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The Multidimensional Self-Control Scale (MSCS): Development and Validation

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Trait self-control is important for well-being and mental and physical health. Most extant measures of self-control are limited in that they do not account for the multidimensionality and specificity of the trait. The aim of this study was to develop and validate a multidimensional and hierarchical scale of self-control in a full and a short version. The development of the Multidimensional Self-Control Scale (MSCS) and the Brief Multidimensional Self-Control Scale (BMSCS) was based on focus groups, a pilot, a main, and a validation sample (total $N = 2,409$). The 29-item MSCS consists of 6 first-order factors (Procrastination, Attentional Control, Impulse Control, Emotional Control, Goal Orientation, and Self-Control Strategies), 2 second-order factors (Inhibition and Initiation), and a third-order self-control factor. The 8 items in BMSCS provides a general trait self-control score. Findings from exploratory and confirmatory factor analyses supported the structures across samples, and internal consistency was acceptable. Assessment for acquiescence and sex differences indicated no major impacts on the scales. Strong convergent validity was observed with the Self-Control Scale (SCS) and the Brief Self-Control Scale (BSCS), as well as to other similar concepts. The MSCS subscales discriminated well between each other. Assessment of incremental validity of the MSCS over SCS, when controlling for sex and personality, showed significant increases in explained variance when predicting habits, hardiness, and life satisfaction. Similar significant results were observed for the BMSCS over the BSCS. Overall, results indicate that the new scales are useful measures that integrate recent theoretical and empirical findings of trait self-control.

Public Significance Statement
This study introduces the new Multidimensional Self-Control Scale (MSCS), including a full and brief version. Findings provide support for a hierarchical model of self-control, with six specific factors, two domain factors of inhibitory and initiatory behaviors, and a higher-order factor of general self-control. The model and the scale can be highly useful for practitioners and researchers in fields such as organizational, health and clinical psychology.

Keywords: inhibition, initiation, measurement, multidimensional, self-control

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Trait self-control has demonstrated to be vital for many important outcomes in life, such as physical and mental health (Hofmann, Friese, & Wiers, 2008; Tangney, Baumeister, & Boone, 2004), subjective well-being (Briki et al., 2015; Cheung, Gillebaart, Kroese, & De Ridder, 2014), and success at work and in education (Duckworth & Seligman, 2005; Mischel, Shoda, & Peake, 1988). Individuals who are low in trait self-control report more anxiety and depression (Bowlin & Baer, 2012; Tangney et al., 2004), more violence in close relationships (Finkel, DeWall, Slotter, Oaten, & Foshee, 2009), higher incidents of eating disorders and substance abuse (Tangney et al., 2004), and have higher levels of impulsivity (Morean et al., 2014). Longitudinal studies show that self-control in-fact can predict health and well-being 30 years later (Moffitt et al., 2011; Schlam, Wilson, Shoda, Mischel, & Ayduk, 2013). Self-control skills have been suggested to be a protective factor in coping with life's demands (Kennett & Keefer, 2006) and significant for the therapeutic change process (Ayduk & Kross, 2017). A meta-analysis of more than 100 studies supports the importance of self-control for a number of outcomes associated with positive functioning (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). Consequently, there has been a tremendous growth in research on self-control in the past decades. Traditionally, self-control has been defined as the ability to inhibit or overrule immediate urges to attain a long-term goal (Carver & Scheier, 1981, 1982; de Ridder et al., 2012; Metcalfe & Mischel, 1999; Vohs & Baumeister, 2004). Many scholars have recently argued that this definition is too narrow and that self-control also entails using more proactive, or initiatory self-control strategies (de Ridder, de Boer, Lugtig, Bakker, & van Hooft, 2011; Fujita, 2011; Galla & Duckworth, 2015; Gillebaart & de Ridder, 2015). Initiatory self-control implies that people can anticipate self-control conflicts and initiate actions to avoid the conflicts rather than just inhibit actions as a last resort to avoid giving in to a temptation. Diary studies indeed show that people use initiatory self-control responses in daily life, such as regulating the availability of temptation and adopting adaptive habits (Hofmann, Baumeister, Förster, & Vohs, 2012).

A meta-analysis identified numerous approaches to measuring self-control and showed that self-report and informant-report questionnaires had the strongest convergent validity and that they had considerably less heterogeneity than delay of gratification tasks and executive function tasks (Duckworth & Kern, 2011). Given its ease of administration and convergent validity, trait self-control is commonly measured by self-report (Hoyle & Davisson, 2017). However, a challenge for the measurement of self-control is the diversity in conceptualizations of self-control. For instance, Nigg (2017) identified more than 25 terms that are commonly used to describe self-regulation processes, many of which are synonymous with self-control.

Despite the recognition of multiple types of self-control, the overwhelming majority of research on self-control assesses self-control as a single, general factor (Duckworth & Kern, 2011; Hoyle & Davisson, 2016). Fujita (2011) states that there is a "need to develop better assessments of people's use of alternative means of self-control beyond effortful impulse inhibition" (p. 361). Davisson and Hoyle (2017) suggest that more effort should be put into developing self-report measurements that address specific types of self-control and that go beyond defining self-control as a unidimensional construct. In the current study we will address these issues by developing and validating multidimensional measurements of self-control that considers both general and specific types of self-control, as well as expanding the hierarchical organization of the self-control concept.

Conceptualization of Self-Control

Inhibitory approaches to self-control assume that self-control is exerted when one consciously recognizes an undesirable impulse and inhibits it. The strength model of self-control is a theory of inhibitory self-control which states that self-control is a limited resource that deteriorates as it is used to inhibit impulses, and that this will cause a depletion of self-control resources (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister, Tice, & Vohs, 2018; Baumeister, Vohs, & Tice, 2007). Inhibitory approaches have mainly been developed by looking at people's self-control failures. However, results from research on high self-controllers suggest that self-control by inhibition is only a part of the picture. For instance, individuals with high self-control report experiencing fewer temptations in their environment, have more adaptive routines, and downregulate response conflicts more effectively compared to individuals with low self-control (Gillebaart & de Ridder, 2015; Hofmann et al., 2012). It has been suggested that individuals with high self-control not necessarily are better at handling self-control challenges but are better at avoiding them (Ent, Baumeister, & Tice, 2015). High self-controllers automatize adaptive behaviors to a larger extent than low self-controllers, and this makes them better at behaving in line with their long-term goals (Adriaanse, Kroese, Gillebaart, & de Ridder, 2014; Baumeister & Alquist, 2009; Gillebaart & Adriaanse, 2017).

Moreover, it has been argued that if self-control was based only on inhibition, this would leave people very vulnerable to constant self-control failure and depletion, and that the successful use of initiatory self-control strategies is what distinguishes high and low self-controllers (Gillebaart & de Ridder, 2015). The notion of a second component of self-control, in addition to inhibition, is not new, and there is considerable empirical support for the notion of a two-factorial structure (Gillebaart, 2018). As to the effect of initiatory self-control, a meta-analysis on the effect of self-control on behavior showed that initiatory behavior plays an equally important role in self-control as inhibitory behavior (de Ridder et al., 2012). The second component of self-control has been named differently based on researchers' emphasis. For instance, Fujita, Carnevale, and Trope (2018) refer to *prospective self-control* as all the proactive processes and strategies individuals use in anticipation of temptations that are in conflict with their long-term goals. Others have used the term *initiatory self-control* (de Ridder et al., 2011; Hoyle & Davisson, 2016) or *start control* (de Boer, van Hooft, & Bakker, 2011) for self-control that consists of initiation of goal-directed behavior. *Effortless self-control* (Gillebaart & de Ridder, 2015) is yet another variation, referring to a limited set of initiatory self-control strategies that are habitual and thereby do not require any conscious effort, such as adopting implementation intentions (Gollwitzer, 1999). Initiatory behavior is not just the opposite from inhibitory behavior. For instance, choosing to not have chocolate and snacks in your home is different from stopping yourself from eating chocolate and snacks when they are easily available for you. In the current study we will use the term *initiatory self-control* and define it, in accordance with prior liter-

ature (Sklar, Rim, & Fujita, 2017), as *the effective*, *proactive processes and strategies individuals use to reach their long-term goals when they anticipate temptations that conflict with these goals*. In contrast to inhibitory self-control, initiatory self-control allows individuals to be more agentic in their efforts, while also conserving their energy (i.e., "effortless"). Furthermore, because these are strategies that are used at an early stage in the self-control process, successful implementation of initiatory self-control may render inhibition unnecessary in many cases.

It has been suggested that measurement of trait self-control should adopt a broad definition of the concept (Gillebaart, 2018; Hoyle & Moshontz, 2018). Hence, we apply a generous definition of self-control and suggest that self-control is *what people do to adjust behavior toward the desired long-term end state when they experience a response conflict.* This definition of self-control allows the inclusion of both inhibitory and initiatory strategies of self-control and is in accordance with prior definitions of self-control (Gillebaart & de Ridder, 2015).

Trait Self-Control, Personality, Sex Differences and Cognitive Abilities

There is no widely accepted singular theory of self-control, and researchers study self-control as two general types: state self-control and trait self-control. *State self-control* varies over time and situations, and it has been suggested that state self-control is a limited resource that is prone to depletion (Baumeister et al., 1998). On the other hand, *trait self-control* is a trait that is relatively stable across time and situations, and differs more between that within individuals (Gillebaart & de Ridder, 2017). Because the rest of this article only concerns trait self-control, for the ease of communication we will only use the term self-control when referring to trait self-control.

Several studies have shown that self-control is related to the Big Five personality traits (John, 1990). For instance, Tangney et al. (2004) found Conscientiousness, Emotional Stability (Neuroticism), and Agreeableness to show a moderate to high correlation with self-control. Because both self-control and Conscientiousness are traits that describe individuals as being goal-directed and having impulse control (Roberts, Jackson, Fayard, Edmonds, & Meints, 2009), they are theoretically related traits. It has been suggested that the relationship between self-control and Neuroticism is based on the importance of "regulating sadness, anxiety and other negative emotions" (Duckworth, Taxer, Eskreis-Winkler, Galla, & Gross, 2019; Gross & John, 2003). For Agreeableness, the association to self-control can be manifested in the importance of controlling oneself in social interactions, such as controlling impulses to speak and respecting turn-taking in conversations (Tsukayama, Duckworth, & Kim, 2013).

Males are overrepresented in socially problematic and risky behaviors that are attributed to impulsivity and a lack of self-control, such as dangerous driving offenses (Norris, Matthews, & Riad, 2000), aggression (Knight, Guthrie, Page, & Fabes, 2002), and substance abuse (Degenhardt et al., 2008). Thus, one would expect to see an apparent sex difference in impulsivity and self-control. In a recent study of sex differences across age groups, Tetering, Laan, Kogel, Groot, and Jolles (2020) showed with a small effect size that females had higher levels of self-control into middle adolescence but that this difference declines in later adolescence. Likewise, in a meta-analysis of sex differences of impulsivity and self-control, Cross, Copping, and Campbell (2011) found that females scored slightly lower on questionnaires measuring impulsivity, and slightly higher on questionnaires measuring self-control, compared with men. Analyses of self-control tasks showed no sex difference.

Both self-control and cognitive abilities have shown predictive validity for to similar outcome variables, such as health and academic success (Moffitt et al., 2011). However, results show that cognitive abilities and self-control are largely unrelated and should be independent predictors of similar outcomes (Junger & van Kampen, 2010; Stadler, Aust, Becker, Niepel, & Greiff, 2016).

Dimensionality of Models for Measuring Self-Control

An overview of self-control measurements indicates that the conceptual structure of self-control is unclear. Davisson and Hoyle (2017) developed a typology to organize self-report measurements of self-control. This typology differentiates between general and specific self-control measures. General measures commonly assess several specific types of self-control, such as impulse control or inhibition. However, the specificity is lost as general measures collapse all data into a single self-control score. The loss of specificity brought on by some general measures may contribute to a bias and an underestimation of self-control effects (Swann, Chang-Schneider, & Larsen McClarty, 2007). For instance, a person may be very successful at initiating behaviors required to meet exercise goals but may have problems with inhibiting unhealthy drinking behaviors. Averaging the scores for specific types of self-control may conceal more differentiated self-control effects. On the other hand, specific measures of self-control usually measure manifestation of self-control in certain limited domains (i.e., clinical or developmental) or specify certain types of self-control (i.e., cognitive self-control strategies) and thereby overlook global self-control effects.

Based on a thorough literature review, we will consider the dimensionality of a few recent or commonly used self-control scales in detail. We will first consider two of the most used uni- and bidimensional scales and then examine a selection of multidimensional scales. For a further review of self-report scales on self-control, see Hoyle and Davisson (2016) and Davisson and Hoyle (2017).

Uni- and Bidimensional Models

The Self-Control Scale (SCS; Tangney et al., 2004) is a 36-item, unidimensional scale that measures general self-control. It was developed based on a comprehensive review of the self-control literature available. The scale focuses on failures to exercise self-control over thoughts, emotions, and impulses, as well as on regulating behavior and overcoming maladaptive habits. Tangney et al. (2004) define self-control as "the ability to override or change one's inner responses, as well as to interrupt undesired behavioral tendencies and refrain from acting on them" (p. 275). This inhibitory definition of self-control is reflected in the items of the scale (e.g., "I am good at resisting temptations"). Although five first-order factors of the SCS were identified, details about the factor structure have not been published and the original study only used total scores. Hence, the SCS is considered a unidimensional model.

Measurement of self-control has during the last decade been dominated by the brief version of the Self-Control Scale (BSCS; Davisson & Hoyle, 2017; de Ridder et al., 2012; Tangney et al., 2004). The unidimensional BSCS has not been accepted without criticism. A psychometric evaluation indicated that the scale adequately captures moderate levels of self-control but has problems in distinguishing individuals with either very high or low levels of self-control (Hasford & Bradley, 2011). Hasford and Bradley (2011) suggested that researchers inspect the dimensionality of the self-control construct to improve the scale. As the problem of unidimensionality of the BSCS also became apparent from a theoretical standpoint (de Ridder et al., 2011; Fujita, 2011), different versions of the BSCS have emerged where certain items have been left out and alternative two-factor structures suggested (de Ridder et al., 2011; Ferrari, Stevens, & Jason, 2009; Maloney, Grawitch, & Barber, 2012; Morean et al., 2014). However, most studies today still use the original 13-item version of the BSCS. A recent study (Hagger et al., 2018) compared three competing versions of the BSCS (de Ridder et al., 2011; Maloney et al., 2012; Tangney et al., 2004) across multiple international samples. Results showed that the Maloney et al. (2012) version was the best fitting model out of the three. The Maloney et al. (2012) eight-item model of the BSCS distinguishes between two latent factors, Restraint and Impulsivity, but does not suggest that self-control is a concept that includes initiatory elements. Hagger et al. (2018) also identified several other problems with the three versions of the BSCS, like low reliability of test scores and suboptimal factor loadings.

Multidimensional Models

Some multidimensional models of self-control have been suggested. All multidimensional models provide a single score of self-control at the second-order and include three to six factors at the first order.

The Dispositional Self-Control Scale (Ein-Gar, Goldenberg, & Sagiv, 2008; Ein-Gar & Sagiv, 2014) suggests that self-control is a dynamic inner struggle whereby people either yield to or overcome a temptation to act on an impulse or to procrastinate. Ein-Gar et al. (2008) claim that people deal with the inner struggle by using *control mechanisms*, which are "cognitive, affective and behavioral means individuals use to help themselves overcome temptation" (p. 1). The authors argue that people use either intrinsic and/or extrinsic control mechanisms. Intrinsic mechanisms are self-control actions that individuals themselves are responsible for executing (such as making a precommitment to oneself), whereas extrinsic mechanisms are self-control actions people take where they seek help from others. The revised version of the Dispositional Self-Control Scale (Ein-Gar & Sagiv, 2014) was reduced from 23 to 17 items and from six factors to two factors. The two factors were named Doing Wrong and Not Doing Right. These factors reflect controlling impulses and controlling procrastination, respectively.

The Capacity for Self-Control Scale (Hoyle & Davisson, 2016) combines two general types of self-control (Inhibition and Initiation) with a factor that measures a persistence aspect of self-control (Continuation). In the scoring, Inhibition and Initiation are combined with the Continuation factor to generate four forms of self-control (Inhibition, Short-Lived; Inhibition, Long-Lived; Initiation, Short-Lived; Initiation, Long-Lived). The initiation factor was formed by reversing items that measure procrastination. However, the procrastination literature suggests that procrastination is a matter of inhibition (Steel, 2007). If initiation and inhibition are qualitatively different concepts (Gillebaart & de Ridder, 2015), reversing inhibition should not give initiation items. Currently, no detailed peer-reviewed documentation of the Capacity for Self-Control Scale have been published.

The 50-item Self-Knowledge Sheet (NAS-50; Nęcka, 2015; Nęcka et al., 2016; Nęcka, Korona-Golec, Hlawacz, Nowak, & Gruszka-Gosiewska, 2019) differentiates between five subfactors of self-control: (a) Goal Maintenance includes keeping in mind one's own intentions and long-term plans; (b) Initiative and Persistence is defined as the ability to set goals and act without delay; (c) Proactive Control is the ability to manage goals and obstacles; (d) Switching and Flexibility is understood as the ability to control attention during a performance and adjusting to changing conditions; and (e) Inhibiting and Adjourning consists of restraining emotional reactions and impulsive behavior. Results indicate that NAS-50 has good psychometric properties (Fryt, Smoleń, & Czernecka, 2019; Nęcka et al., 2016). Although the boundary between self-control and self-regulation is vague and contested, several factors and items of the NAS-50 seem to measure self-regulation rather than self-control. For instance, the ability to create goals (Initiative and Persistence) is traditionally considered to be a core element of self-regulation (Carver & Scheier, 1982).

The Need for an Integrated Measurement of Self-Control

Although there are several measures of self-control, the scales reflect both a disagreement on what self-control is and how to measure self-control. There is a divergence in the number of factors, the levels of the factors, and the contents of the concepts. Furthermore, test scores from some of the most used scales appear to have low estimated reliabilities and suboptimal factor loadings (Hagger et al., 2018). Recent theory and empirical findings suggest that self-control is not a unidimensional construct and that both inhibition and initiation are aspects of self-control (e.g., de Boer et al., 2011). Furthermore, all multidimensional scales of self-control consist of two levels. Most scales consider self-control to be a single factor at the second order, but the number of factors at the first order range from two to six. Some multidimensional scales prioritize broad factors (e.g., the three factors of the Capacity for Self-Control Scale) whereas other scales are more specific (e.g., the five subfactors of the NAS-50).

No current measurement of self-control is able to combine the need for specificity, the need to be able to differentiate between inhibition and initiation, and the need to report self-control as a single latent factor (Davisson & Hoyle, 2017). We suggest that this integration is possible, and in accordance with Fujita (2011) and Davisson and Hoyle (2017) we believe that there is room for improvement when it comes to the measurement of self-control. Like many others, we suggest that self-control is a multidimensional construct. Because the number of factors varies across different scales, we therefore advocate the importance of sampling among a wide range of self-control items. Moreover, we are interested in assessing whether the key to developing an integrated

self-control scale can be found by expanding the hierarchical levels in a model for measurement of self-control.

Aims and Expectations of the Current Study

Based on the literature review, our aims for the current study are to (a) develop a multidimensional and hierarchical scale for measurement of self-control, (b) establish a brief version of the scale, and (c) test the scales structure and assess reliability and validity. We expected the new measurements of self-control to show high convergence with the SCS and BSCS.

Previous studies (e.g., Tangney et al., 2004) have shown a positive relationship between self-control and Conscientiousness, Extraversion, and Agreeableness. Also, it has been shown that there is a negative relationship between self-control and Neuroticism, and no relationship between self-control and Openness to Experience. We expected the same to be the case in this study.

In accordance with prior research, we expected the new measurements to show positive relationships to hardiness (Gordeeva et al., 2016), self-efficacy (Baron, Mueller, & Wolfe, 2016), mental toughness (Gucciardi, Hanton, Gordon, Mallett, & Temby, 2015), and resilience (Chen & Taylor, 2013). Furthermore, we expected the new measurements to be positively related to homework habits (Duckworth et al., 2019), life satisfaction (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014), as well as criteria for physical performance and GPA (Tangney et al., 2004). We did not expect the new measurements to be related to cognitive ability (Junger & van Kampen, 2010; Stadler et al., 2016).

Method

Scale Development

The process of developing a multidimensional scale for self-control was broken down into 10 steps. First, we constructed a conceptualization of self-control based on a thorough literature review. Our definition of self-control was broad and included both initiations and inhibitions of behavior. Second, an item pool for self-control was generated. The item pool was generated in line with the guidelines proposed by Clark and Watson (1995), which suggest that the items in the pool should be based on the definition developed in the literature review. In the third step, we did an exploratory analysis using a principal component analysis (PCA; for simplicity of communication we will use the terms *factor* and *component* interchangeably) to examine the factor structure, and further estimated internal consistency reliabilities for test scores of the factors that were identified. The number of retained items for each factor was first determined by theoretical considerations of whether a factor was psychological meaningful, and second by statistical issues (Costello & Osborne, 2005; Thurstone, 1947). In the fourth step, the identified structure was replicated using an exploratory factor analysis (EFA) in a separate sample to assess the robustness of the identified structure. The fifth step included confirmatory factor analyses (CFAs) in two separate samples to assess structural validity (John & Benet-Martinez, 2000). In the sixth step, we developed a brief version of the scale based on an EFA and a CFA. In the seventh step we examined the proposed model for acquiescent responding by using random-intercept EFA (RI-EFA), because "acquiescent responding in the factor analysis of personality data might result in reversed items exhibiting attenuated communality and factor loadings" (Primi, De Fruyt, Santos, Antonoplis, & John, 2020). In the eighth step, we assessed the identified structures for sex differences and computed separate scale scores for males and females. In the ninth step, we considered the scales convergent and discriminant validity. Finally, we examined the incremental validity in predicting outcomes for the new scales over the commonly used SCS (Tangney et al., 2004), while controlling for sex and personality.

Item Generation

Initially in the item generation process, we generated a set of major themes that reflected our conceptualization of self-control based on the literature review. A pool of 85 items was generated. The items were designed to be of a general nature and applicable across different contexts. Three items of the Irrational Procrastination Scale (Steel, 2010; Svartdal, 2017) were included to reflect the procrastination factor of self-control (Ariely & Wertenbroch, 2002; Steel, 2010). The item pool was refined and supplemented with additional items by two focus groups at The Norwegian Defense University College, one group consisting of undergraduates ($N = 10$, $M_{age} = 23$, $SD_{age} = 2.10$) and another group consisting of senior military officers ($N = 8$, $M_{age} = 37.12$, $SD_{age} = 4.29$). We analyzed the results from the focus groups and refined the item pool. Of the 85 initial items, five items were deleted because they were evaluated as not properly assessing self-control and nine items were reworded to improve clarity. Another 16 items were added to the pool. In total, we retained 96 items before the piloting of the questionnaire.

The goal of the pilot test was to (a) rate the readability of the items in the pool, (b) assess the normality of the items, and (c) facilitate development of new items. Subjects in the pilot testing phase of the questionnaire ($N = 112$, 104 male and 8 female, $M_{age} = 24.7$, age range: 21–35) were undergraduate students at The Norwegian Defense University College. Written informed consent was obtained from all participants, and they filled out the questionnaire by paper and pencil. The subjects were invited to fill out the survey anonymously during class, and participation was voluntary. All but five of the invited participants completed the questionnaire, yielding a participation rate of 95.7%. Participants were asked how well each item described themselves on a scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Participants were also asked to rate each item for its readability on a 5-point scale (1 = *poor*; 5 = *excellent*) and encouraged to give open-ended comments on the quality of the items. A final open-ended question asked the participants to suggest other items that measure self-control. On average, the items in the pool were evaluated as very good for their readability ($M = 4.31$). Three items were rated as less than good ($M < 3$), and another seven items were very close to this threshold. Three items had a kurtosis above ± 2. The item pool was slightly negatively skewed ($M = -.27$) and had a slightly negative kurtosis ($M = -.01$). As a result, six items were deleted and seven items were reworded. Another nine items were added based on suggestions from the participants, yielding a total of 99 items to be tested in the final stage of the scale development.

Participants and Procedure

Participants in the main sample (N = 948, 736 male and 212 female, M_{age} = 19.8 years, SD_{age} = 1.76) were enrolled in the Norwegian Armed Forces Joint Selection and Admission process of 2016. This 2-week process was conducted to test candidates for entry into educational institutions that prepares them for service as commissioned or noncommissioned officers. All 1,070 candidates in the selection process were requested to participate in the study, and participants accepted the invitation by completing an informed consent form and a questionnaire. Candidates were informed that the study was voluntary and independent from the selection process. The participation rate was 88.6%. All participants had completed secondary education and been found fit for conscription in Norway.

Participants in the validation sample (N = 1331, 422 male and 909 female, M_{age} = 50.3 years, SD_{age} = 11.61) were recruited in March 2020 by replying to a Facebook ad or following a link to the survey from the author's personal Facebook pages. The survey was open to all participants older than 16 years and was available for one week.

The combined sample (N = 2279, 1158 male and 1121 female, M_{age} = 37.56 years, SD_{age} = 17.51) consisted of participants from the main and the validation sample.

The study was reviewed and approved by the Research Review Committee at The Norwegian Defense University College (Review NO. 2017919) and the Research Ethics Board at the Department of Psychology, University of Oslo.

Measures

Measures used in this study included data from conscript records, physical and cognitive tests, and survey data.

Self-control item pool. The 99 items from the item generation process were administered to participants. The items were measured on a scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), and 34 were false-keyed.

The Self-Control Scale (SCS). The SCS (Tangney et al., 2004) yields self-control (e.g., "People would describe me as impulsive") either as a full scale consisting of 36 items or as the Brief Self-Control Scale (BSCS; Tangney et al., 2004) consisting of 13 items. There are 24 reversed items in the full scale and nine reversed items in the brief version. Self-control was assessed across five domains (capacity for self-discipline, an inclination toward deliberate/nonimpulsive action, healthy habits, self-regulation in service of work ethic, reliability), and both versions of the SCS report self-control as a single score. Participants reported how well each item describes themselves using a scale ranging from 1 (*not at all*) to 5 (*very much*). The reliabilities for test scores from the SCS (α = .88) and the BSCS (α = .79) were good.

The NEO-Personality Assessment (NEO-PI-3). The Norwegian version of the NEO-PI-3 (Martinsen, 2010; McCrae, Costa, & Martin, 2005) was used to measure personality traits. The 240 items of the scale measures 30 facets, which in turn are classified as five general personality factors or traits: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. Participants respond to items by indicating their agreement with the items on a five-point Likert scale (e.g., "I seldom feel nervous") ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Cronbach's alpha for the personality factors were, overall, good: Neuroticism = .91; Extraversion = .88; Openness to Experience = .87; Agreeableness = .88; and Conscientiousness = .88.

The Self-Reported Habit Index (SRHI). The SRHI (Verplanken & Orbell, 2003) measures habit strength. Habits are defined as "learned sequences of acts that have become automatic responses to specific cues, and are functional in obtaining certain goals or end states" (Verplanken & Aarts, 1999, p. 104). The SRHI is designed to measure a selected target behavior, and in this study the target behavior was homework habits. The scale consists of 12 items (e.g., "Homework is something I do automatically") and is measured on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The reliability was excellent (α = .93).

The Dispositional Resiliency Scale (DSR-15). The DSR-15 measures hardiness. Hardiness is defined as "a generalized style of functioning characterized by a strong sense of commitment, control, and challenge that serves to mitigate the negative effects of stress" (Hystad, Eid, Johnsen, Laberg, & Bartone, 2010). The 15 items in the scale (e.g., "By working hard you can nearly always achieve your goals") are rated on a 4-point scale ranging from 0 (*not at all true*) to 3 (*completely true*). Six of the items on the scale are negatively keyed. The DSR-15 yields a total score for Hardiness, as well as three subscale scores for, respectively, Commitment, Challenge and Control. Only the Hardiness factor of the DSR-15 was used in this study, and the Cronbach's alpha for its test scores was acceptable (α = .71).

Satisfaction with Life Scale (SWLS). The Norwegian version of SWLS (Diener, Emmons, Larsen, & Griffin, 1985) was used to measure life satisfaction. Life satisfaction is defined as "the cognitive and global evaluation of the quality of one's life as a whole" (Pavot & Diener, 2008) and is the component of subjective well-being that is concerned with the cognitive-judgmental aspect (Andrews & Withey, 1976). In the SWLS, participants indicate their agreement with five statements (e.g., "I am satisfied with my life") ranging for 1 (*strongly disagree*) to 7 (*strongly agree*). Cronbach's alpha was good (α = .83).

The Mental Toughness Index (MTI). Mental toughness is defined as "a personal capacity to produce consistently high levels of subjective or objective performance despite everyday challenges and stressors as well as significant adversities" (Gucciardi et al., 2015). The eight items of the MTI (e.g., "I consistently overcome adversity") have a unidimensional structure that was assessed on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), and Cronbach's alpha was good (α = .81).

Resilience Scale for Adults (RSA). The RSA measures an individual's positive resources that can be adapted in stressful situations and prevent the development of negative mental health outcomes. A brief version of the RSA was used in the current study that gives an overall score for Resilience. Participants report how well each item (e.g., "I always find a solution when something unexpected happens") describes themselves using a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), and reliability was acceptable (α = .73).

The Educational Self-Efficacy Scale (ESES). The ESES is a contextualized 7-item measure designed to capture self-efficacy beliefs regarding one's ability to successfully complete the military training and education (Buch, Säfvenbom, & Boe, 2015). The ESES is based on theory of self-efficacy (Bandura, 1977) and the self-determination theory (Deci & Ryan, 1985). The scale assesses

perceived capability for academic performance and for performing well (e.g., "With reasonable certainty, I can say that I am able to be a hard-working student"). Participants report how well each item describe themselves using a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), and reliability was good ($\alpha = .82$).

General mental ability (GMA). The GMA test yielded a combined score from three cognitive ability scales: arithmetic, word similarities, and figures. The Arithmetic scale (30 items, multiple-choice) was similar with the arithmetic scale of the Wechsler Abbreviated Scale of Intelligence (Wechsler, 2011). The Word Similarities scale (54 items, multiple-choice) was similar with the Wechsler Abbreviated Scale of Intelligence's Vocabulary scale. The Figures scale (36 items, multiple-choice) were similar with the Raven Progressive Matrices (Raven, 2003). See Sundet, Barlaug, and Torjussen (2004) for more information on the GMA test.

Performance scores. Performance scores were test scores that were a part of the selection data and included (a) grade point average (GPA), (b) physical strength tests, and (c) 3K run. GPA was an average of the grades from participants' transcript from secondary education. The physical strength test was a combined score based on push-ups, pull-ups, and sit-ups. Both the 3K run and the physical strength test was scored on a 9-point scale ranging from 1 (*unfit*) to 9 (*excellent*).

Data Analysis

Exploratory analyses. The Kaiser-Meyer-Olkin test of sampling adequacy (Cerny & Kaiser, 1977) and Bartlett's test of sphericity (Bartlett, 1950) were used to assess how suited the data were for factor analysis.

As it is recommended to perform exploratory and confirmatory analyses on different samples as models can be overfitted (Fokkema & Greiff, 2017), we split the main sample in two randomized halves. The exploratory subset sample ($n = 482$, 369 male and 113 female, $M_{age} = 19.82$ years, $SD_{age} = 1.80$) was used for the PCA, whereas the confirmatory subset sample was used for the first CFA ($n = 466$, 367 male and 99 female, $M_{age} = 19.73$ years, $SD_{age} = 1.80$). The two samples were close to the recommended sample size of 500 (MacCallum, Widaman, Zhang, & Hong, 1999) and within a subject-to-variable ratio of 5:1 (Bryant & Yarnold, 1995; Gorsuch, 1983).

The choice of using a PCA as an extraction method was based on the difficulty of forming hypotheses about the number of factors that needed to be extracted, because theories of self-control are conflicting in their suggestions for factors at the first-order. The PCA was conducted to investigate the structure in the exploratory subset of the main sample. We utilized principal component extraction and promax rotation. Promax rotation minimizes the effects of correlations between factors and is warranted with substantial intercorrelations. Theory and empirical findings suggest high correlations between different self-reported constructs of self-control (Duckworth & Kern, 2011). The PCA was conducted with SPSS Version 25 (IBM Corp., 2017).

Parallel analysis was used to determine the appropriate number of factors to retain (Hayton, Allen, & Scarpello, 2004). We employed parallel analysis to generate 1,000 random data sets based on the parameters from our data set and determine the appropriate eigenvalue. The cutoff value for comparing eigenvalues was set to 95%. As consistent with best practice (DeVellis, 2017), our item retention criteria for rotated factor loadings were set equal to or more than .50 and less than .30 for cross-loadings. Items that did not meet our criteria were deleted one at a time in an iterative process where the items with the lowest communality estimate were deleted first.

To check the robustness of the initial exploratory analysis, an EFA was conducted on the validation sample. The EFA used the oblique geomin rotation, the weighted least squares with mean and variance adjustment-estimator (WLSMV) and was computed on the polychoric correlation matrix. We used the eigenvalue criteria and model fit indices to evaluate four models. Model fit was evaluated with multiple fit-indices: root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), and comparative fit index (CFI), and standard root-mean-square residual (SRMR). In accordance with common fit criteria, acceptable fit is achieved when RMSEA $\leq .08$, CFI $\geq .90$, TLI $\geq .90$, and SRMR $\leq .08$, whereas excellent fit is indicated by RMSEA $\leq .05$, CFI $\geq .95$, TLI $\geq .95$, and SRMR $\leq .05$ (Marsh, Hau, & Wen, 2004).

Confirmatory analyses. The latent structure was evaluated by testing CFA models in the two different samples. For the confirmation subset of the main sample, we used CFAs with maximum likelihood estimator with robust standard errors (MLR) as the estimation method. MLR was used in this analysis as it has been suggested that if ordinal data consist of five or more categories, they can be treated as categorical data (e.g., Johnson & Creech, 1983; Rhemtulla, Brosseau-Liard, & Savalei, 2012). In addition, for a sample size of 500 the MLR-estimator has shown a superior performance to the alternative WLSMV-estimator by having less biased standard errors of interfactor correlations (Li, 2016). Fit indices were used to assess model fit and chi-square difference tests were used to compare models. Because MLR does not follow chi-square distributions, the Satorra-Bentler scaled chi-square (Bryant & Satorra, 2012) was used to correct the chi-square values before conducting the chi-square difference tests.

We ran a second set of CFAs to assess the robustness of the initial CFAs. These analyses were conducted on the validation sample to maximize statistical power and available information to estimate the item parameters. In accordance with suggestions for larger sample sizes (Sellbom & Tellegen, 2019), we used the polychoric correlation matrix with the WLSMV-estimator in conducting for this and the remaining CFAs. Model fit were evaluated with fit indices and chi-square estimates, whereas models were compared with chi-square difference tests.

Developing a brief scale. We aimed to develop a brief scale with solid psychometric properties and a balance of item content. The brief scale was developed by selecting items from the first factor of the unrotated EFA that was conducted on the full scale: the highest-loading items from each subfactor were selected. In addition, more items were added if required to obtain sufficient reliability, based on a principle of approximate equal balance of subfactors. Next, the identified solution tested in the combined sample using a CFA.

Random-intercept analysis. RI-EFA for the full scale was conducted on the combined sample to control for acquiescent responding, and followed guidelines given by Aichholzer (2014). The random-intercept factor reflects participants agreement. We evaluated the model fit, conducted a difference test whereby we

compared the RI-model with a nested model, and assessed the explained variance resulting from the random-intercept factor loadings.

All EFAs and CFAs were conducted using Mplus analytic software version 8.2 (Muthén & Muthén, 2018).

Other analyses. Sex difference was assessed by using independent samples *t* tests, and the effects of sex differences on the scale was calculated with linear regressions. The Pearson product–moment correlation was used to assess convergent and discriminant validity, while four-step hierarchical regression analyses were employed to analyze for incremental validity. Tests of validity were conducted on the main sample, whereas the combined sample was used to assess for sex differences and calculate scale scores.

Results

Missing Data

On average, each of the 332 variables had 1.35% missing data (range: .2%–4.3%). Given guidelines which suggests that 5% or less missing data is inconsequential for analyses (Schafer, 1999), no efforts were taken to deal with the missing data in this study.

Exploratory Analyses

The purpose of the first exploratory analysis was to determine the factor structure of the items in the item pool. Initially we examined factorability of the variables, before conducting the parallel and the factor analyses.

The Kaiser-Meyer-Olkin test of sampling adequacy (.88) indicated that the data were meritorious, and the Bartlett's test ($p < .001$) indicated that the data were factorable.

The parallel analysis suggested that six factors should be retained from our sample, with eigenvalues ranging from 7.71 to 1.28. Hence, we fixed extraction to six factors.

The item deletion procedure of deleting one item at a time in an iterative process where the items with the lowest communality estimate was repeated until we had a simple, theoretically consistent structure, ultimately reduced from 99 to 30 items. Additionally, three items were deleted because their content was similar to the already-retained items. Also, two of the deleted items were identified as giving unique content to their factors and to be in line with our theory, so these items were kept despite falling a bit short of the item retention criteria. In total, the 29 retained items (see Table 1) accounted for 55% of the cumulative variance in the model. Ten items were negatively keyed.

Based on the factor content, we suggested the following names for the factors. Factor 1 included items that concerned postponement and problems of getting started on tasks, hence this factor was named Procrastination (five items, $\alpha = .82$). The first three of the items on factor 1 were from the Irrational Procrastination Scale (Steel, 2010; Svartdal, 2017). Factor 2 assessed participants' abil-

Table 1
Factor Loadings for Principal Component Analysis With Promax Rotation of the MSCS

Item	Component					
	PRO	AC	IC	EC	GO	SCS
1. I postpone things[a]	.82					
2. If there is something I should do, I get to it before attending to lesser tasks	.74					
3. I put things off for so long that my well-being or efficiency suffers unnecessarily[a,b]	.68					
4. I spend my time wisely	.64					
5. I have a hard time to get started[a,b]	.61					
6. It is hard for me to concentrate[a,b]		.74				
7. I have a good ability to concentrate		.74				
8. I can concentrate, even with many disturbances		.73				
9. I can regulate my focus during a task		.61				
10. I have problems to stay focused on what is said during a talk[a]		.60				
11. Bodily impulses do sometimes have too much control over me[a]			.76			
12. I am easily disturbed by my impulses[a,b]			.73			
13. Sometimes, it is hard to restrain myself[a]			.73			
14. When I am confronted with an unwanted impulse, I have problems to stop thinking about it[a]			.69			
15. I often act without thinking though other alternatives[a]			.65			
16. I try to think about something else when an unpleasant thought is bothering me				.85		
17. When I feel sad, I try to think about something positive[b]				.78		
18. When I feel down, I try to do something I like				.76		
19. If I get angry, I try to focus on something else				.59		
20. When I set a goal, I make concrete plans of how to reach it					.74	
21. I make plans for when, where, and how to reach my goals					.74	
22. I focus daily on my long-term goals[b]					.60	
23. I know what I have to do to reach my goals[b]					.44	
24. I try anything to get me stared when I am uncertain of how to solve a task						.70
25. When I feel stuck, I try to look at the situation from another perspective[b]						.66
26. I try to conquer the fear if I do something scary						.63
27. When it is hard to get started on a task, I try to find something to get me going						.55
28. When it is hard to for me to concentrate on what I read, I try different ways of increasing my concentration						.52
29. I often look for new solutions by redefining the situation						.40

Note. $N = 483$. Factor loadings $< .3$ are not displayed. MSCS = Multidimensional Self-Control Scale; PRO = procrastination; IC = impulse control; AC = attentional control; EC = emotional control; GO = goal orientation; SCS = self-control strategies.
[a] Reversed item. [b] Item in the BMSCS.

ity to control their concentration and to stay focused in different situations, which we named Attentional Control (five items, α = .78). Factor 3 included items about control of impulses and the effect that issues of controlling impulses had on the individual and was named, Impulse Control (five items, α = .80). Factor 4 concerned actions taken to moderate emotional reactions and acting in a willed rather than a passionate fashion, and was named Emotional Control (five items, α = .76). Factor 5 considered how attuned the individual was to short- and long-term goals, and was named Goal Orientation (four items, α = .78). Factor 6 included strategies to conquer challenges that may lead to derailment in various situations where self-control is essential, hence this factor dimension was labeled Self-Control Strategies (six items, α = .72). See Table S1 in the online supplemental materials for a copy of the scale.

The Pearson product–moment correlation revealed that intercorrelation between factors dimensions was moderate (M = .38), ranging from .25 to .53 (Table S2 in the online supplemental materials).

The purpose of the EFA was to validate and check the robustness of the identified factor structure by using an alternative exploratory method in the validation sample. The Kaiser-Meyer-Olkin test of sampling adequacy (.88) indicated that the data were meritorious, and the Bartlett's test ($p < .001$) indicated that the data were factorable.

The eigenvalue-criteria suggested that 6 factors should be retained from this sample (8.11; 2.97; 2.18; 1.67; 1.38; 1.31), and this was supported by the scree plot that showed a drop to eigenvalue of the seventh factor (.92). The four- and five-factor models had inadequate fit-indices, whereas the fit indices of the six-factor model was good (CFI = .96; TLI = .93; RMSEA = .06; RMSEA 90% CI [.05, .09]; SRMR = .03), although the chi-square was significant, $\chi^2(159, N = 1331) = 1256.42$, $p < .001$. The seven- and eight-factor models had slightly higher fit indices than the six-factor model. All 29 items of the six-factor model loaded on the same factors in this sample as they did in the main sample (Table S3 in the online supplemental materials), and there were no cross-loading above .30.

Confirmatory Analyses

The exploratory models were assessed for their structural validity by using CFAs in two separate samples. In the confirmatory subset of the main sample and based on our aims of developing a multidimensional and hierarchical model of self-control, we tested three models for the 29-item self-control data (see Table 2). First, we tested a first-order model to assess whether we could reproduce the results from the exploratory analyses. For this model, we made no assumptions about higher-order latent self-control constructs, but rather suggested that the six correlating factors from the PCA and the EFA could be reproduced. Next, we tested two models that made assumptions about higher-order self-control constructs. The second-order model suggested that self-control was a unidimensional concept at the second-order, whereas the third-order model suggested that self-control consisted of two factors, inhibition and initiation, at the second-order and was unidimensional at the third-order. For the third-order model, we were guided by theory in determining whether first-order factors were an inhibition or initiation factor. Factors that mainly consisted of inhibition items were considered inhibition factors, and factors that mainly consisted of initiation items were considered initiation factors.

Table 2
Confirmatory Factor Analysis: Goodness-of-Fit Summary for Three MSCS-Models

Index	Model		
	First-order model	Second-order model	Third-order model
CFI	.96	.94	.95
TLI	.95	.94	.95
SRMR	.05	.05	.05
RMSEA	.03	.03	.03
RMSEA 90% CI	[.021, .033]	[.027, .038]	[.023, 0.35]
χ^2	488.23	554.13	515.13
df	362	371	370

Note. N = 483. MSCS = Multidimensional Self-Control Scale; CFI = comparative fit index; TLI = Tucker-Lewis index; SRMR = standard root-mean-square residual; RMSEA = root mean square error of approximation; CI = confidence interval.

Fit indices for the structural models showed that the first-order model had good fit indices and supported the structural validity of the exploratory analyses.

For the two higher-order models, the third-order model had excellent fit for CFI and TLI as opposed to the second-order model that had acceptable CFI and TLI values. SRMR and RMSEA were excellent for both higher-order models, whereas the second-order model had a slightly narrower RMSEA 90% confidence interval. To further evaluate the higher-order models, the models were compared with the Satorra-Bentler scaled chi-square difference test. Results showed that the difference between the second-order model (nested) and the third-order model was significant, $\chi^2(1, N = 465) = 41.52$, $p < .001$, suggesting that the third-order model fits the data better. Overall, after considering the quite similar fit-indices and the chi-square test favoring the third-order model, the third-order model was regarded as the best fitting higher-order model (see Figure 1).

The single factor at the third-order was named Self-Control (29 items, α = .90). Factor 1 at the second order included items that reflect Procrastination (reversed), Attentional Control, and Impulse Control. This factor was labeled Inhibition (15 items, α = .86). Factor 2 contained items that illustrated how one acts to cope with different emotional states (Emotional Control), one's orientation toward goals (Goal Orientation), and Self-Control Strategies, hence it was named Initiation (14 items, α = .84). The third-order model reflects the underlying structure of the MSCS.

The robustness of the CFA from the main sample was checked and validated by conducting a CFA in the validation sample. First-, second-, and third-order models were tested, and results were similar as for the CFAs from the main sample (Table S4 in the online supplemental materials). Results indicated that the third-order model (Figure S1 in the online supplemental materials) had an acceptable fit (CFI = .93; TLI = .93; RMSEA = .06; RMSEA 90% CI [.056, .061]; SRMR = .05), although the chi-square was significant, $\chi^2(152, N = 1331) = 2061.95$, $p < .001$.

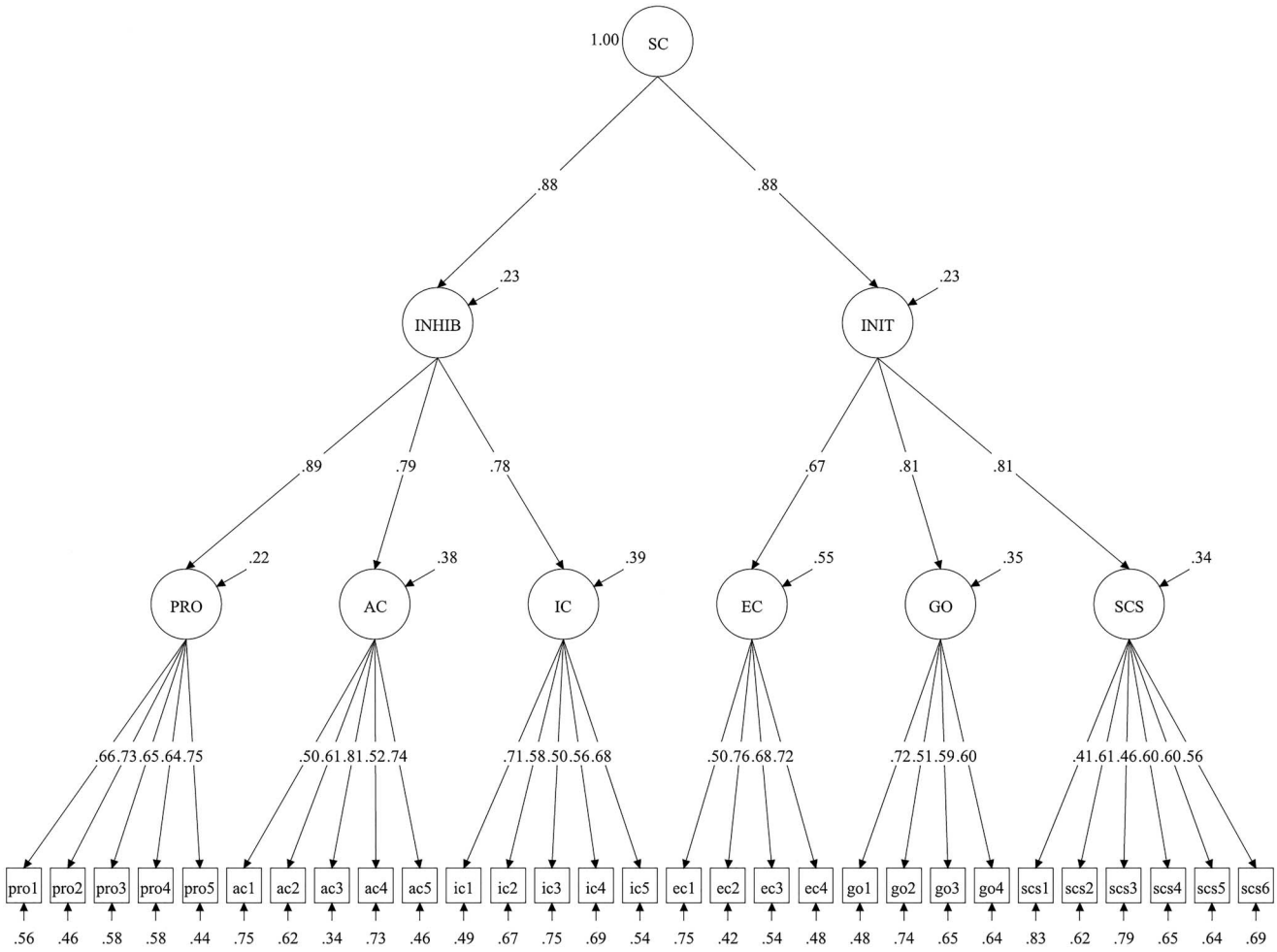

Figure 1. Third-order confirmatory factor analysis for the multidimensional self-control scale. $N = 466$. SC = Self-Control; INHIB = Inhibition; INIT = Initiation; PRO = Procrastination; AC = Attentional Control; IC = Impulse Control; EC = Emotional Control; GO = Goal Orientation; SCS = Self-Control Strategies.

Developing a Brief Scale

The analyses provided evidence for a brief scale of eight items with acceptable internal consistency reliability ($\alpha = .74$). The scale includes items from all six subfactors and has four items tapping each of the second-order factors, Inhibition and Initiation. Four items were false-keyed. See Table S1 in the online supplemental materials for a copy of the scale. We tested a second-order CFA-model with Inhibition and Initiation set as factors at the first-order (Figure S2 in the online supplemental materials). Model fit was good (CFI = .97; TLI = .95; RMSEA = .07; RMSEA 90% CI [.06, .08]; SRMR = .03).

The BMSCS showed a strong correlation to the MSCS in the main and validation samples (rs = .92 and .91;). On average, the BMSCS had moderate correlations to the first-order subscales of the MSCS ($r = .60$, range: .43–.76; Table S2 in the online supplemental materials), as well as strong correlations to Inhibition and Initiation, respectively, $r = .84$ and $r = .71$.

Controlling for Acquiescent Responding

An RI-EFA was conducted to control for acquiescent responding, and this model was compared with a nested model that did not contain the RI-factor. The RI-model (Figure S3 in the online supplemental materials) had an acceptable fit (CFI = .94; TLI = .93; RMSEA = .06; RMSEA 90% CI [.061, .065]; SRMR = .05). Fit indices for the nested model was identical, except for a difference of −.001 on CFI and TLI. Compared with a nested model, the chi-square difference test showed that the RI-model was significantly different, $\chi^2(1, N = 2272) = 60.10$, $p < .001$. The mean RI factor loadings (in absolute values) were low ($\lambda = .12$, range = .06–.15), and far lower that than the average factor loadings on the second-order factors of the MSCS ($\lambda = .70$, range = .45–.93). Given that the RI-factor on average explained 1.4% of the variance of an item and the second-order factor on average accounted for 49% of the variance, acquiescent responding was not considered to be of major impact.

Controlling for Sex Differences

Analyses of scale scores and sex differences were conducted separately for the main and the validation sample to estimate the potential impact of sex differences. Results from independent samples *t* tests (Table S5 in the online supplemental materials) showed one sex difference for the first and second factor order in the main sample (Procrastination and Inhibition), whereas six of the 10 factors showed sex differences in the validation sample. Further analyses of both samples showed that sex differences at the most had very small effects as the two strongest of the 20 linear regressions only accounted for 2% of the variance in each case. The 18 other analyses showed that sex difference accounted for less than 1% of the variance in each case.

Convergent and Discriminant Validity

As expected, there was a strong convergence between the MSCS and the SCS. The total scores of MSCS and the BMSCS correlated between $r = .71$ and .77 with the total scores of the SCS and the BSCS. Table 3 show correlations between all self-control factors and criteria, as well as descriptive statistics for the MSCS and BMSCS.

As expected, all self-control factors had positive correlations to Conscientiousness (*r*s = .22–.41). Also as expected, Neuroticism was the trait that displayed the second strongest relationship to Self-Control, whereas Extraversion and Agreeableness showed the weakest positive relationships to Self-Control. Contrary to expectations, Openness to Experience displayed a weak, positive relationship with two out of three initiation components. See Table S6 in the online supplemental materials for correlations between personality facets and self-control factors.

The MSCS and the BMSCS correlated positively with the other related concept. Mean bivariate correlations between Mental Toughness, Hardiness, Resilience, Self-Efficacy, and Life Satisfaction to the MSCS and BMSCS were moderate (respectively, $r = .55$ and .47; Table 3). In accordance with expectations, Homework Habits showed small to moderate positive relationships with the subscales of the MSCS (*r*s = .24–.51).

The positive relationships of the MSCS and BMSCS to GPA and GMA were small, as expected. The SCS showed a similar correlational pattern to performance scores as the MSCS and the BMSCS. The subscales of the MSCS differed in their ability to predict outcomes. For instance, Homework Habits showed more than twice as strong an effect size to Procrastination as it did to Emotional Control. In addition, GPA and GMA had the strongest correlation to Attentional Control and only weak or no relationship to other aspects of self-control. Performance on physical tests had significant, but weak relationships to Goal Orientation and Procrastination.

Incremental Validity

Incremental validity was tested by assessing the ability of MSCS and BMSCS to explain additional variance for outcomes after sex, personality and the SCS or the BSCS had already been accounted for. Four four-step hierarchical regression models were analyzed for three different outcomes (Homework Habits, Hardiness, and Life Satisfaction). Models 1–3 tested the incremental

Table 3
Means, Standard Deviations, and Correlations Between the MSCS and Criteria Measurements

Measure	*M*	*SD*	SCS	BSCS	N	E	O	A	C	Habits	Hard	Life sat.	MT	Res	SE	GMA	GPA	Strength	3K run
Procrastination[a]	3.74	0.76	.68**	.68**	−.23**	.14**	.02	.12**	.36**	.51**	.40**	.28**	.43**	.49**	.35**	.14**	.03	.12**	.08*
Impulse control	3.79	0.70	.73**	.72**	−.28**	.05	.02	.12**	.32**	.28**	.37**	.23**	.43**	.38**	.31**	.02	.08*	.04	−.01
Attentional control	3.98	0.61	.57**	.54**	−.23**	.17**	.03	.22**	.22**	.29**	.44**	.25**	.58**	.43**	.41**	.15**	.16**	.04	.08*
Emotional control	4.11	0.66	.33**	.29**	−.27**	.14**	.11**	.10**	.33**	.24**	.31**	.26**	.44**	.40**	.18**	.06	.02	−.06	.01
Goal orientation	3.80	0.69	.47**	.48**	−.24**	.17**	.10**	.07*	.25**	.38**	.40**	.19**	.49**	.49**	.34**	.11**	.02	.13**	.10**
S-C strategies	4.06	0.52	.39**	.38**	−.18**	.17**	.06	.07*	.31**	.24**	.46**	.22**	.53**	.43**	.26**	.03	.00	−.01	.01
Inhibition	3.86	0.55	.79**	.76**	−.32**	.15**	.03	.19**	.40**	.47**	.48**	.33**	.55**	.55**	.38**	.18*	.06	.06	.04
Initiation	3.96	0.46	.62**	.61**	−.30**	.21**	.12**	.10**	.38**	.39**	.57**	.29**	.69**	.58**	.44**	.01	.08*	.07*	.08*
MSCS	3.91	0.46	.77**	.75**	−.34**	.19**	.08*	.16**	.42**	.47**	.56**	.34**	.67**	.61**	.44**	.04	.07*	.07*	.07*
BMSCS	3.81	0.58	.73**	.71**	−.29**	.16**	.05	.17**	.40**	.48**	.51**	.30**	.58**	.55**	.40**	−.06	.05	.10*	.07*
SCS	3.69	0.47	—	.91**	−.31**	.10**	.01	.16**	.40**	.44**	.44**	.27**	.47**	.48**	.35**	.08*	.07*	.15**	.12**
BSCS	3.66	0.61	.91**	—	−.29**	.15**	.03	.17**	.41**	.42**	.42**	.28**	.47**	.48**	.37**	.11**	.05	.18**	.13**

Note. $N = 947$. S-C strategies = self-control strategies; MSCS = Multidimensional Self-Control Scale; BMSCS = Brief Multidimensional Self-Control Scale; SCS = Self-Control Scale; BSCS = Brief Self-Control Scale; N = neuroticism; E = extraversion; O = openness to experience; A = agreeableness; C = conscientiousness; Habits = homework habits; Hard = hardiness; Life sat. = life satisfaction; MT = mental toughness; Res = resilience; SE = self-efficacy; GMA = general mental ability; GPA = grade point average; Strength = physical strength test.
[a] Reversed factor.
* $p < .05$. ** $p < .001$.

validity of the MSCS over SCS, respectively, at the third order, the second order, and the first order. Model 4 tested the incremental validity of the BMSCS over BSCS. Sex and personality were introduced as the first and second step of all the hierarchical regression analyses, whereas the third step included self-control measured by the SCS for Models 1–3 and self-control measured by the BSCS for Model 4. Finally, the fourth step added the MSCS for Models 1–3 and the BMSCS for Model 4. Table 4 summarizes the fourth step in the hierarchical regression analyses for all four models.

For the outcome variable Homework Habits, the MSCS and the BMSCS explained considerable variance in all models and were the overall best predictors of Homework Habits. Model 2 shows that the Initiation-factor was the strongest predictor of Homework Habits (β = .28). However, Model 3 shows that it was the reversed Procrastination-factor, which is a part of Inhibition, that was the single factor that explained most of the variance seen in Homework Habits (β = .34). This relationship was not evident in Model 2 as the other second-level inhibition-factors, Attentional Control and Impulse Control, masked the Procrastination-Homework Habit result by their negative relationship to Homework Habits.

For the outcome variable Hardiness, the models show that the MSCS and the BMSCS, overall, explained the most variance in all four models. Model 1 showed that MSCSs one-factor solution

Table 4
Summary of the Fourth Step for Hierarchical Regression Analyses of the MSCS and the BMSCS

Model	HRA 1: HW habits			HRA 2: Hardiness			HRA 3: Life sat.		
	β	R^2	ΔR^{2a}	β	R^2	ΔR^2	β	R^2	ΔR^2
Model 1		.26	.05***		.39	.14***		.14	.04***
Sex[b]	.04			−.01			−.08*		
Neuroticism[c]	.13**			.09*			−.06		
Extraversion[c]	−.01			.15***			.10*		
Openness to experience[c]	−.06			.06			−.06		
Agreeableness[c]	.02			.03			.01		
Conscientiousness[c]	.12*			−.06			−.05		
SCS[d]	.18**			−.05			.01		
MSCS[e]	.34***			.58***			.33***		
Model 2		.27	.05***		.40	.14***		.14	.05***
Sex	.04			−.01			−.09*		
Neuroticism	.13**			−.10*			−.09		
Extraversion	−.01			.14**			.10*		
Openness to experience	−.05			.05			−.05		
Agreeableness	.02			.04			−.01		
Conscientiousness	.12**			−.07			−.05		
SCS	.15**			−.02			−.01		
Inhibition[e]	.29***			.23***			.24**		
Initiation[e]	.10*			.38***			.14*		
Model 3		.32	.10***		.40	.15***		.15	.06***
Sex	.04			−.01			−.07		
Neuroticism	.09*			−.09*			−.05		
Extraversion	−.03			.16***			.10*		
Openness to experience	−.04			.05			−.06		
Agreeableness	.02			.05			−.01		
Conscientiousness	.10*			−.07			−.04		
SCS	.19**			−.05			.05		
Procrastination[e]	.36***			.12**			.12*		
Attentional control[e]	−.01			.20***			.12**		
Impulse control[e]	−.08			.16***			.03		
Emotional control[e]	.04			.02			.15**		
Goal orientation[e]	.11**			.09*			−.03		
Self-control strategies[e]	−.01			.22***			.05		
Model 4		.27	.06***		.35	.08***		.12	.02***
Sex	.03			−.03			−.10*		
Neuroticism	.11*			−.12**			−.08		
Extraversion	−.02			.17***			.11*		
Openness to experience	−.06			.07			−.05		
Agreeableness	.01			.02			−.01		
Conscientiousness	.12**			−.06			−.05		
BSCS[d]	.16**			.11*			.11*		
BMSCS[e]	.36***			.42***			.21***		

Note. $N = 947$. HRA = hierarchical regression analysis; HW habits = homework habits; Life sat. = life satisfaction; SCS = Self-Control Scale; MSCS = Multidimensional Self-Control Scale; BSCS = Brief Self-Control Scale; BMSCS = Brief Multidimensional Self-Control Scale.
[a] ΔR^2 = change in explained variance of the third step of the HRA. [b] Sex was entered as the first step for all models. [c] The five factors of the NEO-Personality Assessment were entered as the second step for all models. [d] Variations of the SCS were entered as the third step for all models. [e] Variations of the MSCS were entered as the fourth step for all models.
* $p < .05$. ** $p < .01$. *** $p < .001$.

(β = .59) were more than four times stronger than Extraversion (β = .14), which was the next best predictor of Hardiness. Among the second-order factors in Model 2, Inhibition was the overall strongest predictor (β = .38) of Hardiness; however, Model 3 shows that Self-Control Strategies of the Initiation factor is the strongest first-order factor (β = .22).

For the outcome Life Satisfaction, the models show that the MSCS and the BMSCS, overall, explained the most variance in all four models. Model 2 showed that Initiation was a better predictor of Life Satisfaction than Inhibition, this result was explained largely by the Emotional Control factor in Model 3.

Discussion

The aim of this research was to integrate recent theory and empirical findings into a new model and measurements of self-control. This study offers a new and coherent way to organize self-control using a three-level hierarchical and multidimensional model, as well as the development of two psychometrically sound scales to measure self-control based on this model.

A PCA revealed a six-factor structure at the first order, and this structure was supported by an EFA and two CFAs, in independent samples. The MSCS included the following subfactors: Procrastination, Attentional Control, Impulse Control, Emotional Control, Goal Orientation, and Self-Control Strategies. The subfactors of the MSCS were consistent with components of self-control suggested in other studies (Duckworth, Gendler, & Gross, 2016; Hoyle & Davisson, 2016; Inzlicht, Bartholow, & Hirsh, 2015; Metcalfe & Mischel, 1999; Mischel, Shoda, & Rodriguez, 1989; Nęcka et al., 2016; Tangney et al., 2004). This multidimensional model provides further support for suggestions that self-control is a multidimensional concept (e.g., Hasford & Bradley, 2011). Factors identified at the second order were consistent with broader conceptualizations of CFA that reflect inhibition and initiation (e.g., de Ridder et al., 2011), thereby supporting notions which suggest that self-control also entails using proactive or initiatory self-control strategies (e.g., Fujita, 2011). The Procrastination factor loaded on the Inhibition factor rather than on the Initiation factor, as reported by Hoyle and Davisson (2016). The notion that procrastination is a part of inhibition is in line with theory that has suggested that procrastination is rooted in problems of inhibiting self-destructive actions rather than initiation actions (Steel, 2007). At the third-order, a single, general self-control factor was identified. This finding is consistent with prior research (e.g., Tangney et al., 2004). As the MSCS consist of three levels, it provides a measure of self-control that is both specific and general. Because there are no other conceptual and measurement models of self-control that spans three levels, we consider this hierarchical model to be a main contribution from this research.

Consistent with our aims, the BMSCS was developed based on a factor analysis and structural validity was supported in a CFA. Similar to other brief scales (Maloney et al., 2012; Morean et al., 2014; Tangney et al., 2004), it measures self-control with few items. Unlike similar scales, however, it is not based on a premise that self-control is defined solely by inhibition; the brief scale replicates the inhibition and initiation structure suggested by current theory (e.g., de Ridder et al., 2011). High intercorrelation between the MSCS and the BMSCS indicate that the BMSCS is a good representation of the MSCS.

Analyses of incremental validity were conducted by adding sex and personality in the first two steps to avoid unintended interference from sex differences and personality variables in assessing whether the new scales had any predictive ability over and beyond the SCS and the BSCS. Results showed that the new scales outperformed the SCS and the BSCS in all 12 analyses of the three outcome variables (Hardiness, Life Satisfaction, and Homework Habits). Analyses of incremental validity also revealed that the SCS and the MSCS, as well as their respective brief scales, differed in their susceptibility to interference from personality variables. For instance, the two sets of correlations between the MSCS and Life Satisfaction, as well as correlations between the SCS and Life Satisfaction, were alike. However, when personality was accounted for in the analyses of incremental validity, the relationship between the SCS and Life Satisfaction diminished. Contrary to the SCS, it seemed that the MSCS to a larger extent captured aspects that are important to Life Satisfaction which were external to personality. Prior studies have showed that self-control and personality is somewhat overlapping (e.g., Hoyle & Davisson, 2016). However, in our view, the utility of a self-control scale is somewhat impaired if it does not explain more than trivial amount of variance in relevant criteria when controlling for sex differences and personality.

Analyses indicated that the MSCS and BMSCS had good convergent and discriminant validity. Consistent with prior studies, self-control measured by the MSCS and the BMSCS showed convergence with Mental Toughness (Cowden, Fuller, & Anshel, 2014) and Hardiness (Gordeeva et al., 2016). The strong convergence between the MSCS and the SCS suggest that the MSCS is an adequate measure of self-control. Furthermore, correlations between the MSCS and the SCS were stronger than between the MSCS and other factors related to positive functioning, such as Mental Toughness and Hardiness, suggesting that the MSCS adequately discriminates between self-control and other performance related concepts. One of the main objectives for the development of MSCS was to set it apart from traditional self-control scales by including an initiation scale. Correlations between the two second-order factors, Inhibition and Initiation, and the inhibition-based SCS reflected the expected convergence for the Inhibition factor and discriminant properties toward the Initiation factor. The same pattern was consistently observed for the subscales of the MSCS to the SCS. The three first-order factors representing Inhibition (Procrastination, Impulse Control, and Attentional Control) showed convergence to the SCS, whereas the factors representing Initiation (Emotional Control, Goal Orientation, and Self-Control Strategies) were considerably more discriminant toward the SCS. We interpret these results in support of the validity of the MSCSs multidimensional and hierarchical approach.

The main theoretical implication of this study is that self-control ought to be considered as a multidimensional, three-level construct. As demonstrated in this study, an advantage of this model is that analyses of self-control conducted at different levels allow for a richer representation of associations between self-control and other relevant variables. At the lower level, the multidimensionality of the MSCS is in accordance with notions of self-control being a multidimensional concept (e.g., Hasford & Bradley, 2011). At the first-order, the MSCS harmonize theory which suggests that procrastination (Steel, 2007), attention (Inzlicht & Milyavskaya, 2017), impulses (Mischel et al., 1989), emotions (Inzlicht et al.,

2015), goal orientation (Carver & Scheier, 1981; Myrseth & Fishbach, 2009), and habitual strategies (Gillebaart & Adriaanse, 2017) are important aspects of self-control. In accordance with theory that suggests that self-control includes the need for initiation of certain behaviors in addition to stopping other behaviors (de Ridder et al., 2011; Fujita, 2011), the second-order includes the bidimensional structure of initiatory and inhibitory self-control. Finally, at the third-order, we show that self-control ultimately can be considered as a unidimensional concept (Tangney et al., 2004).

This study offers researchers several tools that can be used in the assessment of self-control, specifically a full scale of self-control, a brief scale, and several subscales that could be used individually, such as inhibition or initiation scales. The full 29-item scale clearly provides the richest form of assessment for self-control, but estimates of validity and reliability support that the brief scale can be used as a standalone scale for situations in which a brief scale is the preferred option. Another practical implication of the MSCS is that it reduces the bandwidth-fidelity dilemma (Cronbach & Gleser, 1965) in self-control testing as the MSCS includes both quite narrow and broad conceptualizations of self-control.

Limitations and Future Directions

There are several limitations to this study. Sample characteristics is an issue that needs be addressed in two respects. First, the scales were originally developed in a sample consisting of mostly young males in a military setting. This may have skewed test scores in the direction of any typical male response patterns. This issue was addressed by cross validating the scale in a sample more representative of the general population. However, we cannot be certain that the scale structures would be the same if they initially were developed in a gender balanced population. Culture and language are other limiting sample characteristic, and the scales will benefit from validation in other samples.

It has been argued that balanced scales (equal number of true and false keyed items) have a tendency to perform better than scales that are unbalanced when it comes to yielding the *true* factor structure (Savalei & Falk, 2014) and external and criterion validity. For the MSCS, the subscales of Inhibition are balanced, but none of the items representing Initiation are false-keyed. A possible explanation for this might be that participants found the reversed-keyed initiation items to be difficult to understand and that these items loaded on a different factor (Suárez-Álvarez et al., 2018). Another possible explanation is that these items were excluded because they were contaminated by acquiescence variance. Our initial analyses of acquiescence bias indicated that the MSCS had less than half of the acquiescence variance observed in other studies of traits (Aichholzer, 2014; Danner, Aichholzer, & Rammstedt, 2015). However, given the potential gain of eliminating acquiescence bias we suggest future studies follow this issue further, for instance by controlling for acquiescence with an acquiescence index (Soto & John, 2017). A third limitation is the cross-sectional nature of this study. A study including longitudinal criteria would have been useful for examining the predictive validity of the scales by observing long-term effects of different levels of self-control. Finally, self-control was assessed by self-ratings. Knowingly, self-rating measures can be biased. Therefore, future studies should be supplied with ratings from other raters because such ratings have "yielded predictive validities substantially greater than and incremental to self-ratings" (Connelly & Ones, 2010, p. 1092).

Despite these limitations, we believe that the instruments presented here may be useful in a range of study designs. We suggest that future research focuses on further development and validation of the MSCS and the BMSCS. Specifically, we suggest that validation is further documented by assessing the scales' relationship to other criteria.

Conclusions

In sum, the current study integrates recent theory and empirical findings into a new model and measurements of self-control. We do this by using a three-level hierarchical and multidimensional model, as well as the development of two psychometrically sound scales to measure self-control based on this model. The study provides evidence of the adequacy of our conceptual model and the MSCS and BMSCS as useful measures of self-control. The instruments hold considerable potential utility for deepening our understanding of self-control and the relationship between self-control and factors that can improve individuals' goal acquisition, quality of life, as well as mental and physical health.

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