AGNIESZKA MUCHACKA-CYMERMAN

Humanitas University, Poland

ORCID iD: 0000-0002-1627-4036

KATARZYNA TOMASZEK

University of Rzeszów, Poland

ORCID iD: 0000-0001-7019-5403

I WILL STUDY, BUT YOU MUST REWARD ME FIRST!
FACTOR STRUCTURE OF STUDENTS' STUDY REWARD ADDICTION AMONG POLISH EARLY ADOLESCENTS

Abstract

Background: The negative effects of rewards on intrinsic motivation are well-studied, but behavioral and mental dependency on rewards in students is less explored. The Reward Addiction Scale in the Academic Context (RASAC) is the only self-report tool for study reward addiction, originally developed for middle school Turkish students. This study aimed to validate the RASAC for Polish early adolescents and assess its consistency across gender and school stress levels.

Method: 548 adolescents (aged 12-15) completed self-report measures on study reward addiction, school burnout, and social resources.

Results: Principal components analysis indicated two possible models: a 2-factor structure with 8 items and a 3-factor structure with 9 items. Confirmatory factor analysis (CFA) showed acceptable fit for both models. The reward addiction construct includes high reward expectations (HRE) and two reinforcement effects: learning motivation reinforcement (RER) and positive school approach reinforcement (CRE). The instrument demonstrated acceptable reliability, with internal consistency exceeding 0.80 for the total score, HRE, and RER, and over 0.60 for CRE.

Conclusions: The 2-factor structures were consistent across gender and school stress levels, though the 3-factor model requires further exploration. The RASAC-PL is a valid and reliable tool for assessing study reward addiction in Polish early adolescents, offering a valuable resource for understanding reward dependency in educational settings.

Keywords: *Study Reward Addiction,School Burnout, Early Adolescents, Validity of the Scale, Factor Analysis*

Introduction

Parents and teachers tend to strongly believe that rewards help students succeed in their learning activities. However, the use of external rewards to enhance academic achievements has two sides. Some scholars argue that such practices can be effective in promoting optimal learning strategies, but some highlight the dark sides of rewarding. One of the suggested adverse effects of rewarding in the educational context is the study reward addiction (Aypay, 2018). Due to the little attention from researchers that has been paid to this topic and a lack of an examination of the abovementioned construct in the European adolescent population, this qualitative study offers an insight into the under-investigated construct of study reward addiction.

Behavioral Activation System (BAS)
of responses on conditional signals of Reward in Reinforcement Sensitivity Theory (RST)

Reinforcement Sensitivity Theory (RST), developed by Jeffrey Gray, is a prominent framework in psychology that explains individual differences in response to reward and punishment (Gray, 1982). The BAS is a crucial component of RST, responsible for regulating responses to conditioned and unconditioned stimuli that signal reward (appetitive stimuli) or the absence of punishment. This system is characterized by two primary effects on behavior when activated: a motivational effect and a learning effect (Gray, 1982). The motivational effect of the BAS increases arousal levels, which stimulates and directs behavior towards the source of reinforcement (Merchán-Clavellino et al., 2019). This heightened arousal enhances persistence and goal-directed actions, enabling individuals to approach and attain desired outcomes. The learning effect of the BAS redirects attention towards reward-related stimuli, facilitating the processing of information and the learning of associations between stimuli and responses. This enhanced focus on rewards aids in the formation of effective strategies to achieve goals. The activity of the BAS is heavily dependent on the dopaminergic system and involves two interrelated subsystems: the dorsal striatum (including the caudate and putamen) and the ventral striatum (including the nucleus accumbens). The BAS is associated with the development of positive affect or mood and impulsivity, driving behaviors that seek out pleasurable and rewarding experiences (Gray, 1987; Merchán-Clavellino et al., 2019). The BIS serves as a counterbalance to the BAS by responding to cues associated with punishment, non-reward, or novel stimuli(Merchán-Clavellino et al., 2019). While the BAS promotes approach behavior towards rewards, the BIS inhibits behavior to avoid negative outcomes, increasing attention to potential threats and facilitating risk assessment (Suhr, Tsanadis, 2007). This interplay ensures that behavior is modulated by both positive and negative reinforcement signals, promoting adaptive responses. Initially, BIS and BAS were thought to function independently. However, in an extension of the theory, Gray and McNaughton (2000) proposed that these systems are interrelated. They introduced the Fight-Flight-Freeze System

(FFFS), which regulates responses to all aversive stimuli, whether conditioned or not, and triggers avoidance and escape behaviors. High FFFS reactivity is linked to increased levels of fear and avoidance behaviors.

Study Reward Addiction among Students

In educational settings, the BAS is particularly relevant as it mediates students' responses to rewards such as praise, good grades, or other forms of recognition (Aypay, 2018). When students receive these rewards, their BAS is activated, enhancing their motivation to engage in learning activities. However, an over-reliance on external rewards can lead to a dependency, where students' motivation to study becomes contingent on receiving these rewards, potentially leading to study reward addiction. While rewards can effectively boost motivation, they can also create an addictive pattern of behavior, where the primary drive to study is dependent on the expectation of rewards. This over-dependence on external rewards can diminish intrinsic motivation, which is the internal drive to engage in an activity for its own sake. This shift can lead to superficial engagement with learning material and a focus on short-term gains rather than a deep, sustained interest in the subject matter. Study reward addiction can also contribute to school burnout (Aypay, 2018), characterized by exhaustion, cynicism, and a sense of inefficacy related to academic demands. The pressure to meet the expectations associated with rewards can heighten stress levels, leading to burnout. Furthermore, students who are reward-dependent may view peers and teachers primarily as sources of rewards, which can hinder the development of authentic, supportive relationships (van Beek et al, 2013). This can exacerbate feelings of isolation and stress, further impacting their academic and social experiences. Additionally, study reward addiction can impact social interactions (Aypay, 2018). Students who are reward-dependent may view peers and teachers primarily as sources of rewards, which can hinder the development of authentic, supportive relationships. This can exacerbate feelings of isolation and stress, further impacting their academic and social experiences. The focus on rewards can create a transactional dynamic in relationships, where interactions are driven

by the pursuit of rewards rather than genuine connection and collaboration. Reward addiction can increase sensitivity to punishment and lead to a decrease in self-esteem. Children addicted to rewards may exhibit heightened anxiety responses to the absence of rewards, which in turn can lead to negative emotional and behavioral consequences.Behaviorally, children addicted to rewards may exhibit increased anxiety and stress, especially in situations where rewards are not guaranteed. This can lead to disruptive behavior, lack of engagement, and even avoidance of tasks that do not offer immediate gratification (Chen, 2023). The emotional toll can be significant, leading to feelings of inadequacy, frustration, and depression.Therefore, this can have many negative impacts on the child's functioning, which destructively affects the formation of their stable personality.

The present study aims

The main goal of the current study was to test the psychometric validity of the Polish version of the Study Reward Addiction Scale (RASAC-PL). Additionally, we also aimed to examine whether the structure of the study reward addictionconstruct shows measurement invariant across samples that differ in terms of gender and school stress. Based on the original study (Aypay, 2018) we expect to confirm two-factor structure of the RAS construct among Polish early adolescents, regardless gender and stress level. In addition, prior studies revealed positive correlations between RAS construct and school burnout, thus we hypothesized similar pattern between these two characteristics in our research. Furthermore, considering that school distress in a chronic manifestation directly leads to higher school burnout we also hypothesized positive association between these two variables. According to past findings the source of positive stimuli is related to positive valuing and emotions (Phungphai, Boonmoh, 2021), we hypothesized that using rewarding by important others (i.e. parents, and teachers) is positively associated to the quality of relationship with family, and school environment (classmates, teachers) members.

METHODS

PARTICIPANTS AND PROCEDURE

A total sample included 548 participants(257 of students were girls)from elementary schools in Poland (7th-8th grades), which is higher than the calculated sample representativeness size requirement (372 subjects or more). The average age of individuals was 13.21 years (SD = 0.70). All consents from teachers, parents, and students were completed before aged 12-15 years old we started the paper-pencil cross-sectional survey (September 2022 to March 2023).The project has received Ethical approval from the University Research Ethics Committee, andall guidelines of the Helsinki Declaration were followed when collecting data.

MEASURES

Study Reward Addiction Scale (RASAC-PL)comprises 10 items across two subscales (Aypay, 2018): high expectation of rewards (HRE, five items, e.g. *When I don't receive a reward in return, learning new things doesn't make me happy*), and reinforcement effect of reward (RER, five items, e.g. *When I am rewarded by my parents after studying, I feel an increased desire for studying*). RASAC items are rated on a four-point Likert scale from 4 (*strongly agree*) to 1 (*strongly disagree*). A high total score indicates more severe reward addiction in educational context. The English version of RASAC was translated into Polish by one bilingual psychologist and consult with two independent experts in the field. Then, the comments from the experts were implemented and integrated into the final version of RAS-PL scale. Finally, the integrated version was back-translated into English. One difference was made in the Polish version of the scale i.e. in item 10 we added an examples of teachers rewarding behaviors. The internal consistency of the original version of RASAC scale indicators were .86 for HRE, .82 for RER, and .89 for Total Score (Ayapy, 2018).

Student School Burnout Scale (ESSBS), developed by Aypay (2011) in polish adaptation of Tomaszek and Muchacka-Cymerman (2019), is a24 item self-report scale that uses a 4-point Likert scale from 1 (strongly agree) to 4 (strongly disagree), and measuring four domains of students' burnout

in the elementary and middle schools population. The scale allows for estimation of: burnout due to school activities (BSA, 12 items), burnout due to parents (BSF, 5items), incompetence in school (ISS, 4 items), loss of interest in school (LIS, 5items) (e.g. *School is tiring for me) (*Aypay, 2011). The ESSBS-PL demonstrated good internal consistency. In the total sample of this study internal consistency was high for total score – α/ω=0.90, and acceptable for subscales (α/ω ranged from 0.76 to 0.84).

The single item of Current School Stress is a questionnaire measuring school stress experienced by students*(e.g. What is your current stress level related to school performance?*). Participants rated their this item on 5 point Likert scale from 1-Very low to 5-Very high.

Students Social Resources Scale (SR) is a 3 item self-report short instrument that assess quality of relationships with classmates, teachers and parents (e.g. *How do you rate your relationships with your teachers?*). Participants rate each item on a 3-point Likert scale (1 – poor, 3-good).The SR demonstrated acceptable reliability (α=0.61/ω=0.64). In this study we used each item separately, thus the total score was not calculated.

Data Analysis

All statistics were calculated by using the Jamovi 2.3.28 free statistical software package. No missing data were detected in the data.

Factor structure of the RASAC-PL analysis

Statistical analyses were conducted in order to examine the dimensional structure of the RASAC-PL. Exploratory factor analysis was performed by using principal component analysis (PCA) with oblique rotation and two tested solutions (1) two-factor structure similar to the original, (2) three components structure based on eigenvalues greater than 1 technique. The second set of analyses was focused on a technique that allows testing the efficacy of models where the number of components is specified, namely confirmatory factor analysis (CFA). The CFA statistic was conducted with the Robust Weighted Least Square Means (WLSM) method of estimation.

Students from the total sample were randomly assigned into EFA and CFA subsamples taking into account equality in demographic characteristics (age and gender distribution). In addition, the EFA sample included 275 subjects, whereas the CFA sample 273. Principal component analysis was estimated based on EFA combined sample, and separately for boys and girls.

Reliability of the RASAC-PL

The reliability analysis was based on examining two most commonly used indexes of internal consistency (Cronbach's α and McDonald's ω) calculated on the Total Sample.

The measurement invariance of the RASAC-PL

The multi-group measurement invariance statistic was calculated to test whether a similar structure of the study reward addiction construct is present across groups that differ in gender and school stress. Specifically, we estimate MI to determine the similarities among (1) Girls vs. Boys; (2) Low Stress vs. High Stress; and (3) Low Stressed Girls vs. High Stressed Girls vs. Low Stressed Boys vs. High Stressed Boys. The measurement invariance was assessed by calculating four types of invariance i.e. configural, metric, scalar, and residual. The model fit statistics were estimated based on two commonly used criteria, namely the significance of changes in chi-square and CFI ($\Delta\chi2$ with $p \geq .01$ for significance, $\Delta CFI \leq 0.01$), due to limitations of the $\Delta\chi2$ criterion related to sensitivity to sample size.

Validity of the RASAC-PL scale

The validity of the study reward addiction construct was utilized by calculating Pearson's correlation coefficients between Study Reward Addiction indicators and school stress and burnout symptoms (Current School Stress scale, ESSBS scale), and quality of students' relationships with classmates, teachers, and parents (SR scale).

Results

The demographic variables are presented in Table 1.

Table 1. *Students' Demographic Characteristics*

Variable		Total Sample	Exploratory sample (EFA)	Confirmatory sample (CFA)
N		548	275	273
Gender	Female n(%)	257 (46.9)	127(46.2)	130(47.6)
	Male n(%)	291(53.1)	148(53.8)	143(52.4)
Age	M (SD)	13.21(.70)	12.98(.62)	13.43(.70)
	Age range in years (min.-max.)	12-15	12-15	12-15
Current School Stress	M(SD)	3.20(1.18)	3.06(1.10)	3.34(1.24)
Classmates Relationship	M(SD)	2.50(.66)	2.46(.68)	2.53(.63)
Parents Relationship	M(SD)	2.69(.55)	2.68(.52)	2.70(.58)
Teachers Relationship	M(SD)	2.11(.67)	2.12(.62)	2.10(.72)

Exploratory factor analysis of the RASAC-PL structure

According to the results of Principal Component Analysis (PCA) Bartless's Test of Sphericity was significant (EFA total sample: $\chi2=1072$, p<.001; Boys sample $\chi2=571$, p<.001; Girls sample $\chi2=714$, p<.001), and KMO measure indicating the middling sampling adequacy (EFA sample, Boys sample: 0.77; Girls Sample: 0.73).

In the two-factor model, the examination of commonalities indicated that one item scored a value lower than 0.3 (item 6 in EFA total sample – 0.26, in Boys sample – 0.23). In the Girls' Sample four items indicated low commonalities (items: 5,6,7,1). Despite that, the inter-item correlations were above 0.45 in the EFA total sample, and Boys' Sample, and above 0.3 in the Girls' Sample, which according to Field (2009) allows for including items with low commonalities in the PCA analysis. In the three-factor solution suggested by eigenvalues over 1.0 more items indicate low commonalities (5 items in EFA total sample, and boys' sample; 6 items in the girls' sample). The two-factor solution with all original items accounted for 58.1% of the variance in the EFA Total Sample, 67.8% in the Boys Sample, and 63.5% in the Girls Sample. 65.8% of the variances, were explained by Model 2 (8 items), and 68.5% by Model 3 with a 3-factor solution. The PCA statistic revealed that all items exceed the

critical value greater or equal to 0.40. However, in Model 1 in the EFA Total sample and in the Girls' Sample, item four loaded stronger onto the other factor than originally (see Tab. 2). Inter-factor correlations calculated on the total sample were medium in the two-factor model (r=0.42) and from low to high in the three-factor model (r ranged from 0.13 to 0.69).

Table2. PCA *Factor loadings of the polish version of RASAC-PLscale in EFA sample(n=275); Boys Sample (n=148); Girls Sample (n=127)*

Item Nb	Model 1. Two-Factor model (10 items)						Model 2. Two-factor model (8 items)[a]		Model 3. Three-Factor model (10 items)		
	EFA Total Sample		Boys Sample		Girls Sample						
	HRE	RER	HRE	RER	HRE	RER	HRE	RER	HRE	RER	CRE
6	**0.87**	-0.04	**0.89**	-0.08	**0.85**	0.04	**0.86**	-0.01	**0.85**	0.00	-0.13
5	**0.86**	-0.08	**0.84**	-0.22	**0.88**	0.06	**0.85**	-0.06	**0.86**	-0.08	-0.04
7	**0.85**	-0.10	**0.79**	0.08	**0.87**	-0.21	**0.86**	-0.08	**0.85**	-0.11	-0.02
8	**0.67**	0.16	**0.58**	0.20	**0.75**	0.18	**0.69**	0.19	**0.67**	0.16	-0.003
3	**0.62**	0.17	**0.71**	**0.30**	**0.52**	0.02	**0.64**	0.15	**0.66**	0.07	0.19
4	**0.60**	**0.30**	0.41	**0.50**	0.77	0.19	-	-	**0.63**	0.22	0.16
2	-0.04	**0.83**	-0.03	**0.83**	-0.04	**0.82**	-0.04	**0.88**	-0.05	**0.90**	-0.06
1	0.03	**0.80**	-0.03	**0.68**	0.07	**0.87**	0.01	**0.84**	0.02	**0.88**	-0.08
9	0.04	**0.79**	-0.04	**0.78**	0.10	**0.78**	0.06	**0.75**	0.11	**0.63**	**0.38**
10	-0.21	**0.42**	0.15	**0.43**	**-0.48**	**0.46**	-	-	-0.04	-0.05	**0.96**
Explained % of Variance	35.0%	23.1%	32.4%	24.6%	39.6%	23.9%	39%	26.8%	35.4%	21.2%	11.8%
	58.1%		67.8%		63.5%		65.8%		68.5%		

[a] – model without item 4 and 10
Note: Loadings higher than 0.3 or greater are in bold; the original factor structure is marked with grey background;HRE – High Expectation of Reward; RER-Study Motivational Reinforcement Effect of Reward; CER-Positive School Approach Reinforcement Effect of Reward

CONFIRMATORY FACTOR ANALYSES

The results of the CFA analysis indicated that all chi-squared tests were statistically significant, which suggests significant differences between theoretical and observed constructs. However, only two models exceeded the criterion $\chi2/df \leq 5.0$ i.e. models 2 and 3. Comparative Fit Index (CFI) values were above 0.90 (greater than the recommended cutoff value≥ 0.85) in each examined model; the RMSEA values were unacceptable in model 1 (RMSEA≤ 0.08), slightly less than the good fit value in model 2, and indicating good fit in model 3. SRMR values were within the acceptable value (SRMR <0.08) in models 2 and 3 (Sarmento& Costa, 2019) (see Tab. 3).

Table 3. *CFA statistic fit indexes in CFA Sample (n=273)*

Number of model	χ2	df	p	CFI	RMSEA (90%CI)	SRMR	TLI	GFI
1. 2- factor model (10items)	434	34	<0.001	0.937	0.208[0.191;0.226]	0.143	0.919	0.954
2. 2-factor model (8 items)[a]	54.2	19	<0.001	0.993	0.083[0.057;0.109]	0.064	0.990	0.993
3. 3-factor model (9items)[b]	57.3	23	<0.001	0.991	0.074[0.050;0.098]	0.060	0.986	0.993

[a] – model without items 4 and 10; [b] – model without item 4
Note: Classical results were reported

RELIABILITY

The total score of the Polish version of the RASAC-PL, and HRE scales present good reliability (α and ω over 0.80). The results for the RER subscale were acceptable (α and ω over 0.70, and after excluding two items acceptable α and ω over 0.80) (see Tab. 4).

Table 4. *Descriptive statistics and Reliability (results reported fromTotal sample N=548)*

Variables	Nb of items	Descriptivestatistics			Cronbach's α			McDonald's ω		
		Total sample M(SD)	Boyssample M(SD)	Girls sample M(SD)	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
HRE	5	8.33(3.27)	8.63(3.42)	7.98(3.08)	0.857	0.857	0.857	0.860	0.860	0.860
RER[a]	3	8.33(2.30)	8.33(2.33)	8.32(2.27)	0.721	0.805	0.805	0.748	0.813	0.813
CRE	2	6.00(1.54)	6.20(1.47)	5.82(1.57)	-	-	0.605	-	-	0.606
RASAC-PL	10	21.4(5.41)	21.59(5.77)	21.24(4.99)	0.823	0.823	0.823	0.834	0.834	0.834

Note: HRE – High Expectation of Reward; RER[a] – MotivationReinforcement Effect of Reward (score without item 1 and 10), CRE – Positive School Approach Reinforcement Effect of Reward

The reliability for the third factor i.e. Positive School Approach Reinforcement Effect of Reward was also acceptable considering the criterion for short scales – less than 5 items (α and ω ranged from 0.45 to 0.60). According to the results of a *t*Student comparison statistic Girls scored significantly higher than Boys on the High Expectation of Reward (HRE) ($t546= -2.31, p =0.021, d=0.20$), and Positive School Approach Reinforcement Effect of Reward (CRE) $t546= 2.92, p =0.004, d=0.25$), the differences in study reward total score, and Motivation Reinforcement Effect of Reward were insignificant (RASAC-PL Total Score: $t546= -0.76, p =0.446, d=0.07$; RER: ($t546= 1.08, p =0.282, d=0.09$). (see Tab.4).

MEASUREMENT INVARIANCE OF THE RASAC-PL

The measurement invariance analysis was calculated only for the 2-factorial model (8 items) because for the 3-factorial model (9 items) some categories were empty or the system could not find the converge results.

The Δχ2 index suggested no measurement invariance in model 1, whereas scalar and residual invariance describes models 2 and 3. However, by including Δthe CFI criterion we detected that measurement invariance was found in each model i.e. for girls and boys (Model 1), for low vs. high school stress (Model 2), and for a model which includes both categories gender and school stress (Model 3). Model fit indexes were acceptable for CFI, and close or slightly below the acceptable criterion for SRMR, and RMSEA (see Tab. 5).

Table 5. *The multi-group measurement invariance comparison for two-factorial model (8 items) was examined*

Nb. of model	χ2	df	Δ χ²	CFI	ΔCFI
Model 1. Girls (n=257) vs. Boys (n=291)					
1.Configural	137	38	-	0.990	-
2.Metric	186***	44	49	0.986	0.004
3.Scalar	186***	42	0.	0.986	0.00
4.Residual	186***	42	0	0.986	0.00
Model 2. Low school stress (n=326) vs. High school stress boys (n=222)					
1.Configural	132	38		0.991	-
2.Metric	153**	44	21	0.989	0.002
3.Scalar	153	42	0	0.989	0.00
4.Residual	153	42	0	0.989	0.00
Model 3. Low school stressed girls (n=121) vs High school stressed girls (n=136) vs. Low school stressed boys (n=205) vs High school stressed boys (n=86)					
1.Configural	215	76	-	0.989	-
2.Metric	319***	94	104	0.983	0.006
3.Scalar	319	88	0	0.982	0.001
4.Residual	319	88	0	0.982	0.00

***p<0.001
Note: WLSM estimation method was used, Classical results were reported; a – Reject vs. Accept invariance between samples

VALIDITY OF THE RASAC-PL SCALE

According to the higher study reward addiction was significantly positively associatedwithmost of the school burnout indicators (Pearson's coefficients ranged from r=0.13 to 0.18 for RASAC-PL total score, and from r=0.07 to 0.24 for its components). In addition, lower current school stress was related to higher reward addiction among students, except Positive School Approach Reinforcement Effect of Reward. Furthermore, almost all RASAC-PL indicators were significantly positively correlated to school relationships with classmates and teachers. Pearson coefficients for the relationships with parents were insignificant (see Tab. 6).

Table 6. *Correlations between RASAC-PLscores and the other measurements*

Variables	BSA	BSF	ISS	LIS	ESSBS	Stress	Classmates	Parents	Teachers
HRE	0.12**	0.24***	0.11***	-0.15	0.11***	-0.08*	0.13**	-0.002	0.07*
RER[a]	0.05	0.13**	0.07*	0.08*	0.10**	-0.12**	0.08*	-0.02	0.06
CRE	-0.06	0.18***	0.18***	-0.01	0.06	-0.02	-0.05	-0.05	0.12**
RASAC-PL	0.13**	0.29***	0.18***	-0.05	0.18***	-0.09*	0.09*	-0.04	0.09*

***p<0.001; **p<0.01; *p<0.05
Note: HRE – High Expectation of Reward; RERa – Motivation Reinforcement Effect of Reward (score without item 1 and 10), CRE – Positive School Approach Reinforcement Effect of Reward ; BSA-Burnout due to school activities; BSF – burnout due to parents; ISS – Incompetence in school; LIS – Loss of interest in school; ESSBS-School burnout Total Score (ESSBS); Stress – Currents school stress; Classmates – Classmates Relationships; Parents – Parents Relationships; Teachers – Teachers Relationships

DISCUSSION

Rewarding students for studying is a common practice applied by parents and teachers to enhance and control learning motivation. However, little is known about the addictive effect of these practices, hence the study reward addiction structure is still mostly uncovered, and the pervasive negative consequences of this behavioral dependency remain unexplored. To our knowledge studies on this field are scarce because of a lack of theoretical approaches that capture all aspects of this school-related phenomenon. One of the few approaches was proposed by Aypay (2018) and stems from the classical Gray and McNaughton's (2000) RST model. In view of the lack of self-reported measurements of the study reward addiction construct among the European youth population, the main purpose of the current research project was to examine the validity of the Study Reward Addiction Scale (RASAC-PL) among Polish early adolescents.

The Structure and Reliability of the Study Reward Addiction

Based on the principal component method and CFA statistic the two acceptable factorial structures of the study reward addiction construct were detected. Particularly, the first one was the originally suggested by Aypay (2018) two-dimensional model with High expectations of reward and Reinforcement Effect of reward. However, acceptable CFA fit indexes were observed only after excluding two items from the original scale. In contrast, based on

eigenvalues we observed a three-factorial structure i.e. High expectation of reward, and two aspects of the Reinforcement effect of reward focused on study motivation (Motivation Reinforcement Effect of Reward – RER[a]), and positive study-related emotions and school relationships (Positive School Approach Reinforcement Effect of Reward – CRE). Notably, the reliability of the RASAC-PL indicators, examined by internal consistency was acceptable for all examined models i.e. 2-factorial, and 3-factorial constructs.

According to PCA statistic item 4 ('*I would study more if my parents were to buy what I wanted to reward me*') loaded more HER, than the originally proposed RER factor. Furthermore, better-fit indexes in CFA were obtained after excluding item 4, hence we suggest removing it from the pole of RASAC-PL items when calculating its indicators. Additionally, the discussed item includes subjunctive and conditional clauses, which might have been unclear to the readers. Thus, its revision by using simpler linguistic form (i.e. 'I study more when my parents buy me what I ask for') may increase item understanding. The second excluded item – number 10 – refers to school climate as a positive outcome of using rewards by teachers (in the Polish version '*I usually like teachers who reward me (e.g. give me good grades or praise my answers*'). This item captures the somewhat unrepresented effect of reward dependency in educational settings by directly focusing on positive social interactions in the school environment. The highest correlations were detected between items 10 and 9 ('*If I am rewarded for studying, I feel very happy*'), suggesting two positive outcomes of rewarding i.e. positive mood and social integration. Past studies highlighted several benefits of study rewards, encouragement of learners to practice desired behaviors and habits (i.e. effective learning strategies, positive school interactions), and enjoyable learning experiences (Aypay, 2018). According to some scholars rewarding school climate includes recognizing and appreciating students' efforts, where they can be "surrounded by motivated, enthusiastic, positive colleagues' relationships (Hodges, 2010, p.23). Hoffman et al. (2009) revealed that implementing an emotionally targeted reward structure in the classroom by teachers improves the school climate. In contrast, school discipline based on reward withdrawal as punishment decreases positive social interactions. We believe that the CRE factor refers to the socio-emotional processes regulation that are related to rewarding strategies

focused on enhancing learning behaviors. In regards, the need to include the effects of rewarding in education settings is also in line with the notion of the association between reward non-drug behavioral addictions and altered neural plasticity or activation of the dopaminergic brain (Poisson et al., 2021).

The observed three-factorial structure of the study reward addiction was corroborated by CFA analyses. In addition, the 3-factorial model observed in the data may suggest the need for revision of the original RASAC scale by adding items exploring study emotions' (dys)regulation or social interactions conditioned by rewards from important others i.e. teachers and parents. Nevertheless, our results also partially suggest that the study reward addiction construct, similarly to other behavioral addictions, can be related to mood external regulation and social interactions in the classroom. Specifically, past studies confirmed that the brain's reward circuitry may be more susceptible to debilitating conditions in which lack of expected reward for activity (i.e. studying) causes symptoms such as anhedonia, and depression, whereas the presence of reward increases positive emotions and social integration (Supecar et al., 2018). In this regard, it is also important to consider and examine other aspects of the brain's oversensitivity to reward conditions i.e. aberrant reward-associated perception and memory related to school experiences.

Measurement Invariance of the RASAC-PL

The examination of the measurement invariance properties of RASAC-PL capability to be used among students that differ in terms of their gender, and school stress showed the results based on the 2-factorial model of RASAC. According to our findings, the RAS-PL instrument presents a comparable structure across i.e. girls and boys, low-stressed students and high-stressed students populations, and in groups that include both the abovementioned categories. Notably, our results also showed that despite the comparable structure of the examined construct, girls tend to score significantly higher in HRE and CRE than boys. These results are in line with past studies that suggested significant sex differences in reward vs. punishment system sensitivity, although the findings are mixed (Warthen et al., 2020). For example, according to Dhingra et al. (2021) men compared to women showed higher response to the receipt of dollar or cent reward in bilateral orbitofrontal and visual cortex (are more

sensitive to reward), but women demonstratedmore significant modulation to punishment sensitivity in the neural responses to wins. On the contrary, studies conducted by Cornewall et al. (2018) revealed that females are more sensitive to reward frequency, whereas males to reward magnitude in the process of decision-making from experience. Similarly, Chowdhury et al. (2019) observed significant sex influences in substance abuse patterns, with women more prone to cite stress as the main reason. Interestingly, scholars observed a faster punishment-avoidance learning in females than males, but no sex difference were observed in reward-guided associative learning. Furthermore, women are more strongly encoded by reward system to share the money with others than men because of higher gender-related activity in neural reward circuits during prosocial decisions (Soutschek et al., 2017). The abovementioned examples picture the neurobiological mechanism underlying gender differences in reward and punishment sensitivity. The detected sex differences in our studies suggest that similar patterns may be observed in educational settings. The nature of school rewards is directly related to social approval, and acceptance, this is why girls may be more prone to study-reward addiction.

Convergent validity of the RASAC-PL

The validity of the RASAC-PL measure was examined by its correlations with constructs that assess the degree of showing adverse consequences of focusing on study reward i.e. school stress and school burnout. The RASAC-PL total score and high expectations of reward (HRE) significantly positively correlated with almost all school burnout syndrome symptoms (except the loss of interest in school activities). Reinforcement Effects of Reward presented by an increase in study motivation (RER) and positive school approach (CRE) were positively related to higher burnout due to parents pressure (BSF) and incompetence in school (ISS). These findings are in line with the studies conducted by Aypay (2018), who found that 7% of the variances in school burnout syndrome may be explained by higher HRE. Unexpectedly the total RASAC-PL, HRE, and RER were negatively correlated to currently experienced school stress symptoms. These results may be related to a short instrument used of estimate school stress, but also may be a sign of specific characteristic of addicted individuals, who tend to use various defense mechanisms to ignore signals of adverse effects

(i.e. distress) caused by reward source. Finally, higher addiction to reward in educational settings was associated with a better relationship with classmates (except correlations with CRE), and with teachers (except correlations with RER). The results presented above are in line with the notion that '*in the highly social life of humans, rewards that are sought and experienced are intertwined with social relationships and interactions between people (…)The human striatum, known to play a key role in reward processing, displays signals related to a broad spectrum of social functioning, including evaluating social rewards, making decisions influenced by social factors, learning about social others, cooperating, competing, and following social norms.*' (Bhanji, Delgado, 2014, p.61). Our findings confirmed, that young people addicted to study-reward are motivated by the basic human need for social approval and recognition from important others. Positive evaluations from teachers or classmates may be the only reason to increase learning efforts but also represent social factors related to negative self-evaluations as a student. The findings suggest that being overwhelmed due to extreme parents' study-demands is associated with a higher tendency to depend on educational rewards, and incompetence in school. Altogether, our results are in line with the notion that keeping adolescents extrinsically motivated by tangible rewards forces children to compete to gain others' attention and approval, which results in higher school burnout, and loss of self-confidence in educational settings (Aypay, 2018). In summary, RASAC-PL appeared as a valid instrument that can be used among the early adolescent Polish population and is similarly appropriate to determine this type of behavioral dependency among different samples of young people.

Study Limitations

There are several limitations to the present study that warrant consideration. First, the reliance on self-report measures introduces the potential for response biases, including social desirability and recall biases, which could affect the validity of the findings. Participants may have provided responses they deemed socially acceptable rather than reflecting their true experiences. Second, the cross-sectional nature of the study precludes the establishment of causal relationships between study reward addiction, school burnout, and social relationships. Longitudinal research is needed to determine the directionality

and causality of these associations and to explore how these dynamics evolve over time. Third, the study was conducted with a specific demographic group—Polish early adolescents—which limits the generalizability of the results to other cultural contexts or age groups. Future studies should include more diverse and representative samples to enhance the external validity of the findings. Additionally, the exclusion of two items from the original RASAC scale due to poor fit indices suggests that further refinement and validation of the scale are necessary to ensure its robustness across different populations and settings. Finally, the study did not account for potential confounding variables such as socioeconomic status, academic performance, or personality traits, which could influence the observed relationships.

Conclusions

The present study provides significant insights into the psychometric properties of the Polish version of the Study Reward Addiction Scale (RASAC-PL) and its applicability among early adolescents. The findings confirm the validity and reliability of the RASAC-PL, supporting its use in assessing study reward addiction in the Polish adolescent population. Both a two-factor structure, consisting of High Expectations of Reward and Reinforcement Effects of Reward, and a three-factor structure, including Positive School Approach Reinforcement Effect, were found to be valid. The internal consistency of the RASAC-PL was acceptable, indicating that the scale is a reliable measure of study reward addiction.

Measurement invariance analyses demonstrated that the RASAC-PL is suitable for use across different groups, including varying genders and levels of school stress, thereby enhancing its utility in diverse educational settings. The significant correlations between study reward addiction and school burnout, as well as the quality of relationships with classmates and teachers, highlight the intricate relationship between external rewards and various educational outcomes. These findings underscore the importance of understanding the role of rewards in educational contexts and their potential impact on students' academic motivation and well-being.

In conclusion, the RASAC-PL is a valuable tool for educators, psychologists, and researchers to identify and address study reward addiction among early adolescents. By recognizing the potential negative effects of excessive reliance on external rewards, educational stakeholders can develop more balanced and effective motivational strategies that support both academic achievement and students' overall well-being. Future research should continue to refine the RASAC-PL and explore its applicability in other cultural and age groups, as well as investigate longitudinally the long-term effects of study reward addiction on academic and psychosocial outcomes.

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