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Adaptation of the Self-Control Strategies Scale to Turkish and Evaluation of Psychometric Properties

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Abstract

Self-control was initially defined as behavioral inhibition. However, researchers have since recognized that strategies beyond behavioral inhibition are also required. This study aims to adapt the Self-Control Strategies Scale, developed to measure the broader theoretical structure of self-control beyond behavioral inhibition, into Turkish and to examine its psychometric properties. The study was conducted with 477 university students aged between 18 and 31. The confirmatory factor analysis indicates that the 33-item version of the scale shows good fit. Convergent validity analysis involved using the Multidimensional Self-Control Scale and the General Procrastination Scale. It was found that behavioral inhibition remains the strongest predictor of self-control, followed by Pre-Commitment, Reward, and Cognitive Change. General Procrastination is only predicted by Behavioral Inhibition and Pre-Commitment. Reliability analyses of the scale were conducted using McDonald's Omega, test-retest reliability, and item-total correlations. All subscales, except for the Pre-Commitment subscale, have a reliability level above .70. In conclusion, the scale is valid and reliable for use in research conducted in Türkiye. However, the reliability level of the Pre-Commitment subscale should be considered when interpreting the results. This study also provides insights into the skills that should be acquired in self-control enhancement interventions.

Key Words

Behavioral inhibition • Self-control • Self-control strategies • Self-regulation • Willpower

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Introduction

Self-control is essential for success and well-being in many areas of life. Individuals with strong self-control tend to be more successful in various domains such as health, education, financial conditions, and relationships (Baumeister et al., 1998; Cobb-Clark et al., 2022; Duckworth & Seligman, 2005; Hoffman et al., 2014; Moffitt et al., 2010; Tangney et al., 2004). In contrast, weak self-control is associated with several problems, including obesity and unhealthy eating (Elfhag et al., 2008; Jasinka, 2012), procrastination (Ramzi & Saed, 2019), alcohol and substance use (Ford & Blumenstein, 2013), and criminal behavior (Gottfredson, 2017). The importance of self-control has led to increased research in this area.

Initially, self-control was defined as the delay of short-term gratification for long-term goals. According to this perspective, self-control is an attempt to inhibit undesirable impulses (Ainslie, 1975; Mischel et al., 1989). In other words, an internal or external temptation triggers an impulse, and when an individual resists these impulses by considering long-term consequences, they demonstrate successful self-control (Fujita, 2011). Defining self-control as effortful inhibition has led to the neglect of different strategies people use to achieve long-term goals (Fujita, 2011). As research on self-control has increased, it has become evident that individuals with strong self-control often prefer behaviors aligned with their long-term goals automatically, without engaging in effortful inhibition (Adriaanse et al., 2014; de Ridder et al., 2012). They are also known to take preventive measures before impulses arise (Duckworth et al., 2016) For instance, their daily habits and routines are already consistent with their life goals (Galla & Duckworth, 2015), and they avoid engaging in willpower battles that would lead to fatigue (Hofmann, 2012). These studies indicate that self-control extends beyond effortful inhibition.

People often use various strategies beyond impulse inhibition to avoid self-control failure. For instance, according to Duckworth et al.'s (2016) process model, individuals can achieve long-term goals more successfully by taking preventive measures before impulses emerge. According to the situation selection/modification strategies described by the author, a person who spends excessive time playing computer games might place the computer in a closed cabinet during the week or completely remove gaming programs from their computer. Similarly, someone on a diet might store sweets on the top shelves of the cabinet or avoid bringing sweets into the house By doing so, the person reduces the likelihood of encountering temptations, thereby moving towards their goals without engaging in a self-control conflict (Duckworth et al.,2016)

Rewards and punishments are also strategies that help in exercising self-control towards our goals. Imposing a punishment on oneself for not performing a desired behavior or rewarding oneself upon achieving goals can reduce undesirable behaviors and increase desirable ones. Rewards and punishments provide commitment to behavior (Trope & Fishback, 2000). Additionally, individuals can maintain commitment to long-term goals through various pre-commitment devices (Hofmann & Kotabe, 2012). For example, someone wanting to diet might make a prepayment for a meal preparation service, which can help them adhere more closely to their diet. Alternatively, setting a deadline for a task can reduce procrastination (Ariely & Wertenbroch, 2002).

When faced with temptations that challenge our progress towards goals, strategies such as behavioral inhibition, distraction, cognitive change (Magen & Gross, 2007), and acceptance can also be used. For instance, in Mischel's famous marshmallow experiment, children used cognitive change by imagining the marshmallow as a cloud to resist the urge to eat it (Mischel, 2014). Duckworth et al. (2016) suggest that changing our thinking about the current situation can help manage impulses. For example, if staying at home is viewed as leading to health issues associated with a sedentary lifestyle, the preferred behavior might be to go for a walk.

Another useful strategy for resisting temptations is acceptance (Alberts et al., 2013; Forman, 2007). Acceptance involves engaging with internal experiences such as unpleasant feelings, thoughts, and bodily sensations without attempting to change or reduce them (Luoma et al., 2017; Strosahl et al., 2004). This helps in reducing the dominance of internal experiences that challenge our behavior, thus facilitating actions aligned with our goals.

When these strategies are combined, it becomes evident that self-control is a comprehensive concept. Katzir et al. (2021) developed the Self-Control Strategies Scale to assess self-control in its broad context. This scale evaluates self-control across two dimensions: anticipatory control and down-regulation of temptation. Anticipatory control includes Situation Selection/Stimulus Control, Punishment, Reward, and Pre-Commitment, while Down Regulation of Temptation comprises Cognitive Change, Acceptance, Distraction, and Behavioral Inhibition.

In Türkiye, self-control is assessed using various measurement tools such as the Brief Self-Control Scale-SCS, the Multidimensional Self-Control Scale-MSCS, and the Self-Control and Self-Management Scale-SCMS (Ercoskun, 2016; Nebioglu et al., 2012; Gülüm & Tığrak, 2022). The Brief Self-Control Scale (Tangney et al., 2004), adapted by Nebioğlu et al. (2012), is related to inhibitory control. The SCMS, developed by Mezo (2009) and adapted to Turkish by Ercoşkun (2016), includes a self-reinforcement subscale related to reward. The most comprehensive self-control scale used in this study for convergent validity is the Multidimensional Self-Control Scale (Gülüm & Tığrak, 2022). The MSCS features two dimensions: inhibitory and initiatory control, with six subscales each: Procrastination, Attention Control, Impulse Control (inhibitory control); Emotion Control, Goal Orientation, and Self-Control Strategies (initiatory control). As observed, these dimensions differ from those of the scale to be adapted. Unlike the SCSS, none of these scales comprehensively evaluate self-control strategies.

The Present Study

This study aims to examine the psychometric properties of the SCSS (Self-Control Strategies Scale) in Turkish. Validity and reliability analyses have been conducted as part of the adaptation of the scale. To assess convergent validity, the Multidimensional Self-Control Scale and the General Procrastination Scale were utilized. As mentioned, self-control is predominantly addressed through inhibitory control. The original study also identified behavioral inhibition as the strongest predictor of self-control, followed by Pre-commitment and Punishment, with other strategies not being significant predictors (Katzir et al., 2021). To explore whether the strategies explaining self-control differ in Turkish culture, this study also aims to examine the extent to which self-control strategies predict self-control itself as a second objective. Additionally, procrastination, used for assessing convergent validity, is described as a failure of self-regulation (Steel, 2007). Therefore, a negative relationship between self-control and procrastination, as indicated in the literature (Karademir, 2023; Kim et al., 2017; Przepiórka et al., 2019), is expected. Furthermore, the study will investigate which strategies predict general procrastination within the framework of predictive validity.

Strong self-control, or the ability to resist immediate impulses, is an essential characteristic that contributes to success in various aspects of life. Consequently, strategies that help direct our behavior towards long-term goals and overcome immediate impulses are necessary. Understanding which strategies contribute to strong self-control is important for improving quality of life. Thus, this study, by adapting the mentioned scale to a Turkish sample, will contribute to a more comprehensive assessment in future self-control research and provide guidance for practitioners in the field.

Method

Participants

477 university students, 366 women (76.7%) and 111 (23.3%) men, aged between 18-31, recruited to study. The average age of the participants is 21.19 (SD = 1.898).

Measurement Tools

Self Control Strategies Scale (SCSS)

It was developed by Katzir et al (2021) to determine self-control strategies. The original scale is a five-point Likert type scale consisting of 38 items (1=not at all., 5 very much). It consists of 8 sub-dimensions: Situation Selection, Reward, Punishment, Pre-Commitment, Distraction, Cognitive Change, Acceptance and Behavioral Inhibition. The first four subscales are associated with anticipatory control, while the next four are associated with down regulation of temptations. Each subscale is scored separately. Higher scores from the scales indicate that strategy is used more.

Multidimensional Self-Control Scale (MSCS)

It is a 5-point Likert type scale (1 strongly disagree - 5 strongly agree) developed by Nilsen et al., (2020). The original form of the scale consists of 29 items. In this study, a 25-item form adapted by Gülüm and Tığrak (2022) was used. The scale has 6 subscales: Procrastination, attentional control, impulse control, emotional control, goal orientation, and self-control strategies. These subdimensions are grouped under factors inhibition and initiation. The total score obtained from the scale shows high self-control. Cronbach's Alpha coefficient was calculated as .88 for this study

General Procrastination Scale

It was developed by Çakıcı (2003) to measure the procrastination behavior of high school and university students. The scale is a five-point Likert type scale consisting of 18 items (1 does not reflect me at all - 5 reflects me completely). Total scores obtained from the scale indicate that procrastination behavior has increased. In this study, Cronbach's Alpha coefficient was calculated as .94.

Procedure

Before starting the study, permission was obtained from the authors to adapt the scales. Ethics committee approval for the research was received from Hasan Kalyoncu University (approval number E-97105791-050.04-62515). The original scale was translated into Turkish by the authors, and then back-translated by one psychologist who is a native English speaker and resides abroad. Items 7 and 16, which were originally designated as reverse-coded items in the scale, have been adapted in the Turkish translation to ensure they align with the intended meaning, and therefore, they are not treated as reverse-coded items. After finalizing the scale, feedback was gathered from ten individuals to ensure the clarity of the items. Based on the feedback received, any unclear items were revised by the authors. Following these revisions, the scale was again reviewed by the same ten individuals to confirm the clarity of all items. The necessary adjustments were made by the authors, and the scales were given their final form.

The study data were collected from university students via Google Forms in November and December, 2023. Informed consent was obtained from all participants, confirming their voluntary participation in the study.

Data Analysis

Confirmatory Factor Analysis (CFA) was used to test the construct validity. Pearson Correlation and Multiple Regression Analysis were used to test convergent validity. For the reliability analysis, McDonald

Omega reliability coefficient and item-total correlations were calculated, and the test-retest method was employed. Analyses were carried out using the Statistical Program for Social Sciences (SPSS 28) and AMOS 23 software.

Results

Validity Analysis

We conducted confirmatory factor analysis (CFA) with using maximum likelihood estimation method (See Figure 1). Model Fit is analyzed chi-square statistic ($\chi 2/df<5$), Comparative Fit Index (CFI>0.90), Root Mean Square Error of Approximation (RMSEA<0.1), Standardized Root Mean Square Residual (SRMR<0.1), Tucker–Lewis index (TLI>.90) (Hu ve Bentler, 1999; Schumacker ve Lomax, 1996; Kline, 2005).

Table 1

CFA Fit Indices for The Self-Control Strategies Scale After Modifications

Modifications	**$\chi 2/df$**	**CFI**	**TLI**	**RMSEA**	**SRMR**
Original Model	3,076	.83	.81	.066	.081
e6-e38 (s4-s5)	2,8	.85	.83	.062	.085
e13- e14	2,7	.86	.84	.060	.085
D23 moved CC	2,6	.87	.85	.58	.082
D23 Deleted	2,5	.88	.86	.057	.082
e39-e40 (BI36-BI38)	2,4	.88	.87	.056	.085
BI38 Deleted	2,4	.89	.88	.055	.078
BI36 Deleted	2,3	.90	.89	.052	.071
S5 Deleted	2.2	.91	.90	.052	.065
e27-e28 (A31-A32)	2,1	.92	.91	.049	.064
SS1 Deleted (Final Version)	**2,1**	**.92**	**.91**	**.050**	**.064**

All changes in CFA are listed in Table 1. The CFA results of the scale in its original form were determined as 3,076 for the $\chi 2/df$, 0.66 for the RMSEA, .83 for the CFI, .81 for the TLI and .081 for the SRMR values. In order to achieve model fit, modification indices were examined and modifications were made respectively for the items showing the highest covariance. Accordingly, D23 was deleted because of loadings in Cognitive Change Subscale and modifications were made for B36 and B38. However, it was observed that the CFI and TLI values were below .90 and the SRMR value was above .80, and the Standardized Residual Covariance Matrix was examined.

Accordingly, Residual Covariance values that above 2 are defined as poor items (Awang, 2012). When the matrix was examined, it was seen that the highest values (above 3 and 4) were in items B36, B38 and SS5, and these items were deleted from the measurement tool respectively. Later, modifications were made between items e27-e28; the SS1 was deleted because of low factor loading and the scale provided the good fit values seen in Table 1. These values are similar to the CFA values of the original scale (Katzir et al., 2021). Factor loadings is indicated also Table 2.

Table 2

Confirmatory Factor Analysis Factor Loadings for Self-Control Strategies Scale

Subscale	Item	Factor Loadings	Subscale	Item	Factor Loadings
Situation Selection/Stimulus Control	SS2	.75	Distraction	D19	.82
	SS3	.76		D20	.93
	SS4	.79		D21	.82
	SS6	.53		D22	.71
Punishment	P7	.72	Cognitive Change	CC24	.68
	P8	.39		CC25	.77
	P9	.86		CC26	.73
	P10	.70		CC27	.64
Reward	R11	.90		CC28	.71
	R12	.94	Acceptance	A29	.74
	R13	.80		A30	.87
	R14	.83		A31	.61
Pre-Commitment	PC15	.57		A32	.63
	PC16	.30	Behavioral Inhibition	BI33	.36
	PC17	.32		BI34	.83
	PC18	.60		BI35	.73
				BI37	.58

Convergent Validity

Analyzes regarding the relationship between the subscales are included in Table 3. Within the scope of convergent validity analyses, the relationships of the scales with the Multidimensional Self-Control Scale and the General Procrastination Scale were examined (See Table 4). Situation Selection/Stimulus Control has weakly associated with MSCS-Initiatory Self-Control (r ranges from .180 and .209). In addition MSCS-Procrastination, one of the inhibitory strategies, has a weak but statistically significant relationship with Situation Selection (r= .119). Punishment has a weak and positive relationship with MSCS-Initiatory Self-Control (r ranges from.136 and .179) whereas has no significance relationship with MSCS-inhibitory Self Control. The Reward had a weak significant relationship with MSCS-inhibitory Self-Control (r ranges from .196 to .171) and a moderate, significant relationship with MSCS-Initiatory Self Control (r ranges from .222 to .365). Pre-commitment had moderate significant relationship only MSCS-Procrastination and had weak to moderate relationship with MSCS Initiatory Self-Control (r ranged from .174 and .340). Distraction had a weak to moderate significant relationship with both MSCS inhibition and initiation strategies (r ranged from .098 and .257). Cognitive change had weak and significance relationship with MSCS-Inhibitory Self Control, MSCS-Procrastination and MSCS-Attention Control and MSCS Goal Orientation (r ranged from .113 and .239) and moderate relationship MSCS-Initiation, Emotion Control and Self Control Strategies (r ranged from 370 and .425). Acceptance had moderate and negatively significant relationship only MSCS-Impulse Control (r= -.227). Behavioral Inhibition had

moderate relationship both MSCS Inhibitory and Initiatory Self Control (r ranged from .213 and .488). As expected, r values for inhibition strategies were higher than for initiation strategies.

MSCS Total Score had significantly correlated moderately or weakly with all self control strategies except Acceptance (r ranged from .471 and .097). Except Punishment and Acceptance; all strategies had weak and negative associations with general Procrastination Scale (r ranged from -.128 and -.287).

Table 3

Pearson Correlation Analysis for Self-Control Strategies Subscale

	1	2	3	4	5	6	7
1 Situation Selection/Stimulus Control	1						
2 Punishment	.220**	1					
3. Reward	.105*	.250**	1				
4. Pre-Commitment	.244**	.321**	.236**	1			
5. Distraction	.467**	.113*	.099*	.248**	1		
6. Cognitive Change	.421**	.241**	.256**	.346**	.472**	1	
7. Acceptance	-.036	-.032	.091*	.134**	-.024	.095*	1
8. Behavioral Inhibition	.131*	-.104*	.046	-.041	.208**	.205**	-.148**
n	477	477	477	477	477	477	477
M	13.23	10.09	15.47	13.92	12.9706	17.40	13.46
SD	3.47	3.532	4.058	2.826	3.57618	3.97	3.467

*p< .05, **p< .01

Table 4

Pearson Correlation Analysis for SCSS, MSCS and GPS

	MSCS Procrast.	MSCS Attent. Control	MSCS Impulse Control	MSCS Inhibit.	MSCS Emot. Control	MSCS Goal Orientat.	MSCS Self-Control Strat.	MSCS Initiat.	MSCS Total	GPS
Situation Selection	.119*	.039	.050	.088	.180**	.140**	.209**	.225**	.184**	-.154**
Punishment	.083	-.020	-.083	-.011	.136**	.141**	.148**	.179**	.097*	-.041
Reward	.196**	.167**	.047	.171**	.222**	.365**	.293**	.366**	.317**	-.150**
Pre-Commitment	.254**	.085	.031	.155**	.174**	.340**	.263**	.322**	.281**	-.269**
Distraction	.098*	.089	.146**	.144**	.255**	.127**	.216**	.257**	.237**	-.128**
Cognitive Change	.148**	.113*	.068	.139**	.370**	.239**	.387**	.425**	.331**	-.175**
Acceptance	-.044	.050	-.227**	-.102*	-.022	.066	.108*	.062	-.027	.006
Behavioral Inhibition	.307**	.355**	.474**	.488**	.213**	.221**	.267**	.296**	. 471**	-.287**
n	477	477	477	477	477	477	477	477	477	477
M	11.80	12.36	11.83	36.00	13.39	14.64	18.70	46.75	82.74	46.24
SS	3.358	3.23	3.65	8.02	3.41	2.90	3.21	7.53	13.04	15.65

MSCS Multidimensional Self-Control Scale; Procrast: Procrastination; Attent: Attention; it: Inhibition; Orienatat: Orientation; Strat: Strategies; Initiat: Initiation; GPS: General Procrastination Scale

*p< .05, **p< .01

Predictive Validity

We also conducted regression analysis to test which self-control strategies predicted self-control and general procrastination.

As seen Table 5, Behavioral Inhibition (β= .440, t =11.293, p =.000, CI [1.457, 2.070], Pre-commitment (β= .022, t =5.105, p =.000, CI [.600, 1.351], Reward (β= .211, t =5.680, p =.000, CI [.466-.959] and Cognitive Change (β= .105, t =2.286, p =.023 CI [.048, .642]. The model explains a variance in the dependent variable, with an R^2 of 0.365, indicating that 36.5% of the variance is accounted for by the predictors.

As seen Table 6, only Behavioral Inhibition (β= -.286, t =-6.369 p =.000, CI [-1.800, -.951] and Pre-Commitment (β= -.269, t =-5.641, p =.000, CI [-2.010, -972], predicted General Procrastination Scale. The model explains a variance in the dependent variable, with an R^2 of 0.156, indicating that 15.6% of the variance is accounted for by the predictors.

Table 5

Multiple Regression Analysis Predicting Multidimensional Self Control Scale Scores from Specific Self-Control Strategies

	B	Beta	SE	t	p	95.0% CI
(Constant)	29.568		4.00	7.392	.000	[21.709, 37.428]
Situation Selection	-.008	-.002	.163	-.050	.960	[-.328, .311]
Punishment	-.033	.222	.150	-.220	.826	[-.327, .261]
Reward	**.712**	**.211**	**.125**	**5.681**	**.000**	**[.466, .959]**
Pre-Commitment	**.976**	**.022**	**.191**	**5.105**	**.000**	**[.600, 1.351]**
Distraction	.083	-.023	.156	.508	.612	[-.237, .402]
Cognitive Change	**.345**	**.105**	**. 151**	**2.286**	**.023**	**[.048, .642]**
Acceptance	-.076	-.020	.143	-.530	.598	[-.356, .205]
Behavioral Inhibition	**1.763**	**.440**	**.156**	**11.293**	**.000**	**[1.457, 2.070]**

F=35.267; R^2=.365

Table 6

Multiple Regression Analysis Predicting General Procrastination Scale Scores from Specific Self-Control Strategies

	B	Beta	SE	t	p	95.0% CI
(Constant)	89.448		5.5531	16.171	.000	[78.578, 100.317]
Situation Selection	-.305	-.068	.225	-1.358	.175	[-.747 .137]
Punishment	.213	.048	.207	1.029	.304	[-.194, .620]
Reward	-.314	-.081	.173	-1.808	.071	[.654, .027]
Pre-Commitment	**-1.494**	**-.269**	**.264**	**-5.641**	**.000**	**[-.2.010, -972]**
Distraction	.148	.034	.225	.660	.509	[-.293, .590]
Cognitive Change	-.009	-.002	.209	-.044	.965	[-.419, .401]
Acceptance	.031	.007	.197	.158	.874	[-.356, .419]
Behavioral Inhibition	**-1.375**	**-.286**	**.216**	**-6.369**	**.000**	**[-1.800, -951]**

F=12.080; R^2 =.157

Reliability Analysis

Reliability of the subscales was also above .70 except pre-commitment (ω=.80 for Stimulus Selection; ω=. 76 for Punishment; ω=.93 for Reward; ω=. 52 for Pre-Commitment; ω=.89 for Distractions; ω=. 83 for Cognitive Change; ω=.81 for Acceptance and ω=.71 for Behavioral Inhibition) as seen Table 7.

Table 7

McDonald Omega Values of SCSS Subscales

	Number of Items	McDonald's Omega
Situation Selection/Stimulus Control	4	.80
Punishment	4	.76
Reward	4	.93
Pre-Commitment	4	.52
Distraction	4	.89
Cognitive Change	5	.83
Acceptance	4	.81
Behavioral Inhibition	4	.73

Table 8

Item-Total Correlations of SCSS Subscales

Subscale	Item	Item-Total Correlations	Subscale	Item	Item-Total Correlations
Situation Selection/Stimulus Control	SS2	.629	Distraction	D19	.733
	SS3	.647		D20	.837
	SS4	.702		D21	.776
	SS6	.450		D22	.677
			Cognitive Change	CC24	.574
Punishment	P7	.555		CC25	.682
	P8	.330		CC26	.676
	P9	.708		CC27	.583
	P10	.589		CC28	.644
Reward	R11	.829	Acceptance	A29	.596
	R12	.865		A30	.697
	R13	.817		A31	.636
	R14	.850		A32	.660
Pre-Commitment	PC15	.264	Behavioral Inhibition	BI33	.324
	PC16	.271		BI34	635
	PC17	.251		BI35	.562
	PC18	.425		BI37	.509

As Seen Table 8, Item total correlations had the values above .30 (Büyüköztürk, 2016) except Pre-Commitment Subscale (Item PC 15, 16 and 17). These results indicate that the items are distinguishable in terms of the traits they measure and that the scale exhibits high internal consistency except Pre-Commitment Subscale.

Test-Retest reliability analysis was recruited with 30 sample. Analysis show that Distraction, Cognitive Change sub scales T1 and T2 scores had high association (r = .729 and .827, respectively) whereas Situation Selection, Punishment, Reward, Pre Commitment, Distraction, Cognitive Change, Acceptance, Behavioral Inhibition sub scales T1 and T2 scores had moderate association (r ranged from .462 and .674) (See Table 9).

Table 9

Pearson Correlation Analysis for Test-Retest Reliabilty

		T1		*T2*		
	n	*M*	*SS*	*M*	*SS*	r
Situation Selection	30	12.83	2.705	13.57	2.596	.633**
Punishment	30	10.03	2.953	10.33	3.377	.462*
Reward	30	14.60	3.719	14.63	3.222	.672**
Pre-Commitment	30	14.03	2.341	14.23	1.775	.405*
Distraction	30	13.23	2.885	13.60	3.180	.729**
Cognitive Change	30	17.73	3.591	17.17	4.128	.827**
Acceptance	30	13.30	4.203	13.30	4.364	.674**
Behavioral Inhibition	30	13.33	2.510	13.07	2.753	.526**

*p<.05, **p<.01

Discussion

This study aims to adapt the Self-Control Strategies Scale (SCSS), developed to measure a broader theoretical construct of self-control, into Turkish and to examine its psychometric properties. The original scale, consisting of 38 items, was validated in its Turkish version with 33 items. Due to the initial version of the scale showing unacceptable fit indices, modifications and item deletions were performed. Initially, the items 5 and 6 with the highest covariance were associated. It was observed that these items are semantically similar and measure the same construct. Subsequently, item 23, which was originally part of the Distraction was moved to the Cognitive Change. Changing the item's subscale did not improve the fit indices to the desired level, leading to the decision to remove the item from the scale.

Despite modifications to error variances and the deletion of item 23, the fit indices did not improve. Therefore, the covariance matrix was examined. Awang (2012), notes that items with values above 2 are problematic. Based on this, items 38, 36, and 5, starting from those showing the highest covariance, were sequentially removed from the measurement tool. After the removal of the final item, the fit indices reached acceptable ranges, and since the number of items in the subscales was low, item deletion procedures were concluded. One modification was applied between items 31 and 32, which are correlated. When these items were examined, they appeared conceptually similar and measured the same construct. Finally item SS 1 is deleted because of the factor loading is below .30 (Çokluk et al., 2012) and final version of the scale was presented.

As a result, it was found that the χ^2 / df CFI, TLI, RMSEA and SRMR values of the scale showed acceptable fit (Hu ve Bentler, 1999; Kline, 2005; Schumacker ve Lomax, 1996). These values are similar to the fit indices of the original scale. When examining the fit indices of the original scale, analyses conducted with different

samples revealed CFI values ranging from 0.86 to 0.91, TLI values between 0.85 and 0.90, RMSEA values from 0.055 to 0.061, and SRMR values between 0.063 and 0.075 (Katzir et al., 2021).

For convergent validity, the relationship between the SCSS and the MSCS as well as the GPS was examined. The highest correlation between SCSS and the MSCS was found to be with Behavioral Inhibition, showing a positive association. This was followed, in order, by Cognitive Change, Reward, Pre-Commitment, Distraction, Situation Selection, and Punishment. Self-Control was not found to be associated with Acceptance.

These findings indicate that self-control, as initially defined, remains associated with inhibitory control. Indeed, in the Multiple Regression analysis conducted to test predictive validity, Behavioral Inhibition was the strongest predictor of self-control, followed sequentially by Pre-Commitment, Reward, and Cognitive Change. Similarly, in the original study, Behavioral Inhibition was also the strongest predictor followed by Pre-Commitment , Punishment, and Acceptance (Katzir et al., 2021). These results provide clues that self-control strategies may vary culturally. Pre-Commitment appears to be the second strongest predictor of self-control in both studies. However, in our culture, the association between self-control and reward strategies rather than punishment suggests that incorporating rewards related to specific tasks could be beneficial in self-control research. Conversely, Acceptance was not found to be related to self-control in Turkish culture. Instead, Cognitive Change strategies were found to be more relevant to self-control.

General procrastination is most strongly negatively correlated with Behavioral Inhibition. It also shows negative but weakly significant correlations with Pre-Commitment, Cognitive Change, Reward, Situation Selection, and Distraction. This supports the known negative relationships between procrastination and self-control and self-regulation strategies (Karademir, 2023; Kim et al., 2017; Przepiórka et al., 2019; Steel, 2007). However, while these relationships are significant, they are very weak. The Acceptance and Punishment subscales were not found to be related to general procrastination. For predictive validity, procrastination scores were only predicted by Behavioral Inhibition and Pre-Commitment. These findings suggest that the ability to inhibit impulses and the use of commitment devices may be associated with reduced procrastination. Given that procrastination is considered a failure of self-regulation (Steel, 2007), it is expected that impulse inhibition would predict procrastination. Pre-commitments, such as setting deadlines, are also known to help reduce procrastination (Ariely, 2002). These studies support our findings. Other subscales, as mentioned, have low levels of correlation and are therefore considered not to predict procrastination.

Regarding reliability analysis results, it was observed that all values were above 0.70, except for Pre-Commitment. The McDonald Omega reliability coefficient and item-total correlations (PC15, PC16, PC17) for the Pre-Commitment subscale were found to be weak. According to George and Mallery, (2003) . >.50 Cronbach's Alpha values are poor but acceptable range. They classified values of .50 and below as unacceptable. On the other hand Seçer (2015) suggests that a **.20** item-total correlation is an acceptable threshold, and items with values below this threshold can be removed. The item-total correlation values of all items in the scale are above the threshold. However Although these values fall within the acceptable range results indicates that the items are not strongly related to each other for Pre-Commitment subscale. When examining the items in this subscale, it is thought that they may not have been understood as measuring the same construct. For example, the statement "When I want to achieve a goal, I take actions or impose restrictions on myself that make it almost impossible to fail." might have been interpreted more as a form of punishment rather than a commitment tool. The statement "I tell people about my long-term goals so that they can hold me accountable " might have

different implications related to meeting deadlines in Turkish culture. Items in a measurement tool may be interpreted differently across cultures.

When examining the results of the test-retest analyses, it was observed that the correlation coefficients ranged from .405 to .827. These results indicate that the subscales Pre-Commitment, Reward, and Behavioral Inhibition demonstrated moderate consistency over time, while other subscales showed higher consistency.

This study has some limitations. Firstly, due to the low Cronbach's alpha reliability coefficient and the item-total correlations being below .30 for the Pre-Commitment subscale, caution should be exercised when interpreting the results for this subscale. Future studies could develop a measurement tool consisting of items more suitable for our culture to assess pre-commitment. Secondly, to achieve good fit indices, four items were removed from the measurement tool. Thirdly, this study is limited to young adults and predominantly consists of a female sample. A more homogeneous group in terms of gender could be used, allowing for validity analyses such as measurement invariance to be conducted.

In conclusion, this scale, in its 33-item form, is a valid and reliable tool and can be used in research aimed at evaluating self-control strategies, taking its limitations into account. This study also provides some insights for researchers aiming to enhance self-control and reduce procrastination within the Turkish cultural context. Firstly, self-control still appears to be largely associated with behavioral inhibition. Therefore, it is essential to identify factors that facilitate and hinder individuals' ability to suppress their impulses and unwanted desires. Identifying these factors can lead to the development of practical recommendations and interventions. Additionally, establishing deadlines, which ties individuals to their tasks, seems to be related both to enhancing self-control and reducing procrastination. However, this result should be interpreted considering the reliability level of the Pre-Commitment subscale. Given that rewards rather than punishments are more predictive of self-control within the Turkish cultural context, it may be beneficial for individuals to reward themselves for accomplishing desired tasks. Furthermore, teaching cognitive change skills could also be valuable in interventions aimed at increasing self-control. The findings of this study should not be interpreted in terms of cause-and-effect relationships. Experimental studies are needed to understand the impact of these strategies on self-control and procrastination reduction.

Ethic

The present study was approved by the Hasan Kalyoncu University Graduate Education Institute Ethics Committee (Ethics approval number: E-97105791-050.04-62515)

Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Saadet Öztürk, Mehmet Dinç]. The first draft of the manuscript was written by [Saadet Öztürk and Mehmet Dinç], and all authors commented on previous versions of the manuscript.

Conflict of Interest

The authors declare that they have no conflit of interests

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Appendix

Öz-Kontrol (İrade) Stratejileri Ölçeği (ÖKSÖ)

Hepimiz sevdiğimiz bir tatlı ya da en sevdiğimiz mağazadaki indirimler gibi bizi baştan çıkaran bir şey/kontrol etmemiz gereken arzuyla karşılaştığımızda ya da sağlıklı yaşamak, para biriktirmek, okulda/işte başarılı olmak gibi uzun vadeli hedeflerimizin peşinde koşarken öz-kontrol (irade) çatışmaları yaşayabiliriz. Bu ölçek böyle durumlarla karşılaştığınızda nasıl davrandığınızı anlamak için geliştirilmiştir. İnsanlar irade gerektiren durumlarda farklı davranabilirler. Bazı durumlarda kendilerini çok fazla kontrol edebilirken bazı durumlarda o kadar kontrol edemezler. Bu nedenle, bu ölçekteki bazı maddelerde kendinizi güçlü iradeye sahip olarak değerlendirmeniz, bazı maddelerde ise orta veya düşük iradeli olarak değerlendirmeniz mümkündür. Bununla birlikte, sorulara içtenlikle yanıt vermeniz bizim için son derece önemlidir.

	Hiçbir Zaman				**Çoğu Zaman**
1. Kontrol etmem gereken arzularımı uyandıracak durumlardan kendimi uzaklaştırırım.	1	2	3	4	5
2. Hayatımı, kontrol etmem gereken arzularımı uyandıracak şeylerden daha kolay kaçınabileceğim şekilde düzenlerim.	1	2	3	4	5
3. Kontrol etmem gereken arzularımı uyandıracak şeylerle karşılaşmamak için ortamımı değiştiririm.	1	2	3	4	5
4. Ortamımı beni baştan çıkaran şeylerle karşılaşmayacağım şekilde düzenlerim.	1	2	3	4	5
5. Kontrol etmem gereken arzularıma karşı koyamadığım durumlarda genellikle kendimi cezalandırırım.	1	2	3	4	5
6. Planlarımı ve hedeflerimi başarıyla gerçekleştirmek için kendime yaptırımlar uygularım.	1	2	3	4	5
7. Kendime verdiğim sözlere uymadığımda kendimi cezalandırırım.	1	2	3	4	5
8. Uzun vadeli hedeflerim için kendime başarı için ödül, başarısızlık için ise ceza içeren sözler vermeyi severim.	1	2	3	4	5
9. Uzun vadeli hedeflerimi başarıyla tamamladığımda genellikle kendimi ödüllendiririm.	1	2	3	4	5
10. Uzun vadeli bir hedefe ulaştığımda kendimi ödüllendiririm.	1	2	3	4	5
11. Hedeflerim ile ilgili ilerleme kaydettiğimde kendimi ödüllendiririm.	1	2	3	4	5
12. Uzun vadeli önemli bir hedef belirlediğimde, hedefimi başarırsam kendimi ödüllendirmeye karar veririm.	1	2	3	4	5
13. Bir hedefe ulaşmak istediğimde, başarısız olmamı engelleyecek eylemlerde bulunurum veya kendime kısıtlamalar getiririm.	1	2	3	4	5
14. Son teslim tarihlerine uyarım.	1	2	3	4	5
15. Sorumlu hissetmek için insanlarla uzun vadeli hedeflerimi paylaşırım	1	2	3	4	5

16. Ulaşmak istediğim hedeflere kendimi bağlayacak adımlar atarım (örneğin, son tarihlere bağlı kalarak, katılmak istediğim faaliyetlere önceden para ödeyerek)	1	2	3	4	5
17. Kontrol etmem gereken bir arzum olduğunda odağımı ondan uzaklaştırırım.	1	2	3	4	5
18. Kontrol etmem gereken bir arzuyla karşılaştığımda dikkatimi ondan uzaklaştırırım.	1	2	3	4	5
19. Kontrol etmem gereken bir arzum olduğunda düşüncelerimi ondan uzaklaştırırım.	1	2	3	4	5
20. Direnmek istediğim bir arzum olduğunda dikkatimi ondan uzaklaştırırım.	1	2	3	4	5
21. İstemediğim bir arzuyla karşılaştığımda, ona bakış açımı değiştirerek kendimi kontrol ederim.	1	2	3	4	5
22. Baştan çıkarıcı bir şeye karşı daha az arzu duymak istediğimde, ona ilişkin düşünce şeklimi değiştiririm.	1	2	3	4	5
23. Kontrol etmem gereken bir arzuyla karşılaştığımda, kendimi onun beni daha az cezbedebileceği şekilde düşünmeye zorlarım.	1	2	3	4	5
24. İstenmeyen bir arzuyla karşılaştığımda onu soğuk, uzak ve etkisiz bir şeymiş gibi düşünürüm.	1	2	3	4	5
25. Kontrol etmem gereken bir arzum olduğunda onu farklı bir açıdan düşünürüm.	1	2	3	4	5
26. Baştan çıkarıcı bir şeye karşı daha az arzu hissetmek istediğimde, arzularımı kabul ederim.	1	2	3	4	5
27. Baştan çıkarıcı bir şeyle karşılaştığımda ona karşı arzumu kabul ederim.	1	2	3	4	5
28. Ne zaman yasak bir şeye istek duysam, bu arzuyu taşıdığımı kabul ederim.	1	2	3	4	5
29. Düşünmemeyi tercih ettiğim baştan çıkarıcı şeyler olsa da, bunlarla ilgili düşüncelerimin varlığını kabul ederim.	1	2	3	4	5
30. İstenmeyen arzulara göre hareket etmekten kendimi alıkoymam kolaydır.	1	2	3	4	5
31. Benim için iyi olmayan bir şeyi arzuladığımda ona direnmekte zorluk çekerim. * (Ters Madde)	1	2	3	4	5
32. Benim için kötü olsalar bile bazı şeyleri yapmaktan kaçınmak bana zor gelir. * (Ters Madde)	1	2	3	4	5
33. İstenmeyen arzular hissettiğimde davranışlarımı kontrol etmekte zorlanırım. * (Ters Madde)	1	2	3	4	5