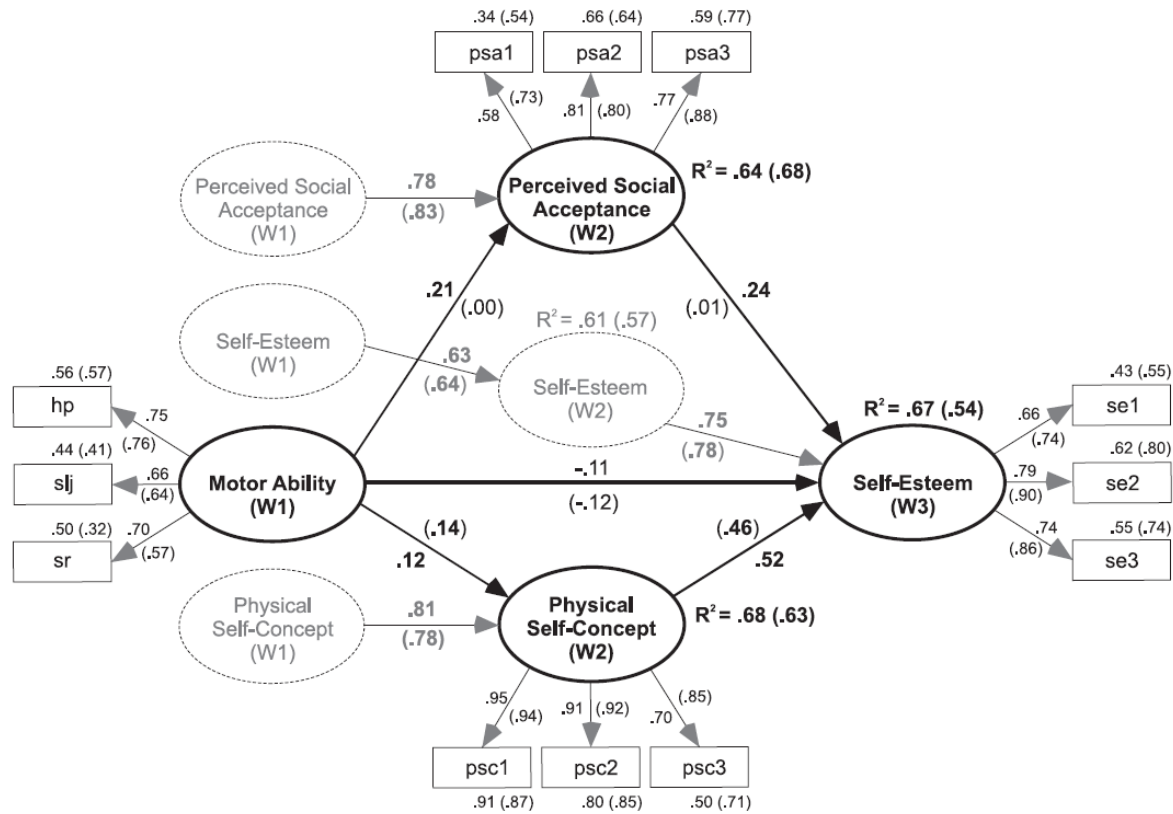


Figure 1. Path diagram of the two models, with motor ability as the predictor variable, perceived social acceptance and physical self-concept as mediators, and self-esteem as the outcome variable. All reported path coefficients (bold when significant,  $p < .05$ , in parenthesis for girls) are standardized 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)	<i>t</i>	<i>p</i>	<i>d</i>	1	2	3	4	5	6	7	8
<b>1 Motor ability (z-stand.)</b>	<b>.28 (.77)</b>	<b>-.27 (.67)</b>	<b>.00 (1.00)</b>	<b>7.73</b>	<b>&lt;.0005*</b>	<b>.76</b>	-	.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								
<b>2 Physical self-concept (W1)</b>	<b>3.52 (.60)</b>	<b>3.37 (.70)</b>	<b>3.45 (.66)</b>	<b>2.46</b>	<b>.014*</b>	<b>.23</b>	.17*	-	.77*	.07	.15*	.63*	.65*	.53*
<b>3 Physical self-concept (W2)</b>	<b>3.55 (.60)</b>	<b>3.39 (.73)</b>	<b>3.48 (.67)</b>	<b>2.41</b>	<b>.016*</b>	<b>.24</b>	.23*	.70*	-	.08	.19*	.52*	.76*	.66*
<b>4 Perceived social acceptance (W1)</b>	<b>3.31 (.63)</b>	<b>3.23 (.64)</b>	<b>3.28 (.64)</b>	<b>1.13</b>	<b>.258</b>	<b>.13</b>	.26*	.18*	.08	-	.67*	.11	.19*	.12
<b>5 Perceived social acceptance (W2)</b>	<b>3.27 (.69)</b>	<b>3.28 (.73)</b>	<b>3.28 (.71)</b>	<b>.056</b>	<b>.956</b>	<b>.01</b>	.29*	.17*	.32*	.67*	-	.17*	.27*	.17*
<b>6 Self-esteem (W1)</b>	<b>3.53 (.50)</b>	<b>3.41 (.60)</b>	<b>3.47 (.55)</b>	<b>2.23</b>	<b>.026*</b>	<b>.22</b>	.06	.55*	.52*	.11	.17*	-	.64*	.63*
<b>7 Self-esteem (W2)</b>	<b>3.52 (.53)</b>	<b>3.37 (.58)</b>	<b>3.45 (.56)</b>	<b>2.73</b>	<b>.007*</b>	<b>.27</b>	.16*	.58*	.76*	.20*	.27*	.64*	-	.72*
<b>8 Self-esteem (W3)</b>	<b>3.56 (.53)</b>	<b>3.42 (.56)</b>	<b>3.50 (.53)</b>	<b>2.43</b>	<b>.016*</b>	<b>.26</b>	.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	$\chi^2$	$p$ (df)	$\chi^2/df$	CFI	RMSEA	SRMR
A.S.		$\geq .05$	$\leq 3$	$\geq .95$	$\leq .08$	$\leq .10$
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.