



## Short Communication

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

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## ABSTRACT

We report the results of a Turkish language translation of the Reinforcement Sensitivity Theory of Personality Questionnaire-Children (RST-PQ-C; Cooper, Stirling, Dawe, Pugnaghi, & Corr, 2017). Seven hundred and thirty-eight primary school students completed the Turkish version of the RST-PQ-C. Confirmatory factor analysis provided evidence for its structure and psychometric properties, confirming 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 revised Reinforcement Sensitivity Theory (r-RST). This study contributes to the validation of the RST-PQ-C and it is hoped will facilitate research within the framework of r-RST on children in Cyprus and Turkey.

## 1. Introduction

Our brain has specialized systems that activate in reaction to specific stimuli and situations. In everyday life, an individual may encounter stimuli/situations which produce specific emotions, such as distress and pleasure. According to the Reinforcement Sensitivity Theory (RST) of personality, elicitation of these emotions depends on activation of approach, avoidance, and conflict systems. Revised-Reinforcement Sensitivity Theory (r-RST) assumes that appetitive and aversive stimuli are mediated by two major emotion systems: behavioural approach system (BAS) and fight, flight and freeze system (FFFS); and there is also a third system, the behavioural inhibition system (BIS), that modifies their outputs. BAS activates when a salient appetitive stimulus appears; FFFS reacts to all aversive stimuli; and BIS engages when goal-conflict is detected. The most prominent development within r-RST is the separation of the BIS and FFFS. Before the revision, BIS was thought to be responsible for mediating conditioned aversive stimuli, while in r-RST it is seen to mediate between approximately equal activation of the BAS and FFFS (Corr, 2016; Corr & Krupić, 2017; Gray & McNaughton, 2000) – and, indeed, goal conflicts in general (e.g., within an r-RST system: FFFS – flight vs. freeze). Variations in these systems' properties are known to be related to personality and various psychopathologies (Bacon, Corr, & Satchell, 2018; Satchell, Bacon, Firth, & Corr, 2018).

The effects of reward and punishment are easier to observe in early

childhood than they are in adulthood (Galvan et al., 2006). Later during development, the social environment progressively changes and it starts to become more complex. Furthermore, reactions to reward and punishment in early childhood are more directly related to temperament (Muris, Meesters, de Kanter, & Timmerman, 2005). At that time, children are less under influence of social norms, with lower level of executive functioning and with fewer learned behavioural patterns. Surprisingly, there is a paucity of longitudinal studies focusing on developmental changes in reward and punishment sensitivities. Based on available data from cross-sectional studies, both reward and punishment sensitivities tend to increase from childhood until early adulthood, where they start declining (Pagliaccio et al., 2016) which is accompanied by structural changes in brain structures involved in reward and punishment processing (Urošević, Collins, Muetzel, Lim, & Luciana, 2012).

Fewer childhood RST scales exist as compared to the number of adult ones. In relation to this problem, at least two drawbacks slow down r-RST research in childhood populations. The first relates to items directly transferred from adult questionnaires, with little modification. The second is that scales have not been developed according to r-RST, therefore they lack the sophistication for separating BIS from FFFS (i.e., BIS and BAS factor; Carver & White, 1994) - separating fear and 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

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develop a children questionnaire which is not modified from an adult scale and which can separate FFFS sensitivity from BIS sensitivity. The RST-PQ-C is a good example, which includes all these necessary features. RST-PQ-C was developed by using focus groups of children presented with RST-relevant scenarios. Items were then written according to standard guidelines: and short, clear and easy to understand.

In this study, our aim was to assess the factor structure and provide information about psychometric properties of the Turkish language translation of RST-PQ-C (Cooper, Stirling, Dawe, Pugnaghi, & Corr, 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) filled out the RST-PQ-C. Cluster sampling method was used for collecting the data. Five schools were chosen randomly from a list among 29 primary schools in Nicosia, Cyprus. A total of 44 participants did not answer items on a particular page within the booklet and therefore were excluded from the sample. Participation was voluntary and ethical approval for the study was obtained from the City, University of London.

### 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 on three subscales: BAS (*i.e.*, *I like to do new and exciting things*); FFFS (*i.e.*, *I would run away from an animal if it was making me feel scared*); and BIS (*i.e.*, *I would stop what I was doing if I thought it was too risky to keep going*). Each subscale includes seven items. 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 (Philip Corr).

## 3. Results

In the RST-PQ-C Turkish version, skewness and kurtosis values for all items ranged from  $-1.63$  to  $0.09$ , 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 =  $0.73$ ; FFFS =  $0.65$ ; BAS =  $0.84$ . The BIS and the FFFS had good and acceptable values. However, reliability of FFFS scale was only adequate and at the lower bound of acceptability. 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. Correlation coefficients between the total scores of the scales are presented in Table 1.

**Table 1**  
Descriptive statistics of participants and correlations between RST-PQ-C scales.

	BAS	BIS	Gender	Age	$\alpha$	Mean	SD	Skewness	Kurtosis
BAS	–		$-0.17^{**}$	$0.12^{**}$	$0.85$	$14.6$	$5.0$	$-0.57$	$-0.39$
BIS	$0.57^{**}$	–	$-0.11^{**}$	$-0.01$	$0.73$	$10.6$	$4.1$	$0.07$	$-0.73$
FFFS	$0.36^{**}$	$0.55^{**}$	$-0.11^{**}$	$-0.11^{**}$	$0.65$	$7.01$	$4.4$	$0.53$	$-0.01$

Note.  $\alpha$  – Cronbach's alpha reliability coefficient; negative correlation for gender indicates that females achieved higher score.

\*\* $p < 0.01$ .

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). Fig. 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 Satorra-Bentler-scaled  $\chi^2 (186) = 370.46$ ,  $p < .00$ ,  $\chi^2/df = 2.302$ , CFI =  $0.98$ , TLI =  $0.92$ , RMSEA =  $0.043$ , SRMR =  $0.04$ . According to Hu and Bentler's (1998) cut-off scores, these values indicated good model fit.

## 4. Discussion

The aim of this study was to translate the RST-PQ-C (Cooper et al., 2017) into the Turkish language and to investigate structure and psychometric properties. In these respects, results showed that the RST-PQ-C Turkish version were adequate. This assessment tool is now suitable for use with a Turkish speaking child population. Using the cluster random sampling method, the data were collected from five different primary schools at various locations in the city of Nicosia ensuring the representativeness of our sample.

FFFS scale had lower internal consistency as compared to the other two scales. As it is responsible for mediating the reactions to all aversive stimuli and driving the organism toward fight, flight or freeze (Corr & Cooper, 2016). Lower Cronbach's coefficient may be attributed to the fragmented nature of this system. The questions in the FFFS scale contain elements of freezing and avoidance and they relate to immediate threat (Cooper et al., 2017). A question in the BIS scale, such as 'I would be careful when playing a game or sport', can be easier for a child to relate and decide about an appropriate response, because children encounters this sort of situations on a daily basis. However, a question in the FFFS scale, such as 'I would be frozen to the spot if there was a snake or spider in the bathroom with me', may be much more difficult to relate, particularly for the children who do not encounter such a situation on a regular basis. Indeed, the majority of the children who participated in the study were located in a city that would substantially minimize the chances of such an encounter. That is why the answers to these questions could be based on guessing about a potential behaviour. This could be a factor in obtaining relatively low Cronbach's alpha value for the FFFS scale.

In our study, the correlation coefficient between the BAS and the BIS was relatively high ( $r = 0.57$ ). This implies a greater connectivity between the BAS and the BIS in childhood. This finding can be explained from a problem solving perspective. Obtaining rewards involve challenges and requires problem solving. It can be argued that higher BAS level relates to facing frustrating problems more frequently (Galvan, 2013). According to rRST, problem solving situations cause an increase in the activity of BIS (Corr, DeYoung, & McNaughton, 2013).

Studies involving children (Amiri, Nadilyu, & Ghasemzade, 2019; Blair, Peters, & Granger, 2004; Luman, Van Meel, Oosterlaan, & Geurts, 2012; Vervoort et al., 2015) show substantially larger correlations between the BIS and the BAS than studies based on adults (Berkman, Liberman, & Gable, 2009; Jackson, 2009; Johnson, Turner, & Iwata, 2003). This is theoretically interesting. The highest correlation value for the children population being  $r = 0.51$  and for the adult population,

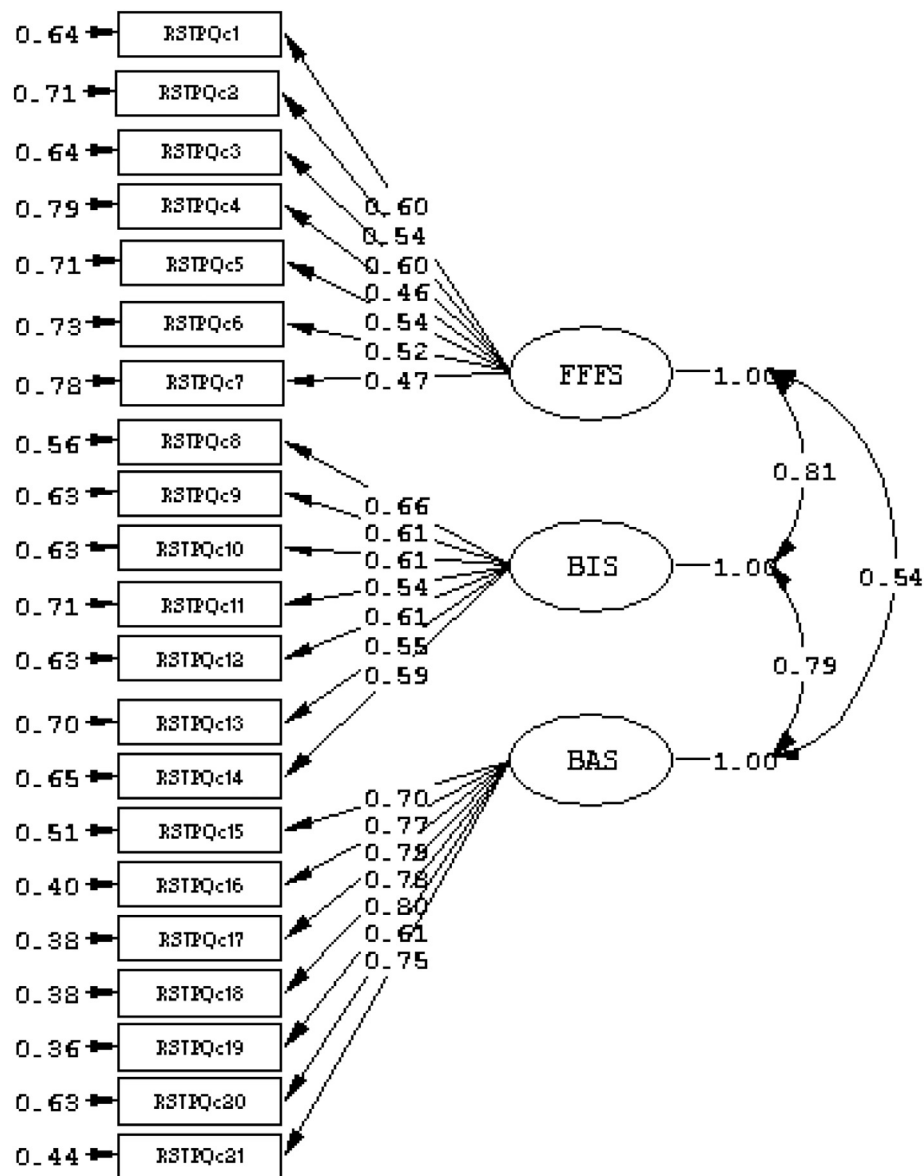


Fig. 1. Factor structure of the RST-PQ-C. Note. FFFS (fight, flight, freeze system); BIS (behavioural inhibition system); BAS (behavioural approach system). RST-PQ-C (Reinforcement Sensitivity Theory - Personality Questionnaire-Children version).

$r = 0.32$ . A similar pattern appears in the correlations between the BIS and the FFFS. The highest value being  $r = 0.55$  in children (Colder et al., 2011; De Pascalis, Sommer, & Scacchia, 2018; Luman et al., 2012) and  $r = 0.46$  in adults (Franken & Muris, 2006; Hannan & Orcutt, 2013; Jackson, 2009; Perkins, Kemp, & Corr, 2007). Furthermore, the relationship between the BAS and the FFFS appears to have a higher correlation in some childhood populations ( $r = 0.29$ ; Vervoort et al., 2010; Slobodskaya & Kuznetsova, 2013; Colder et al., 2011) than adults ( $r = 0.26$ ; Franken & Muris, 2006; Jackson, 2009; Pugnaghi, Cooper, Ettinger, & Corr, 2018).

One limitation of this study comes from the fact that there are no other RST scales for children translated into the Turkish language. 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. As BIS, BAS and

FFFS are implicated in many pathological conditions, such as ADHD, anxiety disorders and personality disorders, the availability of this questionnaire should facilitate future research into the association between personality and psychopathology, and much else.

**Appendix A. Supplementary data**

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2019.05.019>.

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