Review

Examining the validity of the revised Reinforcement Sensitivity Theory scales

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ABSTRACT

Several self-report scales are now available to measure Gray and McNaughton's revised Reinforcement Sensitivity Theory (r-RST). To date, no research has evaluated all the studies used by these scales together in one article so researchers can assess their differential utility. This article attempts to address this issue with a summary of the studies used by the r-RST scales. We found that the Jackson 5 includes the most studies attesting to its validity, but recognize this as partly a function of it as the oldest scale. The Jackson 5 and the Reinforcement Sensitivity Theory Personality Questionnaire have been used by researchers other than the original authors, which suggests acceptance by the r-RST research community. Our hope is that this article is useful to researchers as a succinct summary of the validity of measures and also a commentary on the studies.

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1. Examining the validity of the revised Reinforcement Sensitivity Theory scales

Based on animal learning and neurobiology, original Reinforcement Sensitivity Theory (o-RST; Gray, 1982) was updated to become revised Reinforcement Sensitivity Theory (r-RST; Gray & McNaughton, 2000). A recent development in r-RST is that several self-report scales have become available. Thus far, the construct validity and differential utility of each of the scales has not been examined. This article summarizes the studies associated with each of the scales and provides an evaluation of their usefulness. It is hoped this review will be useful to r-RST researchers in their assessment of which scale to use in their research.

Several self-report measures for r-RST have recently become available. These include the Jackson 5 (Jackson, 2009), the r-RST version of the Sensitivity to Punishment and Sensitivity to Reward Questionnaire caregiver report for children (SPSRQ-C; Colder et al., 2011), the Reinforcement Sensitivity Questionnaire (RSQ; Smederevac, Mitrović, Čolović, & Nikolašević, 2014), the revised Reinforcement Sensitivity Theory Questionnaire (rRST-Q; Reuter, Cooper, Smillie, Markett, & Montag, 2015), the Fight, Flight, Freeze Questionnaire (FFFQ; Maack, Buchanan, & Young, 2015), and the Reinforcement Sensitivity Theory of Personality Questionnaire (RST-PQ; Corr & Cooper, 2016). While the

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older studies are likely to have more studies than the more recent ones, an indication of the validity of the studies can still be provided by an examination of the studies.

Gray first outlined o-RST as an improvement of Eysenck's theories (for a review see Corr, 2008). While most personality models begin with a descriptive model and then investigate the underlying causes of the descriptive traits, o-RST begins with conditioning paradigms in animal learning and from this basis a neuropsychology of motivation, learning, and emotion was outlined. The Behavioural Approach System (BAS), also called the Behavioural Activation System, controls responses to conditioned reward and pertains to impulsivity (Gray & McNaughton, 2000). The Behavioural Inhibition System (BIS) controls responses to conditioned punishment and results in anxiety (Corr, 2004). The Fight/Flight System (FFS) controls responses to unconditioned stimuli. The FFS results in immediate responses of either rapid escape or defensive aggression (Corr, 2008). Because the FFS is a secondary punishment system, it was never clearly incorporated into the personality literature. The primary scales that assessed o-RST focused on the BIS and BAS without reference to the FFS (Carver & White, 1994; Torrubia, Avila, Moltó, & Caseras, 2001).

Based on reviewed behavioural and neurobiological rodent data, Gray and McNaughton (2000) revised the theory and suggested the motivational system should be divided into three systems with a clearer separation between BIS and FFFS. In the new theory, the BAS is relatively unchanged except that it controls responses to all rewarding stimuli rather than just conditioned stimuli. Moreover, the BAS was argued to be more related to extraversion than impulsivity (Smillie, Pickering, & Jackson, 2006). The name BIS remains, but the function differs because it now acts as a conflict detection system. The BIS evaluates approach-avoidance conflict as well as approach-approach conflict and avoidance-avoidance conflict. The BIS assesses and resolves the conflict, which results in defensive approach and greater sensitivity to threat (Corr, 2008). Instead of the BIS, the Fight/Flight/Freeze System (FFFS) is now the system that controls responses to all aversive stimuli, rather than just conditioned aversive stimuli outlined in o-BIS. Based on animal learning, Freeze has also been added to the FFS. Similar to o-RST, these revisions are based on developments in animal learning conditioning research and neuroscience (Gray & McNaughton, 2000; Smillie et al., 2006), which makes r-RST unique among the personality systems.

While the theory was originally based on rodent data, studies have also found separation of BIS and FFFS in humans (e.g., Perkins, Kemp, & Corr, 2007). The theory has been further refined, for example, by including positive evaluation and negative evaluation of the stimuli (Corr & McNaughton, 2012).

2. Literature review inclusion criteria

We conducted a search of the Web of Science database from 2000, when r-RST was introduced (Gray & McNaughton, 2000), to the time of writing (September 2016) using the search term "reinforcement sensitivity theory". This search term identifies both o-RST and r-RST studies and within the search results we identified the r-RST studies. After identifying the various r-RST measures, we also examined citations of each measure within the Web of Science database. The RST-PQ (Corr & Cooper, 2016) was only recently published but the measure has been available so use is noted some studies. The purpose of the article was to examine published peer reviewed empirical studies; therefore, we excluded books, book chapters, conference proceedings, theses, and theoretical articles. See Table 1 for a summary of the strengths and weaknesses of each of the measures according to the authors of this article.

3. Results of literature review

3.1. Jackson 5

Unsurprisingly, the scale with the most studies attesting to its construct validity was the oldest scale, the Jackson 5 (Jackson, 2009). Notably though, it has been used by researchers other than the original author, which suggests it has acceptance among the r-RST research community. The Jackson 5 includes a unitary BAS (consistent with r-RST theory; Jackson, 2009), and an FFFS that is constructed from its three sub-scales of fight, flight and freezing.

The scale is short in length and has been used in many studies. The original article includes two studies: a study of confirmatory factor analysis in undergraduate students and a study comparing the measure with o-RST in the prediction of delinquency and psychopathy in undergraduate students (Jackson, 2009). A study of social drinkers found the

Table 1
Summary of Strengths and Weaknesses of each r-RST Measure According to the Authors of this Article.

Measure	Author(s)	Strengths	Weaknesses
Jackson 5	Jackson (2009)	Short. Single r-BAS. FFFS designed to be either unidimensional or divisible into sub-scales. Two studies for validation. Used by much research including by researchers beyond the original author.	No biomarker correlations. Social comparison is used to measure anxiety which some researchers perceive to be inappropriate.
SPSRQ-C	Colder et al. (2011)	Biomarker correlations in validation study.	Single study for validation. r-BAS subscales, which are not suggested by original theory. A scale specifically for caregiver reports of children, so not applicable broadly.
RSQ	Smederevac et al. (2014)	Single r-BAS. Separate FFFS	No biomarker correlations. Single study for validation. High correlations between the r-BIS, Flight, and Freeze. Fight is negatively correlated with Flight and Freeze.
rRST-Q	Reuter et al. (2015)	Single r-BAS. Separate FFFS. Biomarker correlations in validation study. Two studies in initial validation including in different languages.	Correlations between the domains somewhat high. So far unused by researchers, but it is a relatively new scale. Fight is negatively correlated with Flight and Freeze.
FFFQ	Maack et al. (2015)	Separate FFFS. Five studies for validation including threat scenarios	No biomarker correlations. So far unused by researchers, but it is a relatively new scale. One word descriptors may be perceived as too simple to assess the constructs. Now that several r-RST measures are available a specific measure for FFFS may not be perceived as useful.
RST-PQ	Corr and Cooper (2016)	Five studies in initial validation. Available online for several years so has already become established in the literature, including in studies beyond the original authors.	No biomarker correlations. r-BAS subscales, which are not suggested by the original theory. Splitting defensive fight from FFFS and measuring remaining FFFS as a single component seems unconnected to theory.

Note. Studies ordered by publication date. SPSRQ-C = Sensitivity to Reward and Sensitivity to Punishment Questionnaire caregiver report for children; RSQ = Reinforcement Sensitivity Questionnaire; rRST-Q = The revised Reinforcement Sensitivity Theory Questionnaire; FFFQ = Fight, Flight, Freeze Questionnaire; RST-PQ = Reinforcement Sensitivity Theory of Personality Questionnaire; r-BAS = revised Behavioural Approach System; r-BIS = revised Behavioural Inhibition System; FFFS = Fight/Flight/Freeze System.