

Running head: [VERIDICALITY OF SELF-CONCEPT OF STRENGTH]

THE VERIDICALITY OF THE SELF-CONCEPT OF STRENGTH IN MALE
ADOLESCENTS¹

MIRKO SCHMIDT, STEFAN VALKANOVER, AND ACHIM CONZELMANN

Institute of Sport Science, University of Bern

¹ Address correspondence to Mirko Schmidt, University of Bern, Institute of Sport Science, Bremgartenstrasse 145, 3012 Bern, Switzerland or email (mirko.schmidt@ispw.unibe.ch).

Summary.— Physical self-concept and the veridicality (i.e. the reality relatedness of one's self-perceptions) change during childhood and adolescence and are related to performance in physical fitness, exercise activity and global self-esteem particularly in male adolescents. This cross-sectional study aimed to examine the relationship between self-concept of strength and actual strength in groups of male adolescents ages 12 to 15. For this purpose, 889 male adolescents ($M_{age} = 13.22$ years, $SD = 1.0$) were questioned about their self-concept of strength, and a test of strength was carried out. The results showed that the correlation between the self-concept of strength and the actual strength is higher in older (14 and 15 year old) than younger (12 and 13 year old) adolescents. A chi-square test revealed a significant association between the age groups and the veridicality, indicating that realists are underrepresented in younger, but overrepresented in older adolescents. No association between adolescent's physical activity and their veridicality was found. The consequences for further research trying to shed light on the development of the veridicality in the physical domain are discussed.

1 Having a positive self-concept (i.e., a positive valuation of one's competencies and
2 personal characteristics) is consistently regarded to be a desirable developmental goal (e.g.
3 Harter, 2006). Research has linked high levels of self-concept with achievement motivation (e.g.
4 Eccles, Wigfield, Harold, & Blumenfeld, 1993), academic performance (e.g. Marsh & Martin,
5 2011), work satisfaction (Judge & Bono, 2001) and with athletic performance (Marsh & Perry,
6 2005). Since the self-concept has traditionally been studied by a wide range of different
7 disciplines, a large number of scientific papers have been written on it incorporating many
8 different definitions of self-concept (Harter, 2005). Shavelson, Hubner and Stanton (1976)
9 proposed a model in which four aspects of self-concept are considered as sub-concepts
10 (academic, emotional, social and physical self-concept). The physical self-concept is further
11 subdivided into "physical appearance" and "physical ability" (Shavelson & Marsh, 1986). In
12 sport psychology (and in the present paper), special attention is paid to the sub-dimension of
13 "physical ability" as it reflects one's perceived physical competence, which is not only related to
14 other dimensions of physical self-concept (Carraro, Scarpa, & Ventura, 2010), but also to the
15 performance in physical fitness and physical activity (Burkhalter & Wendt, 2001; Chan et al.,
16 2003). Furthermore, perceived physical competence seems to be of fundamental importance
17 particularly for male adolescents, since it is much more related to global self-worth than in
18 female adolescents (Vedul-Kjelsås, Sigmundsson, Stensdotter, & Haga, 2011).

19 Self-concept is generally thought to develop in two ways during grade school years. First,
20 the domain-specificity of self-concept increases between the ages of five and eight (e.g. Harter,
21 2006; Pintrich & Blumenfeld, 1985). That is, the rather global self-concept of early childhood
22 evolves into the dimensions of an academic, emotional, social and physical self-concept (Marsh,
23 Ellis, & Craven, 2002). Second, younger children tend to have high competence beliefs that are

1 very resistant to contradictory feedback and to past experiences (Stipek & Hoffman, 1980;
2 Wigfield & Eccles, 2002). Their self-concepts are usually very positive and just vaguely match
3 reality. With increasing age, however, these extremely excessive self-perceptions become
4 “healthy”, in the sense that they more accurately reflect the children’s actual competence
5 (Eccles, et al., 1993; Harter, 2005). Hence, primary school children typically have a low
6 correlation between external assessment (e.g. teachers’ judgment, marks, test results) and their
7 self-perceptions of performance, and this correlation increases in later childhood and early
8 adolescence (Marsh, Craven, & Debus, 1991; Stipek & Mac Iver, 1989; Weinert & Schneider,
9 1999). Whereas, cognitive-developmental theorists explain these more accurate self-perceptions
10 by the increasing cognitive abilities and more sophisticated information processing of the
11 growing child (e.g. Nicholls, 1989), others tend to emphasize the significant impact of typical
12 changes in the structure and social context affecting the self-concept of the child, e.g. school
13 enrollment (Harter, 1999, 2005). Certainly, intensive experience with one’s own performance in
14 a specific domain and increasing social comparison processes play a crucial role in the
15 development of realistic self-perceptions (Butler, 2005).

16 This developmental trend has also been observed in the physical domain. Feltz and
17 Brown (1984) stated that the correlation between children’s perceived and actual soccer abilities
18 increases steadily between the age of 9 and 14. Rudisill, Mahar and Meaney (1993) came to a
19 similar conclusion and argued that the relationship between perceived and actual motor
20 competence rises between the age of 9 and 11. Horn and Weiss (1991) claimed that there is a low
21 correlation only between third and fourth grade pupils’ perceptions and their actual physical
22 competence ($r = .21-.32$) and that fifth to seventh grade pupils show a higher correlation ($r = .49-$
23 $.69$). Raudsepp and Liblik (2002) showed that actual and perceived motor competence were

1 significantly but only moderately ($r = .25-.56$) correlated. They concluded that 10 to 13 year old
2 children can only assess their personal motor competence moderately accurately. In contrast,
3 Jürimäe and Saar (2003) found a significant moderate correlation between actual and perceived
4 endurance ($r = .31-.51$), but no significant correlation between actual and perceived strength ($r =$
5 $.03-.21$) in 10 to 17 year olds. Carraro, et al. (2010) revealed 12 to 15 year olds to be quite
6 accurate in their perception of endurance ($r = .60$) but not of strength ($r = .28$).

7 The relation between an individual's self-perception and the correspondent external
8 validity criterion is also called "veridicality". In a broad conceptual sense, veridicality is defined
9 as the extent to which a knowledge structure accurately reflects the information environment it
10 represents (Walsh, Henderson, & Deighton, 1988). One special case of such accurate judgment is
11 self-judgment or self-appraisal. This transforms the subject into the object being judged.
12 Helmkes' (1992) narrow understanding of "veridicality" (which is used here) as "the reality
13 relatedness of one's self-perceptions" (p. 197, translated) thereby further narrows the concept
14 from judgment research in order to restrict it to the act of self-perception. One possibility to
15 verify the veridicality is to compare self-perceptions with perceptions from other observers (e.g.
16 Kwan, John, Kenny, Bond, & Robins, 2004). The second possibility is to compare self-
17 perceptions with objective standards or tests (e.g. Dunning, Heath, & Suls, 2004). Studies have,
18 for example, compared self-assessment of academic skills of students with their test scores or
19 grades at the end of the semester (Kurman & Eshel, 1998; Robins & Beer, 2001), or athletic
20 ability assessments with sport motor test performance (Germain & Hausenblas, 2006). This
21 second option seems to be more appropriate in order to minimize distortions on the side of the
22 observer.

1 A realistic estimation of one's competences (i.e. veridicality) seems to be not only for the
2 general development but especially in the physical context of particular importance. Several
3 authors have suggested that veridicality is related to achievement motivation, adequate task
4 choice and task performance (Försterling & Morgenstern, 2002; Harter, 2006; McFarlin,
5 Baumeister, & Blascovich, 1984) and has been interpreted as potentially preventing
6 inappropriate risk-taking behavior (Plumert, 1995; Schwebel & Plumert, 1999). Weiss and Horn
7 (1990), for instance, have shown how achievement related cognitions differ in children with a
8 tendency to over- or underestimate compared to those who assess themselves realistically.
9 Difference scores were calculated on the basis of examinations of their perceived physical
10 competence and their actual competence, and the children were divided into three groups: those
11 who underestimated their skills (underestimators), those who assessed themselves realistically
12 (realists) and those who overestimated themselves (overestimators). Results showed that
13 underestimators had less challenge motivation, higher trait anxiety and higher external control
14 perceptions than realists. Plumert (1995) showed in a study of 6 and 8 year olds that an
15 overestimation of one's own physical abilities is related to the number and severity of everyday
16 injuries. The more children overestimate, the greater the danger of getting hurt. Gender-specific
17 analyzes revealed that this effect was stronger in boys than in girls. Since results of further
18 studies of this group show similar findings (Plumert, Kearney, & Cremer, 2004; Plumert &
19 Schwebel, 1997), the authors warn about overestimations especially in the physical domain.

20 In view of these empirical findings, the question arises whether this general
21 developmental trend of increasing veridicality as adolescents get older is also found in the self-
22 concept of strength. The main purpose of the present study was to examine the relationship
23 between self-concept of strength and actual strength in groups of male adolescents ages 12 to 15.

1 It is assumed that (a) the correlation between the two variables are higher in older (14 and 15
2 year old) then in younger (12 and 13 year old) adolescents. (b) The group of older adolescents
3 (14-15 year olds) should consist in less under- and overestimators and more realists than the
4 group of younger adolescents (12-13 year olds). And since intensive experience of the own
5 strength can be made by engaging in physical activities, (c) the group of adolescents who have
6 higher levels of physical activity should consist in less under- and overestimators and more
7 realists than the group of adolescents who have lower levels of physical activity.

8 Method

9 *Participants*

10 A total of 889 male adolescents from 25 elementary and 53 secondary classes, aged 12,
11 13, 14, and 15 ($M_{age} = 13.22$ years, $SD = 1.0$) took part in the study. Sample sizes for each of the
12 four age groups are given in Table 1. All classes were recruited from areas with heterogeneous
13 socioeconomic structure. Since the education fair booth in which a part of the data was collected,
14 informed about sports, civil protection and military, girls did not participate. Both the
15 participants themselves and their parents gave their consent to taking part in the study. The
16 parents of two pupils asked for further information on the data collection processes and on the
17 goals of the study. However, by means of a telephone conversation with the respective parents,
18 their concerns could be allayed. All data were anonymous and did not include any information,
19 which might allow identifying any individuals.

20 There was some data loss due to non-participation in the shot-put performance test
21 because of injury ($n = 14$). Thus, the percentage of subjects with incomplete data was 1.5%.
22 Independent t tests showed that their mean of the self-concept of strength ($M = 3.19$, $SD = .70$)
23 and the weekly physical activity ($M = 2.02$, $SD = 2.54$) did not differ from the mean of the self-

1 concept of strength ($M = 3.01$, $SD = .54$) and the weekly physical activity ($M = 2.56$, $SD = 2.41$)
2 of the rest of the sample ($t_{903} = 1.31$, $p = .191$, $d = .35$; $t_{903} = .83$, $p = .405$, $d = .22$). All missing
3 values were equally distributed to the different age groups ($\chi^2 = 1.89$, $df = 3$, $p = .595$, Cramer's
4 $V = .05$). Therefore, participants with missing values were excluded by list-wise deletion
5 (Schafer & Graham, 2002). To check for multivariate outliers, the Mahalanobis distance values
6 were evaluated as χ^2 at $p < .001$ with 3 degrees of freedom (Fidell & Tabachnick, 2003).
7 Referring to the table of critical values for chi square distribution, two cases with a Mahalanobis
8 distance greater than 16.266 were detected as probable multivariate outliers and were therefore
9 deleted. However, excluding them did not change the patterns of results. Finally, all analyses
10 were based on a complete data set ($N = 889$).

11 *Measures*

12 *Self-concept of strength.* Self-concept of strength was measured using the strength
13 subscale consisting of six items from the Physical Self-Concept Scales (PSK; Stiller, Würth, &
14 Alfermann, 2004). In the development of the PSK, a preliminary version of the Physical Self-
15 Description Questionnaire (PSDQ; Marsh & Redmayne, 1994) and the questionnaire of body
16 image (KSB; Alfermann & Stoll, 2000) were used. PSK consists of seven subscales measuring
17 physical abilities (strength, endurance, speed, flexibility, coordination, and sports competence),
18 and physical appearance. Analyses based on $n = 1453$ children, adolescents and young adults
19 aged eight to 28 years demonstrated the appropriateness of the PSK and provided support for
20 reliability and (factorial, discriminant, construct) validity (Stiller et al., 2004). An example of an
21 item of the used strength subscale is "I am stronger than most people my age". All items were
22 rated on a 4-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

1 Cronbach's alpha coefficient was .85 for the present sample, thus showing high internal
2 consistency.

3 *Strength.* The actual strength of the upper extremities was assessed using a shot-put
4 performance test. While sitting on a bench with a height of 38 cm, the subjects had to push throw
5 a medicine ball (2 kg) as far as possible using two hands (Wyss, Marti, Rossi, Kohler, & Mäder,
6 2007). Their feet were parallel to each other, their shoulders were pressed against a wall and the
7 ball was held in front of their chest. The test item score (best of two tries) was the distance
8 achieved in meters. The validity as a test of strength and its reliability have already been
9 demonstrated and the reported test-retest reliability coefficient was .83 with a time interval of 7
10 days (Wyss et al., 2007).

11 *Veridicality.* In order to form the veridicality variable, two variables and an individual's
12 reference group are needed. Since the items of the PSK are formulated age specific, the z-
13 standardization was conducted age specific, indicating the accuracy of the self-concept rating of
14 strength within the group of adolescents of the same age. The veridicality score for each
15 individual was computed by subtracting his z-score for actual strength from the z-score for self-
16 concept of strength. Finally, adolescents were divided into three groups which differed in terms
17 of the veridicality score: those with values of $z < -1$, were labelled *underestimators*; those with
18 values of $z = -1$ to 1 , as *realists*; and those with values of $z > 1$, as *overestimators*.

19 *Physical activity.* In Switzerland, all elementary and high schools provide 3 hours of
20 compulsory physical education classes per week. Extracurricular physical and sports activities
21 are usually organized by independent nonprofit sports clubs which offer various individual and
22 team sports. Self-reported physical activity level was measured by asking participants how many
23 hours they normally engage in physical activity at a sports club for each day of the week

1 separately. Answers were summed over the 7 days of the week to receive the amount of weekly
2 free-time physical activity in hours. This response format has been frequently used (Trautwein,
3 Gerlach, & Lüdtke, 2008) and has been shown to yield more reliable scores than more global
4 reports (e.g., Schwarz & Oyserman, 2001). By means of a median split (2.00), adolescents were
5 divided into two groups which differed in terms their weekly physical activity level.

6 *Procedures*

7 The data was collected in connection with the *Bernese Intervention Study on School*
8 *Sport* (BISS; Conzelmann, Schmidt, & Valkanover, 2011), the *Berner Ausbildungsmesse* (BAM,
9 Bern Education Fair) and the *Bieler Berufsbildungsmesse* (BBM, Biel Vocational Education
10 Fair). All data collection took place between August and October and was carried out at the
11 participating vocational schools themselves. In order to prevent their self-concept from being
12 affected by their own performance or by observing the motor test performance of other
13 participants, respondents were first asked to complete the self-concept questionnaire, and then
14 did the motor test. All participants signed an Institutional Review Board-approved informed
15 consent and received some chocolate bars as a token of appreciation without knowing this
16 beforehand.

17 *Analysis*

18 One-way independent analyses of variance (ANOVA) were conducted to determine
19 differences in the independent variables of different age groups. Pearson product-moment
20 correlation coefficients were calculated between the variables self-concept of strength and actual
21 strength. To check for significant differences in the age-specific correlations, the individual
22 product-moment correlation coefficients were converted into Fisher's *Z*-scores and tested against
23 the critical *Z*-value 1.96. To test whether the older adolescents (14-15 year olds) differed from

1 the younger adolescents (12-13 year olds) and whether more physically actives differed from less
2 physically actives in terms of veridicality, chi-square tests were performed. For all statistical
3 tests, a significance level of $p < .05$ was chosen.

4 Results

5 Table 1 shows the means and standard deviations of self-concept of strength, of actual strength
6 and of physical activity as well as the correlation between the self-concept of strength and the
7 actual strength, for each of the age groups.

8 (Insert Table 1 here)

9 Preliminary analysis showed that all dependent variables were normally distributed with
10 skewness values of $-.06$ to $.53$ and kurtosis values of $-.11$ to $.30$. A one-way ANOVA yielded
11 statistically significant differences in the means, both for self-concept ($F_{3,885} = 2.86, p = .036, \eta^2$
12 $= .001$) and actual strength ($F_{3,885} = 199.77, p < .0005, \eta^2 = .40$) between the different age
13 groups. While the Scheffé test in the self-concept of strength revealed only a significant
14 difference between the 12 year and the 15 year olds, the one in the actual strength revealed
15 differences between all age groups. The four different age groups did not differ in their amount
16 of weekly physical activity ($F_{3,885} = 1.25, p = .292, \eta^2 = .00$).

17 (Insert Table 2 here)

18 (a) With respect to the correlation, the Fisher's Z test indicates that, apart from between
19 12 and 13 year olds ($Z = .80$) and between 14 and 15 year olds ($Z = .12$), significant differences
20 in correlation are seen everywhere else ($Z > 1.96$). These results support the hypothesis that the
21 correlation between the self-concept of strength and the actual strength is higher in older (14 and
22 15 year old) than younger (12 and 13 year old) adolescents. (b) To test whether the veridicality
23 differs between the younger (12-13 year old) and the older (14-15 year old) adolescents, a chi-

1 square test was performed. There was a significant association between the age groups and the
2 veridicality ($\chi^2 = 10.59$, $df = 2$, $p = .005$, Cramer's $V = .11$), indicating that underestimators,
3 realists and overestimators are not distributed equally to both age groups. Interpreting the
4 standardized residuals (cf. table 2), it can be said that realists are underrepresented in younger,
5 but overrepresented in older adolescents. However, Cramer's V points out only a small effect. (c)
6 Finally, the chi-square test revealed no significant association between adolescents physical
7 activity and their veridicality ($\chi^2 = 2.56$, $df = 2$, $p = .279$, Cramer's $V = .05$), indicating that
8 underestimators, realists and overestimators are equally distributed to both groups of those
9 adolescents with higher levels and those with lower levels of physical activity.

10 Discussion

11 The purpose of the study was to examine the relationship between self-concept of strength and
12 actual strength in groups of male adolescents ages 12 to 15. The main findings of the study were
13 that (a) the correlation between the self-concept of strength and the actual strength is higher in
14 older (14 and 15 year old) than younger (12 and 13 year old) adolescents; (b) the veridicality is
15 higher in older (14 and 15 year old) than younger (12 and 13 year old) adolescents; (c) more
16 physically active adolescents do not differ in terms of veridicality from less physically active
17 adolescents.

18 The fact that the correlation between the self-concept of strength and the actual strength
19 increases over the age groups means that male adolescents become more able to accurately
20 assess their own strength with increasing age. These results are largely consistent with other
21 research findings (Feltz & Brown, 1984; Horn & Weiss, 1991; Raudsepp & Liblik, 2002;
22 Rudisill, et al., 1993). Rudisill, et al. (1993) found just a moderate relationship between
23 perceived and actual motor competence in 9 and 11 year olds. Horn and Weiss (1991) revealed

1 low correlations between self-perceptions and physical competence in third and fourth grade
2 pupils' and higher correlation in fifth to seventh grade pupils. Because Raudsepp and Liblik
3 (2002) find that even 12 to 13 year olds can hardly evaluate their physical competence accurately
4 they speculate that self-evaluations continue to develop until middle adolescent years. The
5 results of the present study seem to confirm this assumption, since the 12 and 13 year olds show
6 just moderate and the 14 and 15 year olds show quite substantial correlations between the self-
7 concept of strength and the actual strength.

8 As Piaget's (1929) studies on cognitive development show that children about the age of
9 12 years reach the operational stage of development and should be able at combining different
10 information into a realistic view of their competence, one might wonder why the more accurate
11 self-perception occurs only in the middle and not in the early adolescence. Cognitive-
12 developmental theorists explain this delayed development either by a lack of cognitive abilities
13 in younger children (metacognitive deficit, Parsons & Ruble, 1977), the effort attribution
14 hypothesis which claims that younger children make unrealistic prognoses about their abilities
15 because they are not yet able to differentiate between effort and ability (Wellman, 1985) or by
16 the wishful-thinking hypothesis (Stipek, 1984) assuming that children have difficulty in
17 differentiating between wishes and expectations (Schneider, 1998).

18 Advocates of the ecological systems theory (Bronfenbrenner & Morris, 2006) stress the
19 importance of not only the individual's cognitive development but also his embeddedness in a
20 social system. In this respect, one should not neglect the influence of typical changes in the
21 social context of the growing adolescent affecting his self-concept and veridicality (Harter, 1999,
22 2005). In the present sample the 12 year olds were still in primary school, whereas the 13, 14 and
23 15 year olds are in secondary school. Research in educational psychology suggest that the shift

1 from primary to secondary school and the concomitant changes in educational demands, teacher
2 attitudes, grading systems, and social networks are associated with broad negative psychosocial
3 consequences (e.g. Eccles & Wigfield, 2002). Since negative effects of this shift are also found
4 on physical self-concept (Trautwein, et al., 2008), one can speculate that adolescents shifting
5 from primary to secondary school need some time to adopt to the new reference group before
6 comparing their performance (of strength) with the performance of the new classmates. Beside
7 the cognitive-developmental changes, also socio-environmental shifts could help to explain why
8 the increase of adolescent's accuracy in the self-concept of strength appears delayed.
9 Explanations stressing both aforementioned factors to be interrelated and inseparable from each
10 other would be compatible with modern theories of development (Lerner, 2006) that consider an
11 individual as an active, intentional part of an integrated, complex and dynamic person-
12 environment system (Magnusson & Stattin, 2006).

13 The present study indicates that veridicality increases when adolescents get older.
14 However, since it is a cross-sectional study, one should be careful with conclusions concerning
15 the veridicality change over time. A longitudinal study would be helpful to determine how and
16 when the veridicality develops in the physical domain. Whereas the functional characteristics of
17 veridical self-perceptions are widely discussed in younger children and mainly in the academic
18 domain (e.g. Försterling & Morgenstern, 2002; Harter, 2006; McFarlin, et al., 1984), the age
19 related development of adolescents' veridicality in the physical domain is rarely investigated
20 (Weiss & Amorose, 2008). But especially in the context of preventing traffic accidents a realistic
21 assessment of one's own physical abilities seems to be of particular importance (Plumert, 1995;
22 Schwebel & Plumert, 1999; Plumert, Kearney, & Cremer, 2004; Plumert & Schwebel, 1997).

1 Further research investigating adolescents' veridicality in the physical domain could have a
2 significant impact going beyond the context of physical activity.

3 Of course, dealing with veridicality (and unavoidably also with its operationalization)
4 implies certain problems which can also be found in the present study. Two contentious issues
5 are discussed in the literature: Firstly, it is unclear which criterion is to be used to operationalize
6 overestimation or underestimation: the veridicality variable can be formed by comparing self-
7 perceptions with perceptions of others (Kwan, et al., 2004) or with objective standards or tests
8 (Dunning, et al., 2004). Secondly, there is disagreement about the use of difference scores or
9 residuals: It is sometimes advised not to use difference scores to form the veridicality variable
10 (Ackerman, Beier, & Bowen, 2002; Ackerman & Wolman, 2007). The main criticism is the
11 emergence of ceiling and floor effects. That is, persons with very good performances can hardly
12 overestimate themselves and persons with very bad performances can hardly underestimate
13 themselves. Therefore, Gramzow, Elliot, Asher and McGregor (2003) suggest using residual
14 values to minimize this problem (for a detailed discussion cf. Funder, 1995; Kurt & Paulhus,
15 2008; Robins & John, 1997). In the present study difference scores with a cut-off at $z = +/-1$
16 were used. These scores as well as the selected cut-off points are certainly discussable. Future
17 research should compare different methods to operationalize veridicality and test different cut-
18 off points against each other.

19 Some further limitations concern the all-male sample and the used instruments. Plenty of
20 studies revealed sex differences in children's and adolescent's physical self-concept (e.g.
21 Carraro, et al., 2010; Vedul-Kjelsås, et al., 2011). In order to test sex differences in adolescents'
22 veridicality it would have been advisable to include both male and female adolescents in the
23 sample. Furthermore, the use of a battery of tests (e.g. EUROFIT; Adam, Klissouras, Ravazollo,

1 Renson, & Tuxworth, 1998) – instead of a single test – would have allowed several dimensions
2 of physical self-concept to be related to the corresponding motor test performance and to
3 determine whether there are any differences in veridicality between the different dimensions of
4 the physical self-concept.

5 In conclusion, the findings suggest that male adolescents ages 14-15 can perceive their
6 personal strength quite accurately and perceive themselves more veridical than adolescents ages
7 12-13. Further research should use modern theories of development as theoretical frameworks,
8 employ longitudinal rather than cross-sectional designs, include both male and female
9 adolescents, and use a battery of tests to shed more light on the development of veridicality in the
10 physical domain.

11

References

- 1
2 Ackerman, P. L., Beier, M. E., & Bowen, K. R. (2002). What we really know about our abilities
3 and our knowledge. *Personality and Individual Differences*, 33, 587-605.
- 4 Ackerman, P. L., & Wolman, S. D. (2007). Determinants and validity of self-estimates of
5 abilities and self-concept measures. *Journal of Experimental Psychology: Applied*, 13,
6 57-78.
- 7 Adam, C. V., Klissouras, V., Ravazollo, M., Renson, R., & Tuxworth, W. (1998). *EUROFIT:*
8 *European test of physical fitness*. Rome: Council of Europe, Committee for the
9 Development of Sport.
- 10 Alfermann, D., & Stoll, O. (2000). Effects of physical exercise on self-concept and well-being.
11 *International Journal of Sport Psychology*, 30, 47-65.
- 12 Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In
13 R. M. Lerner (Ed.), *Handbook of child psychology: Vol 1. Theoretical models of human*
14 *development* (6th ed., pp. 793-828). Hoboken, NJ: Wiley.
- 15 Butler, R. (2005). Competence assessment, competence, and motivation between early and
16 middle childhood. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and*
17 *motivation* (pp. 202-221). New York: Guilford Press.
- 18 Burkhalter, N. A., & Wendt, J. C. (2001). Prediction of selected fitness indicators by gender, age,
19 alienation, and perceived competence. *Journal of Teaching in Physical Education*, 21, 3-
20 15.
- 21 Chan, E. W., Au, E. Y., Chan, B. H., Kwan, M. K., Yiu, P. Y., & Yeung, E. W. (2003). Relations
22 among physical activity, physical fitness, and self-perceived fitness in Hong Kong
23 adolescents. *Perceptual and Motor Skills*, 96, 787-797.

- 1 Carraro, A., Scarpa, S., & Ventura, L. (2010). Relationships between physical self-concept and
2 physical fitness in Italian adolescents. *Perceptual and Motor Skills, 110*, 522-530.
- 3 Conzelmann, A., Schmidt, M., & Valkanover, S. (2011). *Persönlichkeitsentwicklung durch*
4 *Schulsport. Theorie, Empirie und Praxisbausteine der Berner Interventionsstudie*
5 *Schulsport (BISS)* [Personality development through physical education. Theory,
6 empirical evidence, and practical implications of the Bernese Intervention Study on
7 School Sport (BISS)]. Bern: Huber.
- 8 Dunning, D., Heath, C., & Suls, J. M. (2004). Flawed self-assessment: Implications for health,
9 education, and the workplace. *Psychological Science in the Public Interest, 5*, 69-106.
- 10 Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of*
11 *Psychology, 53*, 109-132.
- 12 Eccles, J. S., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1993). Age and gender differences
13 in children's self- and task-perceptions during elementary school. *Child Development, 64*,
14 830-847.
- 15 Feltz, D. L., & Brown, E. W. (1984). Perceived competence in soccer skills among young soccer
16 players. *Journal of Sport Psychology, 6*, 385-394.
- 17 Försterling, F., & Morgenstern, M. (2002). Accuracy of self-assessment and task performance:
18 Does it pay to know the truth? *Journal of Educational Psychology, 94*, 576-585.
- 19 Fidell, L. S., & Tabachnick, B. G. (2003). Preparatory data analysis. In J. A. Schinka & W. F.
20 Velicer (Eds.), *Handbook of Psychology: Volume 2. Research Methods in Psychology*
21 (pp. 115-141). New York: Wiley.
- 22 Funder, D. C. (1995). On the accuracy of personality judgment: A realistic approach.
23 *Psychological Review, 102*, 652-670.

- 1 Germain, J. L., & Hausenblas, H. A. (2006). The relationship between perceived and actual
2 physical fitness: A meta-analysis. *Journal of Applied Sport Psychology, 18*, 283-296.
- 3 Gramzow, R. H., Elliot, A. J., Asher, E., & McGregor, H. A. (2003). Self-evaluation bias and
4 academic performance: Some ways and some reasons why. *Journal of Research in*
5 *Personality, 37*, 41-61.
- 6 Harter, S. (1999). *The construction of the self: A developmental perspective*. New York: Guilford
7 Press.
- 8 Harter, S. (2005). The development of self-representations during childhood and adolescence. In
9 M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 610-642). New
10 York: Guilford.
- 11 Harter, S. (2006). The Self. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology:*
12 *Vol 3. Social, emotional and personality development* (6th ed., pp. 505-570). New York:
13 John Wiley & Sons.
- 14 Helmke, A. (1992). *Selbstvertrauen und schulische Leistungen* [Self-confidence and school
15 performance]. Göttingen: Hogrefe.
- 16 Horn, T. S., & Weiss, M. R. (1991). A developmental analysis of children's self-ability
17 judgements in the physical domain. *Pediatric Exercise Science, 3*, 310-326.
- 18 Judge, T. A., & Bono, J. E. (2001). Relationship of core self-evaluations traits - self-esteem,
19 generalized self-efficacy, locus of control, and emotional stability - with job satisfaction
20 and job performance: A meta-analysis. *Journal of Applied Psychology, 86*, 80-92.
- 21 Jürimäe, T., & Saar, M. (2003). Self-perceived and actual indicators of motor abilities in children
22 and adolescents. *Perceptual and Motor Skills, 97*, 862-866.

- 1 Kurman, J., & Eshel, Y. (1998). Self-enhancement, generality level of self-evaluation, and
2 emotional adjustment. *Journal of Social Psychology, 138*, 549-563.
- 3 Kurt, A., & Paulhus, D. L. (2008). Moderators of the adaptiveness of self-enhancement:
4 Operationalization, motivational domain, adjustment facet, and evaluator. *Journal of*
5 *Research in Personality, 42*, 839-853.
- 6 Kwan, V. S. Y., John, O. P., Kenny, D. A., Bond, M. H., & Robins, R. W. (2004).
7 Reconceptualizing individual differences in self-enhancement bias: An interpersonal
8 approach. *Psychological Review, 111*, 94-110.
- 9 Lerner, R. M. (2006). Developmental science, developmental systems, and contemporary
10 theories of human development. In W. Damon & R. M. Lerner (Eds.), *Handbook of Child*
11 *Psychology. Volume 1. Theoretical models of human development* (6th ed., pp. 1-17).
12 New York: John Wiley & Sons.
- 13 Magnusson, D., & Stattin, H. (2006). The person in context: A holistic-interactional approach. In
14 W. Damon & R. M. Lerner (Eds.), *Handbook of Child Psychology. Volume 1. Theoretical*
15 *models of human development* (6th ed., pp. 400-464). New York: John Wiley & Sons.
- 16 Marsh, H. W., Craven, R. G., & Debus, R. (1991). Self-concepts of young children 5 to 8 years
17 of age: Measurement and multidimensional structure. *Journal of Educational*
18 *Psychology, 83*, 377-392.
- 19 Marsh, H. W., Ellis, L. A., & Craven, R. G. (2002). How do preschool children feel about
20 themselves? Unraveling measurement and multidimensional self-concept structure.
21 *Developmental Psychology, 38*, 376-393.
- 22 Marsh, H. W., & Martin, A. J. (2011). Academic self-concept and academic achievement:
23 Relations and causal ordering. *British Journal of Educational Psychology, 81*, 59-77.

- 1 Marsh, H. W., & Perry, C. (2005). Self-concept contributes to winning gold medals: Causal
2 ordering of self-concept and elite swimming performance. *Journal of Sport and Exercise*
3 *Psychology, 27*, 71-91.
- 4 Marsh, H. W., & Redmayne, R. S. (1994). A multi-dimensional physical self-concept and its
5 relations to multiple components of physical fitness. *Journal of Sport and Exercise*
6 *Psychology, 16*, 43-55.
- 7 McFarlin, D. B., Baumeister, R. F., & Blascovich, J. (1984). On knowing when to quit: Task
8 failure, self-esteem, advice, and nonproductive persistence. *Journal of Personality, 52*,
9 138-155.
- 10 Nicholls, J. G. (1989). *The competitive ethos and democratic education*. Cambridge, MA:
11 Harvard University Press.
- 12 Parsons, J. E., & Ruble, D. N. (1977). The development of achievement-related expectancies.
13 *Child Development, 48*, 1075-1079.
- 14 Piaget, J. (1929). *The child's conception of the world*. London: Routledge & Kegan Paul.
- 15 Pintrich, P. R., & Blumenfeld, P. C. (1985). Classroom experience and children's self-
16 perceptions of ability, effort, and conduct. *Journal of Educational Psychology, 77*, 646-
17 657.
- 18 Plumert, J. M. (1995). Relations between children's overestimation of their physical abilities and
19 accident proneness. *Developmental Psychology, 31*, 866-876.
- 20 Plumert, J. M., Kearney, J. K., & Cremer, J. F. (2004). Children's perception of gap avoidances:
21 Bicycling across traffic-filled intersections in an immersive virtual environment. *Child*
22 *Development, 75*, 1243-1253.

- 1 Plumert, J. M., & Schwebel, D. C. (1997). Social and temperamental influences on children's
2 overestimation of their physical abilities: Links to accidental injuries. *Journal of*
3 *Experimental Child Psychology*, 67, 317-337.
- 4 Raudsepp, L., & Liblik, R. (2002). Relationship of perceived and actual motor competence in
5 children. *Perceptual and Motor Skills*, 94, 1059-1070.
- 6 Robins, R. W., & Beer, J. S. (2001). Positive illusion about the self: Short-term benefits and
7 long-term costs. *Journal of Personality and Social Psychology*, 80, 340-352.
- 8 Robins, R. W., & John, O. P. (1997). The quest for self-insight. Theory and research on accuracy
9 and bias in self-perception. In R. Hogan, J. Johnson & S. Briggs (Eds.), *Handbook of*
10 *Personality Psychology* (pp. 649-679). New York: Academic Press.
- 11 Rudisill, M. E., Mahar, M. T., & Meaney, K. S. (1993). The relationship between children's
12 perceived and actual motor competence. *Perceptual and Motor Skills*, 76, 895-906.
- 13 Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art.
14 *Psychological Methods*, 7, 147-177.
- 15 Schneider, W. (1998). Performance prediction in young children: Effects of skill, metacognition,
16 and wishful thinking. *Developmental Science*, 1, 291-297.
- 17 Schwarz, N., & Oyserman, D. (2001). Asking questions about behavior: Cognition,
18 communication, and questionnaire construction. *American Journal of Evaluation*, 22,
19 127-160.
- 20 Schwebel, D. C., & Plumert, J. M. (1999). Longitudinal and concurrent relations among
21 temperament, ability estimation, and injury proneness. *Child Development*, 70, 700-712.
- 22 Shavelson, R. J., Hubner, J. J., & Stanton, G. C. (1976). Self-concept: Validation of construct
23 interpretations. *Review of Educational Research*, 46, 407-441.

- 1 Shavelson, R. J., & Marsh, H. W. (1986). On the structure of self-concept. In R. Schwarzer (Ed.),
2 *Self-related cognitions in anxiety and motivation* (pp. 305-329). Hillsdale: Erlbaum.
- 3 Stiller, J., Würth, S., & Alfermann, D. (2004). Die Messung des physischen Selbstkonzepts
4 (PSK). Zur Entwicklung der PSK-Skalen für Kinder, Jugendliche und junge Erwachsene
5 [Measuring the Physical Self-Concept (PSK). On the development of PSK-Scales for
6 children, adolescents and young adults]. *Zeitschrift für Differentielle und Diagnostische*
7 *Psychologie, 25*, 239-257.
- 8 Stipek, D. J. (1984). Young children's performance expectations: Logical analysis or wishful
9 thinking? In J. G. Nicholls (Ed.), *The development of motivation*. Greenwich: JAI Press.
- 10 Stipek, D. J., & Hoffman, J. M. (1980). Children's achievement-related expectancies as a
11 function of academic performance histories and sex. *Journal of Educational Psychology,*
12 *72*, 861-865.
- 13 Stipek, D., & Mac Iver, D. (1989). Developmental change in children's assessment of
14 intellectual competence. *Child Development, 60*, 521-538.
- 15 Trautwein, U., Gerlach, E., & Lüdtke, O. (2008). Athletic classmates, physical self-concept, and
16 free-time physical activity: A longitudinal study of frame of reference effects. *Journal of*
17 *Educational Psychology, 100*, 988-1001.
- 18 Vedul-Kjelsås, V., Sigmundsson, H., Stensdotter, A.-K., & Haga, M. (2011). The relationship
19 between motor competence, physical fitness and self-perception in children. *Child: care,*
20 *health and development, 38*, 394-402.
- 21 Walsh, J. P., Henderson, C. M., & Deighton, J. (1988). Negotiated belief structures and decision
22 performance: An empirical investigation. *Organizational Behavior and Human Decision*
23 *Processes, 42*, 194-216.

- 1 Weinert, F. E., & Schneider, W. (Eds.). (1999). *Individual development from 3 to 12: Findings*
2 *from the Munich Longitudinal Study*. New York: Cambridge University Press.
- 3 Weiss, M. R., & Amorose, A. J. (2008). Motivational orientations and sport behavior. In T. S.
4 Horn (Ed.), *Advances in Sport Psychology* (3th ed., pp. 115-155). Champaign, IL: Human
5 Kinetics.
- 6 Weiss, M. R., & Horn, T. S. (1990). The relationship between children's accuracy estimates of
7 their physical competence and achievement-related behaviors. *Research Quarterly for*
8 *Exercise and Sport*, 61, 250-258.
- 9 Wellman, H. M. (1985). *Children's searching: The development of search skill and*
10 *spatial representation*. Hillsdale, NJ: Erlbaum.
- 11 Wigfield, A., & Eccles, J. S. (2002). The development of competence beliefs, expectancies for
12 success, and achievement values from childhood through adolescence. In A. Wigfield &
13 J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 91-120). San Diego, CA:
14 Academic Press.
- 15 Wyss, T., Marti, B., Rossi, S., Kohler, U., & Mäder, U. (2007). Assembling and verification of a
16 fitness test battery for the recruitment of the swiss army and nation-wide use.
17 *Schweizerische Zeitschrift für «Sportmedizin und Sporttraumatologie»*, 55, 126-131.

18

Tables

1
2 Table 1
3 *Means and standard deviations of the self-concept of strength (SC Strength), actual strength and*
4 *physical activity, post hoc tests for group differences and correlations (r) between the self-*
5 *concept of strength and the actual strength for each age group (N = 889).*

| Age group | n | SC Strength | | Post Hoc | Actual Strength | | Post Hoc | r | Physical Activity | |
|-----------|-----|-------------|-----|----------|-----------------|-----|-------------|------|-------------------|------|
| | | M | SD | | M | SD | | | M | SD |
| Age 12 | 303 | 2.96 | .57 | <15 | 3.16 | .46 | <13,14,15 | .20* | 2.77 | 3.21 |
| Age 13 | 195 | 3.02 | .52 | | 3.70 | .64 | <14,15; >12 | .27* | 2.38 | 1.81 |
| Age 14 | 282 | 3.00 | .53 | | 4.20 | .77 | <15; >12,13 | .54* | 2.47 | 1.81 |
| Age 15 | 109 | 3.14 | .50 | >12 | 4.63 | .68 | >12,13,14 | .53* | 2.49 | 2.10 |

6 *p < .05. Actual strength = test score in the shot-put performance test (in meters).
7

8 Table 2
9 *Crosstabulation of Age Group and Veridicality (Underestimators, Realists, Overestimators).*

| Age group | Veridicality | | | Total |
|--------------|-----------------|---------------|----------------|-------|
| | Underestimators | Realists | Overestimators | |
| Age 12 to 13 | 105 (1.1) | 290 (-1.3) | 103 (1.3) | 498 |
| Age 14 to 15 | 64 (-1.2) | 269 (1.5) | 58 (-1.5) | 391 |

10 *Note.* * = Standardized residuals appear in parentheses below group frequencies.