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Review

Reinforcement Sensitivity Theory of Personality Questionnaires: Structural survey with recommendations

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ABSTRACT

The Reinforcement Sensitivity Theory (RST) of personality has attracted considerable psychometric attention and there now exists a number of questionnaires to measure its three main systems: the *fight-flight-freeze system* (FFFS, related to fear), the *behavioural inhibition system* (BIS, related to anxiety), and the *behavioural approach system* (BAS, related to hope and pleasure). This article provides an assessment of the structural properties of these questionnaires in the light of (a) theoretical issues, (b) operational translations, and (c) factor analytic solutions. This review highlights the different theoretical perspectives underlying these descriptive models. To clarify this literature and to assist RST researchers, this article outlines a number of recommendations to guide the choice of questionnaire(s) and interpretation of results — this discussion serves, too, to highlight some of the unresolved issues in RST that call for further conceptual and empirical attention.

1. Introduction

The Revised Reinforcement Sensitivity Theory (RST) of personality is widely known to personality researchers. Its popularity reflects the importance attached to the general idea that underlying human personality is a small number of neurobehavioural systems responsible for appetitive and aversive motivation (Corr, 2013). RST is increasingly recognized as providing an integrative framework for the neurobiology of personality (e.g., Kennis, Rademaker, & Geuze, 2013) and, in consequence, it has attracted considerable empirical attention.

The most recent version of RST (Corr & McNaughton, 2012; Gray & McNaughton, 2000; McNaughton & Corr, 2004, 2008) postulates three major neuropsychological systems (RST-3): the *fight-flight-freeze system* (FFFS) is activated by all forms of aversive stimuli (including frustrating nonreward); the *behavioural approach system* (BAS) by all forms of appetitive stimuli (including relief of nonpunishment); and the *behavioural inhibition system* (BIS) by all forms of goal conflict, with one major class being (equal) co-activation of the FFFS and BAS. As is well known, this is a revision of the original RST formulated by Gray (1982) that laid emphasis upon only two of these systems, the BIS and the BAS (RST-2). What is less apparent is the hidden complexity in and between these systems which renders any attempt to provide a psychometric description of them far from straightforward — indeed, as shown in this article, prone to confusion.

Over the past forty plus years, questionnaire measures of RST-2 and RST-3 have proliferated, with each bringing new issues that need consideration and which generate debate. In consequence, the RST field is becoming increasingly muddled — an unwelcome state of affairs because it is bound to impede the scientific progress of RST as it relates not only to personality but to psychopathology and the wider reaches of everyday behaviour. Researchers are now faced with a large (and somewhat bewildering) diversity of questionnaires from which to choose — in itself, this is causing goal conflict in the literature.

As is widely known, the most significant change to revised RST is the separation of FFFS/fear and BIS/anxiety processes — although there are important developments in the BAS too. Although these two defensive systems were contained in the early version of RST (Gray, 1982), they were not adequately distinguished and, as a result, research focused almost exclusively on the BIS and BAS and, by so doing, conflated FFFS/fear and BIS/anxiety. Although understandable at the time, this was rather unfortunate because the FFFS and BIS always had very different behavioural functions and distinct neuropsychopharmacological bases (Corr & McNaughton, 2012; McNaughton & Corr, 2004). In terms of the importance of this separation, this is now recognized especially in the psychopathological literature (Bijttebier, Beck, Claes, & Vandereycken, 2009). However, until recently, one major limitation of this literature has been the absence of appropriate psychometric measures of FFFS-fear and BIS-anxiety (Sylvers, Lilienfeld, & laPraririe, 2011; see Dissabandara, Loxton, Diaz, Daglish, & Stadlin, 2012).

The aims of this article are to provide a handy summary of all purpose-built RST questionnaires, to assess their structural properties and, in the style of a property surveyor, to highlight problems and to make recommendations to enable researchers (especially those new and non-committed to the field) to make a rationally-informed choice.

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2. RST questionnaires: structural survey

Most of the available RST questionnaires are based on the original BIS/BAS model (RST-2). A detailed review of this literature has already been given by Torrubia, Avila, and Caseras (2008), so only a summary is provided here. It is worth noting that, although the newer class of RST measures have tackled the separation of FFFS and BIS, most still adhere to the unrevised notion of the BAS, conceived as a unitary dimension.

For ease of illustration, comparison of all RST questionnaires is shown in Table 1.

2.1. Scales for unrevised RST-2

Below is a description of attempts to provide psychometric measures for RST-2, focusing mainly on unitary defence and approach systems, with the exception of the first questionnaire reviewed.

2.2. Gray-Wilson Personality Questionnaire (GWPS)

The first full-blown attempt to measure the specific factors of RST was made by Gray's own research group. The *Gray-Wilson Personality Questionnaire* (GWPQ; Wilson, Barrett, & Gray, 1989; Wilson, Gray, & Barrett, 1990) measures six typical rodent-reactions to reinforcement: BAS (*Approach* to rewarding stimuli, and *Active Avoidance* of punishment, to signals to safety); BIS (*Passive Avoidance* of punishment by inactivity and submission, and *Extinction* of behaviours that have not led to reward); and FFS (Fight-Flight System; *Fight*, defensive aggression to threat, and *Flight* from punishing stimuli). The GWPS is noteworthy for separating components relating to the FFS and BIS — note, 'freeze' was not added to the FFS until the 2000 revision (Gray & McNaughton, 2000).

Although these six scales showed satisfactory internal consistencies (perhaps related to item redundancy and their narrow, specific content), factor analysis provided only limited confirmation of the a priori structure (see also Wilson, Barrett, & Iwawaki, 1995, for a later replication). The strongest associations were between Fight and Approach, and between Flight and Passive avoidance.

Table 1
Summary and comparison of unrevised and revised RST questionnaire.

Questionnaire	FFFS	BIS	BAS
Unrevised (RST-2)			
GWPS	√Fl, Fi	√PA, Ex;	√Ap, AV
GRAPES	x	√	√
BIS	x	√	x
BIS/BAS	x	√	√RR^1, D, FS
SPSRQ	√?	√	√
Revised (RST-3)			
J-5	√Fl, Fi, Fz	√	√
RSQ	√	√	√
rRST-Q	√Fl, Fi, Fz	√	√
RST-PQ*	√	√	√RI, G-DP, RR^2, Imp

Note. GWPS = *Gray-Wilson Personality Questionnaire* (Wilson et al., 1989); GRAPES = *General Reward and Punishment Expectancy Scales* (Ball & Zuckerman, 1990); BIS = BIS scale (MacAndrew & Steele, 1991); BIS/BAS = BIS/BAS scales (Carver & White, 1994); SPSRQ = Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia et al., 2001); J-5 = Jackson-5 (Jackson, 2009); RSQ = Reinforcement Sensitivity Questionnaire (Smederevac et al., 2014); revised Reinforcement Sensitivity Theory Questionnaire (Reuter et al., 2015); RST-PQ = Reinforcement Sensitivity Theory–Personality Questionnaire (Corr & Cooper, 2015; * = additional scale for Defensive Fight). Abbreviations: Fl = Flight, Fi = Fight, Fz = Freeze; PA = Passive Avoidance, Ex = Extinction; Ap = Approach, AV = Active Avoidance, RR^1 = Reward Responsiveness, D = Drive, FS = Fun-Seeking, RI = Reward Interest; G-DP = Goal-Drive Persistence, RR^2 = Reward Reactivity, Imp = Impulsivity.

2.3. General Reward and Punishment Expectancy Scales (GRAPES)

A different approach to the GWPQ is the *General Reward and Punishment Expectancy Scales* (GRAPES; Ball & Zuckerman, 1990) which does not focus on specific rodent-defined typical behavioural reactions to reinforcing stimuli but rather on a more cognitive interpretation of Gray's model. It is appropriate to note here that there is still ambiguity in RST concerning the role of behavioural and cognitive components (Zinbarg & Mohlman, 1998) and this issue has not yet been resolved in revised RST — for example, there is almost certainly a significant cognitive component to the BIS, as seen in the cognitive biases evident in anxiety (Wytykowska, Corr, & Fajkowska, 2015). However, Gray's own approach was to focus on behavioural *outputs* of RST systems as they can better be matched to prototypical animal learning paradigms — this fact is demonstrated in the explicit rationale for the development of the GWPQ, discussed above (and in conversations between the author and Jeffrey Gray).

Despite the theoretical appeal of this scale, it has not been used widely in RST research.

2.4. BIS scale

Another measure of punishment sensitivity is the *BIS scale* (MacAndrew & Steele, 1991), which is an MMPI-derived, criterion-keyed, tool to measure BIS sensitivity. Items were selected on the grounds: (1) that they differentiated between three different samples of females (psychiatric outpatients, putative normal subjects, and incarcerated prostitutes who are assumed to have an underactive BIS); and (2) they correlated positively with the Neuroticism scale and negatively with the Extraversion scale of the Eysenck Personality Questionnaire (EPQ). The final scale comprised 30 items, which would appear to measure anxiety-related cognitions, emotions, and behaviours. It is doubtful that this scale adds much to existing anxiety scales and, thus, is infrequently used. In addition, it does not separate the FFFS from the BIS, and does not include a measure of the BAS.

2.5. Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ)

The very first attempt to provide a specific measure of RST is the *Susceptibility to Punishment Scale* (Torrubia & Tobena, 1984). In accordance with the original notion of the BIS, item content was related to habitual behaviours in response to cues of punishment, frustrative non-reward and novel stimuli. Psychometric evidence shows adequate internal consistency and good convergent and discriminant validity. This scale was later expanded to include a measure of *sensitivity to reward* (SR), which is now part of the *Sensitivity to Punishment and Sensitivity to Reward Questionnaire* (SPSRQ; Torrubia, Avila, Molto, & Caseras, 2001). Principal component analysis confirmed that these two scales are orthogonal. They correlate with other personality variables in accordance with predictions, namely SP highly positively with neuroticism, and SR positively with extraversion. By virtue of its general nature of reward and punishments sensitivities, the SPSRQ has been widely used in RST research. Its limitations are: (a) a lack of separation of the FFFS/fear and BIS/anxiety; and (b) a lack of sub-components and scales for the BAS, which is now accepted by many researchers as being multidimensional (e.g., Carver & White, 1994; Corr, 2008; Dawe, Gullo, & Loxton, 2004).

2.6. BIS/BAS scales

By far and away the most popular RST questionnaire is the Carver and White (1994) *BIS/BAS scales*. This includes one scale to measure the BIS, and three scales to measure BAS functioning (*Drive*, *Reward Responsiveness*, and *Fun Seeking*). Reliability and validity data are excellent. In relation to the BAS, oblique factor analysis indicated a three-factor