**Development of Short and Ultra-Short Forms of the Multidimensional Self-Esteem
Scale: Relations to the Big Five, Narcissism, and Academic Achievement in Adults and
Adolescents**

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Abstract

The multidimensional assessment of self-esteem plays an important role in self-esteem research. In this article, we present the development of a short form and an ultra-short form of the Multidimensional Self-Esteem Scale (MSES; Schütz et al., 2016). Items were selected by eliminating redundant items and by using a deterministic search algorithm in a sample of 644 adults ($M_{age}=47.0$). Construct validity was established by investigating the relations between each MSES short form and other constructs and cross-validating the factor structure of both short forms of the MSES in 674 adolescents ($M_{age}=14.2$) and in 425 adults from a preregistered study ($M_{age}=49.1$). Both short scales demonstrated satisfactory reliability and factorial validity in all samples. Analyses examining relations with the Big Five personality traits, narcissism, and academic achievement supported construct validity in all age-groups. The present research indicates that the short versions of the MSES are economic and valid instruments for measuring multidimensional self-esteem in adolescents and adults. The short form (MSES-24) should be particularly useful in applied research settings with a need to reduce participants' burden, whereas the ultra-short form (MSES-12) may prove convenient for panel studies and large-scale research with limited time capacities.

Keywords: Multidimensional Self-Esteem Scale (MSES), short form development, confirmatory factor analysis, Big Five, narcissism

Development of Short and Ultra-Short Forms of the Multidimensional Self-Esteem Scale: Relations to the Big Five, Narcissism, and Academic Achievement in Adults and Adolescents

Self-esteem is one of the most prolific constructs in psychological practice and research. Extensive research has shown that self-esteem is associated with important life outcomes such as academic achievement, psychological well-being, physical health, and relationship satisfaction (Orth et al., 2012; Taylor & Brown, 1988). The predictive power of self-esteem is particularly high when self-esteem is measured at the appropriate level of specificity, which can be realized by using multidimensional instruments (Marsh et al., 2006).

There is a long research tradition in which self-esteem is conceptualized as a multidimensional construct that encompasses several domains, for example, self-evaluations in the social domain (e.g., “I feel uncomfortable in social interactions”) or in the physical domain (e.g., “I am satisfied with my athletic ability”; see Shavelson et al., 1976, for a review). At the same time, individuals hold general feelings of self-worth (global self-esteem as “the way people generally feel about themselves [...] a feeling of affection for oneself that is not derived from rational, judgmental processes”; Brown & Marshall, 2006, p. 4).

Multidimensional models of self-esteem have elaborated both global and domain-specific self-esteem. For example, multidimensional hierarchical models such as the one by Shavelson et al. (1976) postulate a global factor of self-esteem at the apex of the hierarchy, which is divided into different domains of self-esteem at a subordinate level. According to Shavelson et al., any change in global self-esteem would require substantial changes in its subordinate domains. Theories about the development of self-esteem are guided by these considerations and claim, for example, that feeling adequate in important domains will result in the development of high global self-esteem (e.g., Harter, 2006). Others have argued that global self-esteem influences domain-specific self-evaluations by amplifying or buffering the

influence of external feedback regarding these self-evaluations (Brown & Marshall, 2006).

On the basis of these theoretical considerations, multidimensional scales have been developed to assess domain-specific and global self-esteem. Typically, multidimensional instruments include subscales for measuring domain-specific self-esteem and another subscale for measuring global self-esteem, such as the self-regard subscale (Fleming & Courtney, 1984), the self-esteem subscale (Marsh et al., 1985), or the global self-worth subscale (Messer & Harter, 2012). For instance, the Multidimensional Self-Esteem Scale (MSES; Schütz et al., 2016) distinguishes one global self-esteem subscale (originally termed “self-regard”; Fleming & Courtney, 1984) and the five domain-specific subscales measuring social contact, social criticism, performance, physical appearance, and physical ability self-esteem. Self-regard has been defined in terms of favorable or unfavorable *general evaluations* of the self (see Fleming & Courtney, 1984; Fleming & Watts, 1980) and resembles Rosenberg’s (1965) conceptualization of global self-esteem. The MSES is an adaptation of the Multidimensional Self-Concept Scale (Fleming & Courtney, 1984), which has been developed based on the model by Shavelson et al. (1976) and on the Feelings of Inadequacy Scale (Janis & Field, 1959). The MSES has been validated for adults and adolescents (Rentzsch et al., 2016) and is widely used for research purposes (e.g., Bluemke, & Frieze, 2012; Krause et al., 2016; Rentzsch & Schröder-Abé, 2018) and in applied settings such as the clinical context (e.g., Hoffmeister et al., 2010; Roepke et al., 2011; Vierhaus et al., 2012).

The Present Research

Previous analyses have supported the psychometric properties of the MSES in clinical practice and in research settings. However, it is often necessary to use short scales because they reduce the burden on participants and result in lower dropout rates (McCarthy et al., 2006). In this regard, we wanted to develop a valid short version of the MSES with the same number of items per subscale to ensure comparability across measures. To maintain the

original scope of the construct, we reduced the original item pool from 32 to 24 items with four items per subscale (see Marsh et al., 1998). Furthermore, we aimed to develop a valid ultra-short version that can be of practical use in panel studies and large-scale research. To ensure psychometrically sound measurement models, we reduced the original item pool to two items per subscale (Marsh et al., 1998). We also wanted to investigate whether the short forms are applicable in adults and adolescents. Previous research has supported the notion that the cognitive-affective process of differentiation between self-esteem domains is completed by the end of preadolescence (Marsh, 1989) and the structure is similar to the differentiated structure in adults (Rentzsch et al., 2016). Furthermore, research has highlighted the predictive power of multidimensional self-esteem for specific life outcomes in adolescents (e.g., Marsh et al., 2006) and in adults (e.g., Roepke et al., 2011).

Regarding construct validity, we investigated associations between multidimensional self-esteem and the Big Five personality traits, academic achievement, and narcissism. Because neuroticism reflects negative core self-evaluations (Judge et al., 1997), we expected negative relations between neuroticism and all self-esteem domains as well as global self-esteem. Considering the social behaviors that extraverted individuals tend to engage in (Wrzus et al., 2016), we expected self-esteem concerning social contact to be uniquely related to extraversion over and above global self-esteem. Conscientiousness predicts intrapersonal outcomes such as effort and academic achievement (Poropat, 2009). Openness, often described as interest in intellectual tasks (Costa & McCrae, 1992; Denissen & Penke, 2008), has been found to be linked to academic achievement (Poropat, 2009). We therefore expected that performance self-esteem would be uniquely related to conscientiousness and openness. Since previous research has shown that agreeableness is associated with social behaviors, but rather with avoidance of conflicts than with actively seeking out social contact (Denissen & Penke, 2008; Wrzus et al., 2016), we conducted explorative analyses on its association with

social self-esteem.

Because academic accomplishments have been shown to be associated with academic self-esteem (Marsh et al., 2006), we expected unique relations between performance self-esteem and academic achievement.

Narcissism as measured with the NPI (Raskin & Terry, 1988) is positively related to inflated self-views in the agentic domain (e.g., intelligence, creativity, and scholastic aptitude), which is the foundation of agentic narcissists' global self-evaluations (i.e., high self-importance, entitlement, and social power; Gebauer et al., 2012; Rentzsch & Gebauer, 2019). Due to their self-enhancement bias (Grijalva & Zhang, 2016), narcissists were expected to express convictions that their performance is admirable, that they are physically attractive to others, and that they engage in social contact with others easily. We expected unique associations with self-esteem regarding individuals' agency in social-, physical-, and performance-related domains.

To establish discriminant validity, we also investigated the unique association between the external constructs and all other domains of self-esteem. For example, we expected the unique associations between extraversion and social contact self-esteem and between academic achievement and performance self-esteem to be particularly strong.

In two studies with a total of three samples we aimed to develop two short forms of the MSES (MSES-24, MSES-12) by eliminating redundant items and by using a deterministic search algorithm. We used latent factor model analyses to cross-validate the factor structure of both short forms of the MSES and to establish construct validity.

Study 1

The purpose of this study was to develop a short form (MSES-24) and an ultra-short form (MSES-12) of the Multidimensional Self-Esteem Scale in adults (Sample 1). We also aimed to establish construct validity regarding the unique relations between global and

domain-specific self-esteem and the Big Five personality traits, narcissism, and academic achievement in adults (Sample 1) and in adolescents (Sample 2).

Method

Participants

For the present investigation we used data from two different samples. We reanalyzed data that had been reported by Rentzsch & Gross (2015) (Sample 1). Participants were recruited from the general German population using a participant pool consisting of potential volunteers for participation in lab research. As an incentive, participants were given feedback on their self-esteem profile. A total of 644 participants (436 women) completed an online questionnaire. Participants' average age was 47.0 ($SD=12.4$).

Data from adolescents (Sample 2) were collected as part of a larger project conducted in the high-school context (Rentzsch et al., 2013). A total of 674 adolescents (352 female, 311 male) from 13 to 17 years of age ($M=14.2$, $SD=0.6$) participated.

Measures

Multidimensional self-esteem. In both samples, self-esteem was assessed with the MSES (Schütz et al., 2016) which consists of six subscales comprising 32 items, each rated on a 7-point rating scale ranging from 1 (*not at all*) to 7 (*very much*) for items measuring intensity and from 1 (*never*) to 7 (*very much*) for items measuring frequency.

Global self-esteem captures a person's general perception of self-worth. High scorers stand out with respect to their high overall self-acceptance, self-confidence, and positive self-evaluation.

Social contact refers to a person's self-perceived social skills. High scorers feel at ease when meeting others and engaging in conversations.

Social criticism reflects a person's confidence that they will be accepted by others. High scorers report little fear of others' disapproval.

Performance self-esteem addresses people's confidence in their own performance and competence. High scorers feel comfortable when confronted with challenging tasks and are generally happy with their performance.

Physical appearance taps into people's confidence in their physical appearance. High scorers feel physically attractive and satisfied with their bodies.

Physical ability captures a person's evaluations of their own abilities with respect to sports and physical coordination. High scorers are confident about their physical abilities and feel athletic.

To examine the reliability of the MSES subscales, we computed McDonald's omega based on single measurement models (see Table 1).

Big Five personality traits. In Sample 1, participants completed the Ten-Item Personality Inventory (TIPI-G; Gosling et al., 2003; German adaptation by Muck et al., 2007). Every personality trait was measured with two items on a 7-point rating scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*). Reliabilities (Cronbach's alphas) reached values of .71 (extraversion), .38 (agreeableness), .65 (conscientiousness), .76 (neuroticism), and .51 (openness). In Sample 2, participants completed the Big Five Inventory with 44 items (BFI; John et al., 1991; German adaptation by Lang et al., 2001). Responses were made on 5-point rating scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The reliabilities (Cronbach's Alphas) of the scales were .75 (neuroticism), .82 (extraversion), .76 (openness), .60 (agreeableness), and .75 (conscientiousness).

Narcissism. Narcissism was assessed in Sample 1 with the 12-item short version of the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988; German version by Schütz et al., 2004) developed by Klavina and Schröder-Abé (2012). Out of two self-descriptions, participants were asked to choose the one with which they identified the most, Alpha=.70.

Academic achievement. In Sample 2, academic achievement was assessed by

calculating the mean of students' self-reported grades in mathematics, physics, German, and English ($\text{Alpha}=.79$). In the German grading system, low scores correspond with high achievements. For ease of interpretation, scores were inverted prior to the analyses such that high scores represented high achievement.

Analytic Strategy

The adult Sample 1 ($N=644$) was randomly split into two equally sized subsamples. Randomly selected cases served as the calibration subsample ($n=322$), which was used to identify items for the short forms of the MSES. Unselected cases served as the validation subsample ($n=322$), which was used for cross-validation. The adolescent Sample 2 was used to test for the measurement invariance of the short forms of the MSES across the adult ($N=644$) and the adolescent sample ($N=674$). In addition, we aimed to establish construct validity regarding the unique relations between domain-specific self-esteem and external variables in Samples 1 and 2.

All analyses were carried out by using Mplus Version 8.4 (Muthén & Muthén, 1998-2019). For structural equation models, we used full-information maximum likelihood estimation with robust standard errors (Bollen, 1989). We report how we determined our sample size, all data exclusions (if any), all data inclusion/exclusion criteria, whether inclusion/exclusion criteria were established prior to data analysis, all measures in the study, and all analyses including all tested models. If we use inferential tests, we report exact p values, effect sizes, and 95% confidence or credible intervals. Scripts used for the analyses are available on the OSF (<https://osf.io/gn42x/>).

Item selection. Our first goal was to reduce the number of items by eliminating redundant items based on the interitem correlation matrix in the calibration sample. We chose $r > .80$ (Kline, 1979) as criterion. In order to further reduce the number of items, we used an algorithm based on a brute-force approach implemented in the R package *stuart* (Schultze,

2018), which determines the best solution of item combinations. Items were selected based on composite reliabilities and model fit in the calibration sample, since we wanted to select the psychometrically best items (Janssen et al., 2017).

Latent factor model analyses. All analyses were based on latent factor models for the short form and the ultra-short form of the MSES. An RMSEA $< .08$ (Browne & Cudeck, 1993) and a CFI $\geq .90$ (Marsh et al., 2004) indicated adequate model fit.

Previous research has modelled multidimensional self-esteem either by using single factor models each pertaining to the global or a domain-specific subscale (e.g., von Soest et al., 2016; Rentzsch & Schröder-Abé, 2018) or by establishing first-order models with correlated factors each pertaining to a single subscale of the multidimensional self-esteem measure (Fleming & Courtney, 1984; Rentzsch et al., 2016; Marsh & Yeung, 1998). Higher-order models, such as the one proposed by Shavelson et al., however, have been shown to be empirically untenable (Marsh, 1987; Rentzsch et al., 2016). For the purposes of the present research, a latent factor model of the MSES must, therefore, meet the following requirements: a) acknowledge previous conceptualizations of multidimensional self-esteem, b) acknowledge the role of global vs. domain-specific self-esteem, and c) allow us to disentangle general perceptions of self-worth from domain-specific content. Accordingly, we used a parameterization of the correlated six-factor model that meets all requirements: In this model, the latent factors pertaining to the five domains of self-esteem (i.e., social contact, social criticism, performance, physical appearance, physical ability) were each regressed on the latent factor pertaining to global self-esteem. We used four indicators for each latent self-esteem factor of the short form (MSES-24) and two indicators for each latent self-esteem factor of the ultra-short form (MSES-12). On the basis of Geiser et al.'s (2012) suggestions, we, thus, modelled global self-esteem as the reference factor. For each of the five domains of self-esteem, the residual factor indicates domain-specific variance that cannot be predicted by

global self-esteem (see Figure 1). This model is equivalent to the correlated six-factor model but has the clear advantage of allowing the computation of unique correlations with external criteria over and above global self-esteem (Geiser et al., 2012). Using the correlated six-factor model instead would lead to correlations with external variables that are masked by the intercorrelations of domain-specific self-esteem with global self-esteem.

Invariance testing. To cross-validate the short forms of the MSES, we ran invariance testing procedures across the calibration ($n=322$) and validation samples ($n=322$). To conduct the invariance testing, we carried out a hierarchically arranged set of analytical steps. The configural model served as the initial model (Model A). Subsequently, a series of increasingly restrictive models were compared against each other to examine invariance (Meredith, 1993). According to Chen (2007) and Cheung and Rensvold (2002), when comparing nested models, a ΔCFI value smaller than .01 and a $\Delta RMSEA$ value smaller than .015 indicated invariance. Metric invariance was tested in Model B by constraining the factor loadings across the two subsamples. Additionally, scalar invariance was examined by imposing equality constraints on the item intercepts (Model C). Model D tested for structural invariance by imposing equality constraints on the factor variances and regression coefficients. Moreover, we ran the same invariance testing procedures between the adult Sample 1 ($N=644$) and the adolescent Sample 2 ($N=674$).

Relations to external variables. To test for construct validity, we investigated the associations between domain-specific/global self-esteem from the MSES-24 and MSES-12 and external variables in Sample 1 and Sample 2. Based on the latent factor model of the MSES (Figure 1), we correlated the global self-esteem factor and the domain-specific residual factors each with external variables to address the unique relations between the specific self-esteem domains and these variables, over and above global self-esteem (see Geiser et al., 2012). In these models, we used the manifest scale scores of the external variables. In

addition, we computed Pearson correlations between the manifest scale scores of each subscale from the short forms of the MSES and the external variables, which are presented on the OSF (<https://osf.io/gn42x/>). Moreover, we report results from the original 32-item MSES in order to facilitate comparisons between the different forms of the MSES.

Results and Discussion

Item Selection

On the basis of the interitem correlation matrix in the calibration sample, we excluded Item 16 from the original pool of 32 items. With the help of brute force, we then selected 24 items from the remaining pool of 31 items, thus constituting the 24-item short form (MSES-24). In the same manner, we selected 12 items from the pool of 31 items in order to generate the 12-item ultra-short form (MSES-12). The specific items from the short forms of the MSES are provided on the OSF in German and English, with the MSES-12 items being a subset of the MSES-24 items (<https://osf.io/gn42x/>). Descriptive statistics based on the calibration and validation samples are reported in Table S1 on the OSF. Both short forms demonstrated satisfactory reliabilities in Sample 1 (α s ranging from .78 to .87 for the short form; α s ranging from .70 to .86 for the ultra-short form; Table 1).

Invariance Testing

Using invariance-testing procedures across the calibration and validation samples, the configural model yielded satisfactory model fit for the short form of the MSES (CFI=.930, RMSEA=.056) and an excellent model fit for the ultra-short form (CFI=1.000, RMSEA=.000), as displayed in Table S2 on the OSF. Analyses supported metric, scalar, and structural invariance across the two random subsamples.

Using invariance-testing procedures across Sample 1 and Sample 2, the configural model exhibited satisfactory model fit for the MSES short form (CFI=.928, RMSEA=.052) and an excellent model fit for the ultra-short form (CFI=.993, RMSEA=.025). Analyses

indicated metric invariance as well as partial scalar and structural invariance (see Table S2).

Results provide support for the factor structure of the short and ultra-short forms of the MSES and their applicability in different age groups.

Relations to External Variables

The latent factor models revealed satisfactory to excellent model fit in the adult sample (CFI=.931, RMSEA=.054, for the short form; CFI=.998, RMSEA=.016, for the ultra-short form) and in the adolescent sample (CFI=.924, RMSEA=.049, for the short form; CFI=.986, RMSEA=.032, for the ultra-short form). A detailed overview of parameter estimates and significance tests is provided on the OSF (<https://osf.io/gn42x/>).

Correlational analyses investigating the unique associations between domain-specific self-esteem and external variables provided support for the domain-specific content of the short forms of the MSES (Table 1). As expected, the residual factor of the performance domain was uniquely associated with conscientiousness ($r=.16, p=.001$, for both short forms in Sample 1; $r=.49, p<.001$ for the short form, $r=.32, p<.001$ for the ultra-short form in Sample 2), openness ($r=.16, p=.002$, for the short form, $r=.16, p=.004$, for the ultra-short form in Sample 1; $r=.26, p<.001$, for the short form, $r=.22, p<.001$, for the ultra-short form in Sample 2), and academic achievement ($r=0.58, p<.001$, for the short form, $r=.35, p<.001$, for the ultra-short form). Self-esteem concerning social contact revealed a unique relation with extraversion ($r=.55, p<.001$, for the short form, $r=.50, p<.001$, for the ultra-short form in Sample 1; $r=.52, p<.001$ for the short form, $r=.45, p<.001$ for the ultra-short form in Sample 2), but there was no such unique relation with agreeableness ($r=-0.01, p=.88$, for the short form, $r=0.02, p=.78$, for the ultra-short form in Sample 1; $r=.06, p=.22$ for the short form, $r=.12, p=.07$ for the ultra-short form in Sample 2). As expected, neuroticism was consistently negatively correlated with all self-esteem domains in Sample 1 (all $r_s<-.41, p_s<.001$) and in Sample 2 (all $r_s<-.18, p_s<.01$), highlighting the underlying negative relation between

neuroticism and a general self-esteem factor ($r_s = -0.77$, $p < .001$, for both short forms in Sample 1; $r = -.56$, $p < .001$, for the short form, $r = -.61$, $p < .001$, for the ultra-short form in Sample 2). Furthermore, self-esteem regarding social contact, performance, and physical ability were uniquely related to narcissism ($r = .38$, $p < .001$, $r = .16$, $p < .001$, $r = .10$, $p = .04$, for the short form; $r = .34$, $p < .001$, $r = .13$, $p = .003$, $r = .13$, $p = .01$, for the ultra-short form, respectively).

As can be seen in Table 1, results from the short and ultra-short forms of the MSES closely resembled those from the original 32-item MSES scale.

Study 2

The purpose of this study was to test for the measurement invariance of the short and ultra-short forms of the Multidimensional Self-Esteem Scale across the adult sample from Study 1 and an adult sample from Study 2. In addition, we aimed to establish construct validity regarding the unique relations between global and domain-specific self-esteem and the Big Five personality traits. Hypotheses, design, methods and analyses were preregistered before data collection (see <https://osf.io/39d67/>).

Method

Participants

Participants from a pool that consists of potential volunteers for participation in lab research were invited to participate in an online survey. As an incentive, participants had the chance to win 25 Euro or a psychology book. In total, 425 participated ($M_{\text{age}} = 49.1$, $SD_{\text{age}} = 14.8$). Out of 398 subjects who provided information on demographics, 277 were female.

Measures

Multidimensional self-esteem. Self-esteem was assessed with the short form (MSES-24) and the ultra-short form (MSES-12) of the Multidimensional Self-Esteem Scale. The MSES-24 and MSES-12 were presented to participants in randomized order. To examine the

reliability of the short forms of the MSES, we computed McDonald's omega based on single measurement models (Table 2).

Big Five personality traits. As in Sample 2 (Study 1), participants completed the Big Five Inventory with 44 items (BFI; John et al., 1991; Lang et al., 2001). The internal consistencies (Cronbach's alphas) of the scales were .86 (neuroticism), .89 (extraversion), .82 (openness), .73 (agreeableness), and .79 (conscientiousness).

Analyses

As preregistered, all analyses were based on the same latent factor models for the short form and the ultra-short form of the MSES as described in Study 1. We report how we determined our sample size, all data exclusions (if any), all data inclusion/exclusion criteria, whether inclusion/exclusion criteria were established prior to data analysis, all measures in the study, and all analyses including all tested models. If we use inferential tests, we report exact p values, effect sizes, and 95% confidence or credible intervals.

Invariance. We tested for the measurement invariance of the short and ultra-short forms of the MSES across the adult sample from Study 1 ($N=644$) and the adult sample from this study ($N=425$).

Construct validity. To test construct validity, we investigated the associations between domain-specific/global self-esteem from the MSES-24 and MSES-12 and Big Five personality traits. In these models, we used the manifest scale scores of the Big Five personality dimensions as external variables. In addition, we computed Pearson correlations between the manifest scale scores of each subscale of the MSES short forms and the external variables which are presented in Table S5 on the OSF (<https://osf.io/gn42x/>).

Inference criteria resembled those from Study 1 and were preregistered. Analysis scripts and parameter estimates of latent factor models are available on the OSF (<https://osf.io/gn42x/>).

Results and Discussion

Invariance Testing

Results from the invariance testing procedures are displayed in Table S2 on the OSF. The configural model (Model A) of the MSES short form exhibited a satisfactory model fit (CFI=.919, RMSEA=.062); the configural model of the ultra-short form yielded an excellent model fit (CFI=.994, RMSEA=.026). Analyses indicated metric, scalar, and structural invariance for both short forms of the MSES. Results provided support for the factor structure of the short and ultra-short forms of the MSES and their applicability in adults.

Relations to the Big Five personality traits

As expected, the latent factor models revealed satisfactory to excellent model fit (CFI=.904, RMSEA=.073, for the short form; CFI=.991, RMSEA=.036, for the ultra-short form).

Supporting the domain-specificity of the MSES short and ultra-short forms, specific domains revealed unique relations with associated personality traits, over and above global self-esteem (Table 2). As preregistered, performance self-esteem was uniquely positively related to conscientiousness ($r=.23$, $p<.001$, for the short form; $r=.16$, $p=.01$, for the ultra-short form) and openness ($r=.26$, $p<.001$, for the short form; $r=.22$, $p<.001$, for the ultra-short form). Also in line with findings from Study 1 and our hypotheses, self-esteem regarding social contact was uniquely related to extraversion ($r=.60$, $p<.001$, for the short form; $r=.63$, $p<.001$, for the ultra-short form), but less so to agreeableness ($r=.09$, $p=.12$, for the short form; $r=.13$, $p=.03$, for the ultra-short form). Neuroticism was consistently negatively correlated with all manifest self-esteem domain measures (all $r_s<-.44$ for both short forms, $p_s<.001$), and there was a significant negative relation between neuroticism and the global self-esteem factor ($r=-.77$ and $-.73$, $p<.001$, for short and ultra-short form respectively).

General Discussion

The present findings provide support for the short forms of the MSES as valid instruments for the assessment of multidimensional self-esteem in adult and adolescent populations. Our results also advance empirical and theoretical considerations concerning the correlates and structure of multidimensional self-esteem.

Results from latent factor models supported the multidimensional structure of the short form (MSES-24) and the ultra-short form (MSES-12) of the Multidimensional Self-Esteem scale across three samples. Preregistered analyses indicated metric, scalar, and structural invariance in samples of adults. Metric as well as partial scalar and structural invariance held across different age groups. Varying item intercepts between the adult and adolescent samples are in line with the typical trajectory of self-esteem across the lifespan — with lower levels during adolescence and increases over the course of adulthood (Robins et al., 2002).

An investigation of the unique associations between the subscales of the MSES and related constructs highlighted the domain-specific content of the short forms of the MSES. For example, we found unique relations between performance self-esteem and academic achievement over and above general self-esteem. This result is in line with previous findings that showed that performance self-esteem and achievement are interrelated (Marsh et al., 2006). Also in line with previous research, performance self-esteem was uniquely related to the personality dimensions of conscientiousness and openness in all age groups (Costa & McCrae, 1992; Denissen & Penke, 2008; Poropat, 2009).

Neuroticism was consistently negatively correlated with all self-esteem domains and with global self-esteem, supporting the conception of neuroticism as a negative core self-evaluation (Judge et al., 1997).

In line with our expectations, social contact self-esteem was uniquely positively related to extraversion across age groups and across the different forms of the MSES. In

previous studies, extraverted individuals have been found to experience positive affect in social situations (e.g., Denissen & Penke, 2008) and to actively seek social connections (Wrzus et al., 2016). Extraversion is probably closely related to social contact self-esteem because of the joy extraverted people obtain from social situations. However, we found only small associations between social contact self-esteem and agreeableness, which may be due to the fact that agreeableness is also characterized by cooperation and avoidance of conflicts (Denissen & Penke, 2008; Wrzus et al., 2016). These findings may help to advance the nomological network and thus the construct validity of the social domain of self-esteem as being characterized by positive, self-assured, and joyful social interactions as opposed to cooperative behaviors.

In line with our expectations, analyses revealed unique relations between narcissism and the domains of social contact, performance, and physical ability self-esteem. Our results reflect narcissists' inflated self-views in the agentic domain (Campbell & Foster, 2007; Gebauer, et al., 2012; Rentzsch & Gebauer, 2019) when measured with the NPI (Raskin & Terry, 1988).

In total, our analyses provide evidence that the psychometric properties of the short and ultra-short forms closely resemble those from the original 32-item version and thus suggest that there is no loss of validity as a consequence of shortening the scale.

Strengths, Limitations, and Implications for Future Research

We acknowledge recent discussions on the benefits and challenges of using automated algorithms in short scale development (see the editorial by Dörendahl and Greiff, 2020, in *EJPA*). In the present article, we selected items by (a) eliminating redundant items and (b) using a deterministic search algorithm and selecting the items with the best psychometric support. Since the number of possible solutions when selecting 12 or 24 items out of 32 items was adequate (1.5 million possible combinations for the MSES-12 and 46.875 for the MSES-

24), we used the bruteforce algorithm which guarantees to find the optimal solution. If the number of combinations exceeds computational capacity, however, we recommend the use of probabilistic algorithms such as Ant Colony Optimization (Janssen et al., 2017).

We used a limited set of criterion variables. Although we integrated school grades as an actual outcome of performance self-esteem, future validation approaches might want to use a broader set of criteria for validation. The assessment of behavioral outcomes such as observed classroom behavior or reported daily behavior using experience sampling would advance the predictive validity of the short forms of the MSES.

Results on the agreeableness and openness subscales from Sample 1 (Study 1) must be interpreted carefully because of limited reliability. Since the results from the TIPI-G in Study 1 closely resembled those from the BFI-44 in Sample 2 and in Study 2, however, we are confident that the present results are valid.

The use of the latent factor model of the MSES (Figure 1) is novel in multidimensional self-esteem research and may guide future research. This model has multiple advantages because it acknowledges previous conceptualizations of multidimensional self-esteem and the role of global vs. domain-specific self-esteem. Due to its parameterization it is equivalent to a correlated factor model which has been used in previous research on multidimensional self-esteem (e.g., Rentzsch et al., 2016; Marsh & Yeung, 1998), but has the clear advantage to allow the computation of unique correlations with external criteria over and above global self-esteem (see Geiser et al., 2012). This model is, thus, particularly useful for testing construct validity. For example, our research provided evidence that agentic narcissism (as assessed with a short form of the NPI) was uniquely related to the social contact or the performance domain of self-esteem over and above general positive self-evaluations. Our results may be interpreted as suggesting that domain-specific effects reflect overly positive self-evaluations in specific domains such as being able to get in

touch with people or excelling academically, which cannot be explained by general positive self-evaluations. Thus, our findings may be particularly important for future self-enhancement research. Research investigating associations between domain-specific self-esteem without partialling out global self-esteem variance may use either single-factor models (e.g., Rentzsch & Schröder-Abé, 2018; van Soest et al., 2016) or first-order models with correlated factors pertaining to each subscale.

A strength of the present research is the preregistration of our second study to cross-validate the structure of the MSES short forms and to test construct validity. Future research on short-form development may accordingly rely on preregistration.

We suggest that the 24-item short form (MSES-24) may be particularly useful in applied research settings where there is a need to lower the burden on participants while at the same time maintaining the original scope of the construct. For large-scale assessments and panel studies with very limited time resources, we recommend the ultra-short scale with two items per subscale (MSES-12). As the original form of the MSES has been widely applied in clinical practice, future researchers may want to test the applicability of the MSES short-form in individual and clinical assessment settings.

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Open Science

Open Data: Data for Study 1 (Sample 1) and Study 2 are available at <https://osf.io/gn42x/>. We confirm that there is sufficient information for an independent researcher to reproduce all of the reported results, including codebook if relevant (Rentzsch et al., 2021).

Open Materials: We confirm that there is sufficient information for an independent researcher to reproduce all of the reported methodology (Rentzsch et al., 2021).

Preregistration of Studies and Analysis Plans: Study 1 was not preregistered. Study 2 was preregistered with an analysis plan (Rentzsch et al., 2020).

Table 1*Summary of Descriptive Statistics and Correlations Between Global and Domain-Specific Self-Esteem and External Variables in Adult and Adolescent Samples, Study 1*

Variables	Global self-esteem		Social contact		Social criticism		Performance		Physical appearance		Physical ability	
	Adult	Adol.	Adult	Adol.	Adult	Adol.	Adult	Adol.	Adult	Adol.	Adult	Adol.
Short form (MSES-24)												
Extraversion	.31**	.24**	.55**	.52**	.06	.03	.11*	.01	.05	.14**	.13**	.31**
Agreeableness	.19**	.03	-.01	.06	-.05	-.06	.06	.08	.00	-.07	.05	-.00
Conscientious.	.39**	.15**	-.01	-.05	-.19**	-.05	.16**	.49**	-.03	-.06	.06	-.04
Neuroticism	-.77**	-.56**	-.11**	-.15**	-.06	-.13**	.05	.03	-.01	.02	-.09*	-.16**
Openness	.36**	-.04	.37**	.09	.08	-.05	.16**	.26**	.02	-.02	.10*	.07
Narcissism	.34**		.38**		-.03		.16**		.05		.10*	
Grade		.08		-.18**		-.10*		.58**		-.09		-.16**
<i>M (SD)</i>	4.87/1.25	4.82/1.28	4.87/1.44	4.80/1.24	4.72/1.41	4.26/1.43	5.01/1.13	4.36/1.12	4.55/1.46	4.21/1.46	4.19/1.38	4.72/1.42
ω	.82	.82	.87	.71	.85	.81	.81	.75	.85	.83	.78	.77
Ultra-short form (MSES-12)												
Extraversion	.32**	.25**	.50**	.45**	.04	.12	.09	.01	.01	.10*	.15**	.24**
Agreeableness	.18**	-.00	.02	.12	-.08	-.03	.07	.08	.01	-.06	.02	-.06
Conscientious.	.38**	.15**	.01	-.08	-.24**	-.03	.16**	.32**	-.02	-.07	.00	-.13*
Neuroticism	-.77**	-.61**	-.14**	-.03	.01	-.08	.04	.03	-.04	.04	-.14**	-.12*
Openness	.50**	-.05	.34**	.06	.07	-.04	.15**	.22**	-.01	-.03	.09	.06
Narcissism	.36**		.34**		-.09		.13**		-.01		.13**	
Grade		.09		-.19**		-.07		.35**		-.09		-.18**
<i>M (SD)</i>	4.97/1.39	4.77/1.40	4.75/1.49	4.81/1.33	4.79/1.55	4.52/1.56	4.97/1.23	4.29/1.15	4.59/1.74	4.47/1.77	4.77/1.61	5.14/1.60
ω	.75	.71	.81	.64	.74	.60	.84	.73	.86	.86	.70	.64
Original form (MSES, 32 items)												
Extraversion	.31**	.26**	.57**	.58**	.05	.01	.12*	.02	.11*	.15**	.15**	.32**
Agreeableness	.20**	.03	-.02	.02	-.07	-.08	.06	.07	-.00	-.06	.06	.02
Conscientious.	.40**	.19**	.01	-.04	-.17**	-.09*	.15**	.51**	.00	-.07	.08	-.03
Neuroticism	-.73**	-.50**	-.17**	-.20**	-.17**	-.20**	-.02	-.02	-.07*	-.04	-.13**	-.18**
Openness	.36**	.01	.35**	.06	.10*	-.10*	.20**	.28**	.07	-.04	.14**	.08
Narcissism	.35**		.39**		.00		.19**		.13**		.11*	
Grade		.11**		-.18**		-.12**		.55**		-.11*		-.17**
<i>M (SD)</i>	4.08/1.18	4.96/1.16	4.87/1.43	4.73/1.25	4.64/1.43	4.23/1.45	5.00/1.13	4.40/1.05	4.48/1.40	4.16/1.36	4.16/1.31	4.66/1.29
ω	.89	.87	.90	.78	.89	.85	.84	.76	.87	.84	.78	.74

Note. Cells present correlation coefficients between latent (residual) factors of self-esteem and external variables for different forms of the MSES in an adult sample (Adult, Sample 1) and an adolescent sample (Adol., Sample 2) from Study 1; ω = McDonald's Omega. $N_{\text{Adult}}=644$ and $N_{\text{Adol.}}=674$. * $p < .05$. ** $p < .01$.

Table 2

Summary of Descriptive Statistics and Correlations Between Global and Domain-Specific Self-Esteem and Big Five Personality Traits, Study 2

Variables	Global self-esteem	Social contact	Social criticism	Performance	Physical appearance	Physical ability
Short form (MSES-24)						
Extraversion	.52**	.60**	.07	.05	.07	.15**
Agreeableness	.27**	.09	.13	.06	.02	.10
Conscientiousness	.37**	.10	.03	.23**	.11*	.19**
Neuroticism	-.77**	-.08	-.12*	-.08	.02	-.15**
Openness	.20**	.22**	-.00	.26**	.08	.09
<i>M/SD</i>	4.84/ 1.44	4.68/ 1.47	4.70/ 1.53	5.02/ 1.15	4.51/ 1.49	4.00/ 1.51
ω	.89	.88	.90	.80	.86	.83
Ultra-short form (MSES-12)						
Extraversion	.52**	.63**	-.03	.12*	.07	.09
Agreeableness	.24**	.13*	.17	-.00	.06	.10
Conscientiousness	.37**	.15*	.02	.16**	.13*	.11
Neuroticism	-.73**	-.14**	-.25**	-.10*	-.04	-.14**
Openness	.21**	.25**	-.01	.22**	.11	.08
<i>M/SD</i>	4.75/ 1.62	4.64/ 1.52	4.84/ 1.61	4.98/ 1.27	4.67/ 1.74	4.56/ 1.79
ω	.86	.83	.79	.89	.88	.82

Note. Cells present correlation coefficients between latent (residual) factors of self-esteem and external variables for the short forms of the MSES; ω = McDonald's Omega. $N=417$ for the MSES-24 and $N=412$ for the MSES-12.

* $p < .05$. ** $p < .01$.

Figure 1
Latent Factor Model of the Short Form of the Multidimensional Self-Esteem Scale (MSES-24)