Title: The psychometric properties of the Turkish version of Reinforcement Sensitivity Theory - Personality Questionnaire – Children (RST-PQ-C)

Ibrahim Bahtiyar[a]

Philip J. Corr[b]

Dino Krupić[c]

[a]Department of Psychology, Near East University, Nicosia, CYPRUS

[b]Department of Psychology, City, University of London, UK

[c]Department of Psychology, University of J.J. Strossmayer in Osijek, Osijek, Croatia

Corresponding author:

Ibrahim Bahtiyar

Department of Psychology

Near East University

Nicosia, CYPRUS

PK: 99138

Tel: 03922236464

Email: Ibrahim.bahtiyar@neu.edu.tr

Abstract

In this study we report the results of examining psychometric properties of a Turkish translation of the Reinforcement Sensitivity Theory of Personality Questionnaire-Children (RST-PQ-C; Cooper, Stirling, Dawe, Pugnaghi, & Corr, 2017). Seven hundred thirty-eight primary school students completed the Turkish version of the RST-PQ-C. Confirmatory factor analysis provided evidence for construct validity and supported a three factor structure: fight-flight-freeze system (FFFS), behavioural approach system (BAS) and behavioural inhibition system (BIS). Results showed that RST-PQ-C Turkish version is a valid and reliable self-report measure of reinforcement sensitivity. This study contributes to the validation of the RST-PQ-C and it is hoped that it will facilitate implementation of the research within the framework of r-RST on children population in Cyprus and Turkey.

Key words: children, revised Reinforcement Sensitivity, confirmatory factors analysis, Turkish translation

1. Introduction

Our brain has specialized systems that activate in particular situations. In everyday, an individual can face circumstances which can produce specific emotions such as pain and pleasure. According to Reinforcement sensitivity theory (RST) elicitation of these emotions depend on activation of approach, avoidance or conflict resolution systems. Revised-Reinforcement sensitivity theory (r-RST) assumes that the appetitive and aversive stimuli are handled with three major emotion systems: behavioural approach system (BAS); fight, flight and freeze system (FFFS) and behavioural inhibition system (BIS). BAS activates when a salient appetitive stimulus appears. FFFS reacts to all emotionally aversive stimuli and BIS engages when there is an obstacle either in reaching a desired reward or avoiding undesired circumstance. The most prominent advancement in the r-RST was the separation of the BIS and FFFS. Before the revision, BIS was thought to be responsible of reacting to aversive stimuli but in the r-RST it was changed to be a mediator system between BAS and FFFS (Corr, 2016; Corr & Krupić, 2017; Gray & McNaughton, 2000). Variations in these systems' properties have known to be related to personality and various psychopathologies (Bacon, Corr, & Satchell, 2018; Satchell, Bacon, Firth, & Corr, 2018).

Fewer children scales exist when compared to the number of adult RST scales. Two drawbacks can be argued to slow down the r-RST research in the children population at the current state. The first one is the adopted scales where the items are directly transferred from an adult questionnaire. The second one is the scales which have not been developed according to r-RST and lacking the sophistication for separating BIS from FFFS (i.e., BIS and BAS factor; Carver & White, 1994). Separating fear from anxiety is important in the light of the r-RST as they can be differentially impaired in different pathological conditions (Bijttebier, Beck, Claes, & Vandereycken, 2009; Colder et al., 2011). That is why it is

important to develop a children questionnaire which is not modified from an adult scale and also can separate FFFS sensitivity from BIS sensitivity. Developing self-report measures which is consistent with the r-RST is a step forward in the personality research and RST-PQ-C is a good example which includes all these necessary features. RST-PQ-C items were developed by using focus groups. Items were written according to standard guidelines and short, clear, easy to understand statements were used.

In this brief form, we show psychometric properties of the Turkish translation of RST-PQ-C (Cooper et al., 2017).

2. Method

2. 1 Participants and procedure

Total of 738 primary school students (383 boys and 355 girls) aged between 7 and 11 with a mean age of 9.3 years (SD = 1.3) from primary schools in Nicosia, Cyprus fulfilled the RST-PQ-C. A total of 44 participants were discarded (both RST-PQ-C and AMS) due to too many blanks in the questionnaires.

Participation was voluntary and ethical approval for the study was obtained from Near East University's Ethics Review Board.

2. 2 Materials

Reinforcement Sensitivity Theory Personality Questionnaire-Children (RST-PQ-C; Cooper, et al., 2017) contains 21 items answered on a 4-point Likert-type scale distributed into three subscales; BAS, FFFS and BIS sensitivities. The questionnaire was translated for this study from English to Turkish by a team of psychologists and English language teachers. Two bilingual psychologists translated English items to Turkish language. Subsequently, the items were back translated to English language by two bilingual English language teachers. The resulting items were checked by one of the developers of the original scale.

3. Results

In the RST-PQ-C Turkish version skewness and kurtosis values for all items ranged from -1.63 to .09, and -1.53 to 0.18, respectively. According to Curran, West, and Finch, (1996) skewness and kurtosis values of 0–2, and 0–7 can be taken as descriptive parameters of univariate normality. The value that the Prelis program yielded was 1.070 for relative multivariate kurtosis which was relatively small. This indicated that the multivariate distribution was reasonably normal. Cronbach's alpha for the three scales were BIS = .73; FFFS = .65; BAS = .84 indicating adequate reliability. In the original study of Cooper et al. (2017), the FFFS also had the lowest factor loadings when compared to the other scales. FFFS is fragmented and it contains elements of freezing, fleeing and avoidance. The lower Cronbach's alpha could be attributed to this fragmented nature of the FFFS construct. Correlation coefficients between the total scores of the scales are presented in Table 1.

Table 1

Descriptive statistics of and correlations between RST-PQ-C scales

	BAS	BIS	*α*	Mean	SD	Skewness	Kurtosis
BAS	-		*.85*	14.6	5.0	-.57	-.39
BIS	.57	-	*.73*	10.6	4.1	.07	-.73
FFFS	.36	.55	*.65*	7.01	4.4	.53	-.01

Note: α – Cronbach alpha reliability coefficient

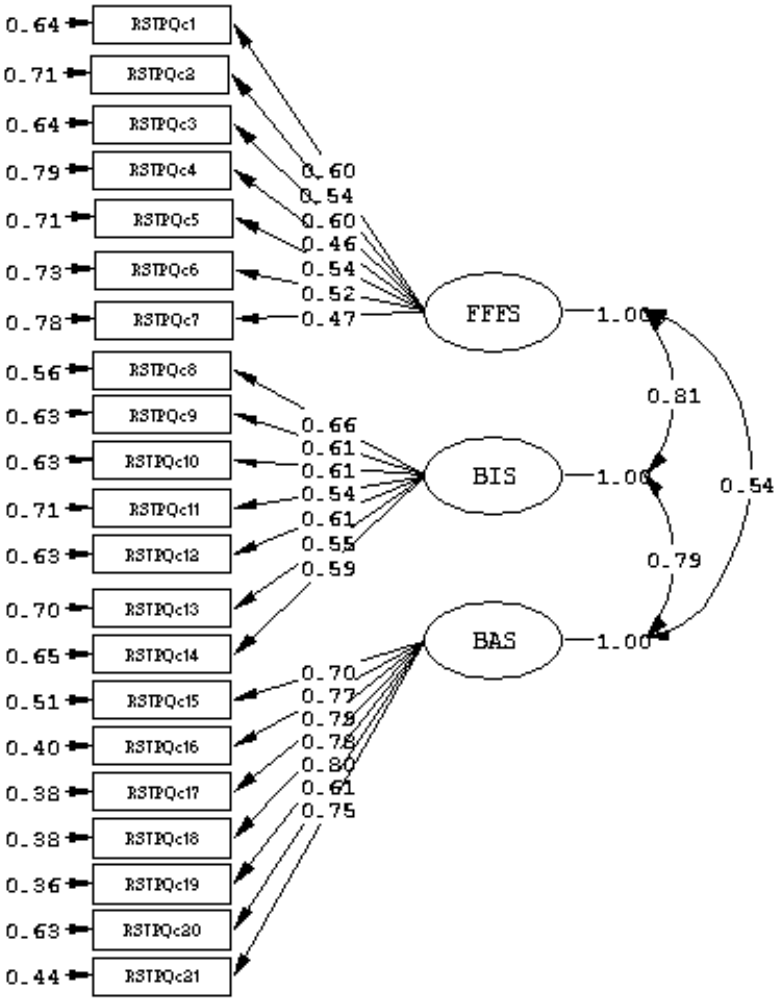

Figure 1. Factor structure of the RST-PQ-C

Note. FFFS (fight, flight, freeze system). BIS (behavioural inhibition system). BAS (behavioural approach system). RST-PQ-C (Reinforcement sensitivity theory - personality questionnaire-children version)

Confirmatory factor analysis (CFA) was conducted by Lisrel 9.2 for assessing the factor structure of the RST-PQ-C-Turkish version by robust maximum likelihood estimation (MLR). Model fit was ascertained using a mean-adjusted minimum fit function χ^2; ratio of χ^2 (Chi square value divided by the degree of freedom); the root mean square error of approximation (RMSEA); the comparative fit index (CFI); Sattora-Bentler scaled chi-square (χ^2) (Satorra & Bentler, 1999); Tucker–Lewis index (TLI) and standardized root mean square residual (SRMR). Figure 1 represents the hypothesized three factor model for RST-PQ-C and the standardized values. Each factor was measured by seven items. The hypothesized model was a three-factor model with the BIS, FFFS and BAS factors. The model fit indices for the model were Sattora-Bentler-scaled $\chi 2$ (186) =370.46, $p < .00$, $\chi^2/df = 2.302$, CFI = .98, TLI = .92, RMSEA = .043, SRMR = .04. According to Hu & Bentler's (1998) cut-off scores, these values indicated good model fit. To examine the incremental validity and predictor roles of the BAS, FFFS and BIS above and beyond age and gender, we conducted a hierarchical multiple regression analysis of intrinsic and extrinsic motivation (summarized in Table 2). In this model, the BAS was the strongest predictor of the intrinsic motivation scores ($\beta= .32$, $p<.001$). BIS was the strongest predictor of extrinsic motivation ($\beta= .15$, $p<.05$).

4. Discussion

The aim of this study was to translate the RST-PQ-C (Cooper et al., 2017) into Turkish and to investigate its construct validity. Evidence was provided showing that the psychometric properties of the RST-PQ-C Turkish version were adequate and this assessment tool can be used with the Turkish speaking child population.

In the literature, there are some differences in terms of values that were obtained from adult and children samples. Studies that included adult participants generally found lower correlation values between BAS and BIS. Berkman, Liberman and Gable (2010) reported that

BAS and BIS were not significantly correlated in an adult sample. Jackson (2009) has reported a modest correlation (r = 0.27) between these systems. However, in the children's samples, the correlation coefficient between the BAS and the BIS appeared to be higher. Luman, Van Meel, Oosterlaan, and Geurts (2012) reported that the correlation coefficient between the BAS and the BIS was .45. Similarly, Muris (2005) obtained a value of .38. Blair, Peters, and Granger (2004) reported that they found a modest relationship (r = .36) between BIS and BAS. Vervoort et al. (2015) also reported that the BAS and the BIS were modestly and positively correlated (r =.24). Furthermore, Amiri, Nadilyu and Ghasemzade (2019) recently reported that the strength of the positive relationship between BAS and BIS was .51. It appears that there is a difference in the magnitude of the relationship of the BAS and the BIS when the children and the adult samples are compared. The researchers argued that the positive relationship they found in the children's samples was in line with the r-RST, which proposes that the BIS mediates the defensive approach and the approach with caution (Gray & McNaughton, 2000). Vervoort et al. (2010) interpreted their findings to mean that the BAS and the BIS have a joint influence in the normal children population, which is consistent with the r-RST's joint sub-systems hypothesis (Corr, 2002).

Hierarchical regression analysis provided evidence for incremental validity and showed that the BAS was the strongest predictor of intrinsic academic motivation. On the other hand, the BIS appeared to be better predictor of extrinsic motivation. The unique contribution of these findings was the presentation of the BAS as a good predictor of the intrinsic academic motivation and furthermore, these results call for further investigation to assess the mediational effects of the achievement goal orientations.

Table 2

Summary of hierarchical regression analysis predicting scores on the intrinsic motivation scale and the extrinsic motivation scale

Predictors and step		Intrinsic motivation				Extrinsic motivation			
		β	R^2	ΔR^2	ΔF	β	R^2	ΔR^2	ΔF
1	Gender	-.09*	.04	.04	16.433***	.01	.02	.02	6.007**
	age	.19***				-.13**			
2	Gender	-.03	.16	.12	36.190***	.04	.05	.03	8.634***
	Age	.14***				-.12**			
	FFFS	-.01*				.05			
	BIS	.10*				.15**			
	BAS	.32***				.003			

*p < .05. **p < .01. ***p < 001

One limitation of this study comes from the fact that there are no other RST scales for children translated into Turkish. For this reason, we were not able to administer a questionnaire to assess convergent validity. In the future, it would be worthwhile translating one of the other reinforcement sensitivity questionnaires into Turkish.

In summary, the results of this study provided evidence that the psychometric properties of the Turkish version of RST-PQ-C are comparable to the original version and it

can be used as an assessment tool in the Turkish language speaking children population. BIS, BAS and FFFS are implicated in many pathological conditions such as ADHD, anxiety disorders and personality disorders. Translating this questionnaire will facilitate further investigations about these issues.

References

Amiri, S., Nadilyu, K. B., & Ghasemzade, M. (2019). Reliability, Validity, and Factor Structure of the Persian Version of the Children Reinforcement Sensitivity Scale. *Iranian Journal of Psychiatry and Clinical Psychology*, *24*(4), 444–457. https://doi.org/10.32598/ijpcp.24.4.444

Bacon, A. M., Corr, P. J., & Satchell, L. P. (2018). A reinforcement sensitivity theory explanation of antisocial behaviour. *Personality and Individual Differences*, *123*, 87–93. https://doi.org/10.1016/j.paid.2017.11.008

Berkman, E. T., Liberman, M. D., & Gable, S. L. (2009). BIS, BAS and response conflict: testing predictions of the Revised Reinforcement Sensitivity Theory. *Personality and Individual Differences*, *46*(310), 586–591. https://doi.org/10.1016/j.paid.2008.12.015

Bijttebier, P., Beck, I., Claes, L., & Vandereycken, W. (2009). Gray's Reinforcement Sensitivity Theory as a framework for research on personality-psychopathology associations. *Clinical Psychology Review*, *29*(5), 421–430. https://doi.org/10.1016/j.cpr.2009.04.002

Blair, C., Peters, R., & Granger, D. (2004). Physiological and neuropsychological correlates of approach/withdrawal tendencies in preschool: Further examination of the behavioral inhibition system/behavioral activation system scales for young children. *Developmental Psychobiology*, *45*(3), 113–124. https://doi.org/10.1002/dev.20022

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*, *67*(2), 319–333. https://doi.org/10.1037/0022-3514.67.2.319

Colder, C. R., Trucco, E. M., Lopez, H. I., Hawk, L. W., Read, J. P., Lengua, L. J., … Eiden, R. D. (2011). Revised reinforcement sensitivity theory and laboratory assessment of BIS and BAS in children. *Journal of Research in Personality*, *45*(2), 198–207. https://doi.org/10.1016/j.jrp.2011.01.005

Cooper, A. J., Stirling, S., Dawe, S., Pugnaghi, G., & Corr, P. J. (2017). The reinforcement sensitivity theory of personality in children: A new questionnaire. *Personality and Individual Differences*, *115*, 65–69. https://doi.org/10.1016/j.paid.2016.06.028

Corr, P. (2002). J.A.Gray's reinforcement sensitivity theory: Test of the joint subsystems hypotesis of anxiety and impulsivity. *Personality and Individual Differences*, *33*, 511–532. https://doi.org/10.1016/j.paid.2008.12.015

Corr, P. J. (2016). Reinforcement sensitivity theory of personality questionnaires: Structural survey with recommendations. *Personality and Individual Differences*, *89*, 60–64. https://doi.org/10.1016/j.paid.2015.09.045

Corr, P. J., & Krupić, D. (2017). Motivating personality: Approach, avoidance, and their conflict, *4*, 39–90. https://doi.org/10.1016/bs.adms.2017.02.003

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, *1*(1), 16–29. https://doi.org/10.1037/1082-989X.1.1.16

Gray, J. a, & McNaughton, N. (2000). The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system, (2nd ed.) In *Oxford Psychology Series*,*33* p. 433. https://doi.org/10.1017/S0140525X00013066

Hu, L.T., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods*, *3*(4), 424–453. https://doi.org/http://dx.doi.org/10.1037/1082-989X.3.4.424

Jackson, C. J. (2009). Jackson-5 scales of revised Reinforcement Sensitivity Theory (r-RST)

and their application to dysfunctional real world outcomes. *Journal of Research in Personality*, *43*(4), 556–569. https://doi.org/10.1016/j.jrp.2009.02.007

Luman, M., Van Meel, C. S., Oosterlaan, J., & Geurts, H. M. (2012). Reward and punishment sensitivity in children with ADHD: Validating the Sensitivity to Punishment and Sensitivity to Reward Questionnaire for children (SPSRQ-C). *Journal of Abnormal Child Psychology*, *40*(1), 145–57. https://doi.org/10.1007/s10802-011-9547-x

Muris, P. (2005). Behavioural inhibition and behavioural activation system scales for children : Relationships with Eysenck's personality traits and psychopathological symptoms. *Personality and Individual Differences*, *38*, 831–841. https://doi.org/10.1016/j.paid.2004.06.007

Satchell, L. P., Bacon, A. M., Firth, J. L., & Corr, P. J. (2018). Risk as reward: Reinforcement sensitivity theory and psychopathic personality perspectives on everyday risk-taking. *Personality and Individual Differences*, *128*, 162–169. https://doi.org/10.1016/j.paid.2018.02.039

Satorra, A., & Bentler, P. M. (1999). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika*, *66*(4), 507–514. Retrieved from https://repositori.upf.edu/bitstream/handle/10230/890/412.pdf?sequence=1&isAllowed=y

Vervoort, L., Vandeweghe, L., Vandewalle, J., Van Durme, K., Vandevivere, E., Wante, L., … Braet, C. (2015). Measuring punishment and reward sensitivity in children and adolescents with a parent-report version of the BIS/BAS-scales. *Personality and Individual Differences*, *87*, 272–277. https://doi.org/10.1016/j.paid.2015.08.024

Vervoort, L., Wolters, L. H., Hogendoorn, S. M., De Haan, E., Boer, F., & Prins, P. J. (2010). Sensitivity of Gray ' s Behavioral Inhibition System in clinically anxious and non-anxious children and adolescents. *Personality and Individual Differences*, *48*, 629–633.

https://doi.org/10.1016/j.paid.2009.12.021