PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

MEASURING PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS
WITH A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

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ABSTRACT

The present study examined the validity and reliability of the parent-report version of Carver and White’s BIS/BAS-scales for children, measuring Punishment and Reward Sensitivity (PS and RS). Gender and age differences in PS and RS were explored. Mothers (n=546, 62% girls, 2-18 years) completed the BIS/BAS parent-version and other instruments assessing PS/RS, personality and psychopathology. Reliability of most (sub-)scales was at least acceptable. The BIS/BAS-scales had meaningful relationships with other instruments assessing PS/RS, personality and psychopathology. There were significant age differences on BIS/BAS-scores, but no significant gender differences. The BIS/BAS parent-version is a valid and reliable parent-report PS/RS instrument for children and adolescents.

Keywords: Reinforcement Sensitivity Theory; Punishment Sensitivity and Reward Sensitivity; parent-report; children and adolescents; validity and reliability
INTRODUCTION

Gray’s Reinforcement Sensitivity Theory (RST) inspired research into human behavior in adults and children. The original version (oRST) of this neuropsychological theory (Gray, 1982) states that behavior originates from activity in at least two major brain systems, sensitive to different types of stimuli. The Behavioral Approach System (BAS) reacts to appetitive, rewarding stimuli, the Behavioral Inhibition System (BIS) to aversive, punishing or novel stimuli. Activity in both systems has differential behavioral and affective consequences. BAS-activity elicits impulsivity, approach behavior and positive affectivity (PA). BIS-activity elicits inhibition, avoidance behavior and negative affectivity (NA), fear and anxiety. Stable individual differences in BIS/BAS-activity are referred to as Punishment Sensitivity (PS, for BIS) and Reward Sensitivity (RS, for BAS). Consistent with this, BIS relates positively to the personality dimensions Neuroticism and negatively to Impulsivity/Extraversion, while BAS relates positively to Impulsivity/Extraversion and negatively to Neuroticism (Franken, Muris, & Rassin, 2005; Muris, Meesters, De Kanter, & Timmerman, 2005). Extreme manifestations of PS and RS are considered risk factors for, respectively, internalizing and externalizing problems in both adults (Bijttebier, Beck, Claes, & Vandereycken, 2009; Harnett, Loxton, & Jackson, 2013) and children (Quay, 1988; Vervoort, 2010; Vervoort et al., 2010). Several adaptations made to the original model (Corr, 2001, 2002; Gray & McNaughton, 2000) converged in the formulation of a revised version of the theory (rRST). However, the core assumptions on the role of PS and RS in personality and psychopathology formulated in oRST still hold to date.

Despite the widespread use of RST, there is no agreement on the instrument to assess its concepts. Several questionnaires have been used to assess PS and RS in child and adolescent samples (Vervoort, 2010). One of the most popular RST-instruments is Carver and White’s BIS/BAS-scales (1994). It’s child self-report version (Muris et al., 2005) is used extensively and its psychometric characteristics are well documented: self-reported BIS/BAS-scores are meaningfully associated with personality dimensions.
PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

(Bjornebekk, 2009; Muris et al., 2005) and psychopathology. Self-reported BIS is associated with internalizing problems, like anxiety (Sportel, Nauta, de Hullu, & de Jong, 2013; Sportel, Nauta, de Hullu, de Jong, & Hartman, 2011; Vervoort et al., 2010), while self-reported BAS is associated with externalizing problems, like hyperactivity and conduct problems (Muris et al., 2005). Less is known on reliability and validity of a RST parent-report instrument (Blair, 2003). In a small sample (n=42) of children aged 3-5, parent-reported BIS correlated significantly positively with CBQ_Fear (Rothbarth’s Child Behavior Checklist, 1989), and significantly negatively with CBQ_Anger/Frustration (Blair, 2003). In a study with a larger sample (n=170) of the same age group, BIS correlated significantly positively with CBQ_Fear and both BIS and BAS correlated significantly negatively with CBQ_Anger/Frustration and CBQ_Approach (Blair, Peters, & Granger, 2004). These early studies concluded that a BIS/BAS-scales parent-version might be a valid index of PS/RS in children, but, given the inconsistent results on BAS and CBQ_Approach, suggested nevertheless that more research is needed.

Brain development studies reveal lower activity in inhibition regions and higher activity in reward regions during adolescence compared to younger and older age, suggesting age related differences PS/RS (Galvan, 2013). However, developmental effects in BIS/BAS-scales are understudied. The few studies that report age differences concern diverse age groups and results are equivocal and inconsistent with brain research (Blair, 2003; Blair et al., 2004; Urosevic, Collins, Muetzel, Lim, & Luciana, 2012; Vervoort et al., 2010). Further, although PS/RS related brain circuits differ between girls and boys (Guyer, McClure-Tone, Shiffrin, Pine, & Nelson, 2009), gender differences on BIS/BAS-scales are seldom investigated and even more indistinct. Some studies report lower BAS-scores and higher BIS-scores in girls than in boys, but others report no differences (Blair, 2003; Matton, Goossens, Braet, & Vervaet, 2013; Verbeken, Braet, Lammertyn, Goossens, & Moens, 2012). Insight in developmental and gender differences in PS/RS is critical to understand their role in determining behavior.
The present study examines the validity of a parent-version of Carver and White (1994) BIS/BAS-scales in a large sample of children and adolescents, following theoretical RST-based expectations (Bijttebier et al., 2009; Gray, 1982) and empirical evidence of validity studies using self-report (Bjornebekk, 2009; Muris et al., 2005; Vervoort et al., 2010). BIS and BAS-scores are expected to correlate positively with PS and RS, respectively. Following the theoretical and empirically validated associations between BIS/BAS and personality, BIS-scores are expected to correlate positively with neuroticism and NA, BAS-scores with extraversion and PA. BIS-scores are expected to correlate positively with inhibition and negatively with approach, while for BAS-scores the reverse is expected. Since extreme levels of BIS and BAS are considered risk factors for psychopathology, BIS-scores and BAS-scores are expected to correlate significantly positively with internalizing and externalizing problems respectively. Reliability is evaluated and gender and age differences in BIS/BAS-scores explored.

METHOD

1.1. Participants and procedure

 Mothers of 546 children (62% girls, age $M=11.63$, $SD=3.95$, range 2-18 years) were recruited in region, country by Psychology students at institution city as partial fulfillment of course credits. Children of participating mothers were divided in three age groups: preschool (2-5 years, n=80), primary school (6-11 years, n=138) and secondary school (12-18 years, n=326). Children’s gender was not distributed equally over age groups, $\chi^2(2)=26.24$, p<.001, with 44% girls in the preschool group, 51% girls in the primary school group and 70% girls in the secondary school group. All procedures were approved by the Institutional Ethical Committee. Parents signed informed consent and completed child age-appropriate questionnaires.

1.2. Questionnaires

1.2.1. Instruments measuring Punishment and Reward Sensitivity
PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

**BIS/BAS-scales.** SP and SR were indexed by a Dutch parent-version of the Carver and White (1994) BIS/BAS-scales. The parent-version was developed by our research group and based on a Dutch validated age-downward adaptation of the original scales (Muris et al., 2005) (not Blair, 2003). For this parent-version, self-report items were rephrased to refer to the parent’s child\(^1\). Twenty items are scored on a 4-point scale (1=not at all true, 2=somewhat not true, 3=somewhat true, 4=all true). Seven items are PS/BIS-related and include statements as “My child is very fearful compared to his/her friends”. Thirteen items are RS/BAS-related and include statements as “My child craves for excitement and new sensations”. Five RS-related items make up the BAS_RewardResponsiveness (BAS_RR) subscale, four the BAS_Drive subscale (BAS_D) and 4 the BAS_FunSeeking subscale (BS_FS). BAS_Total is computed by summing all 20 BAS-items. Validity of the child self-report BIS/BAS-scales is well established (Bjornebekk, 2009; Muris et al., 2005; Vervoort et al., 2010).

**SPSRQ.** The Sensitivity to Punishment and Sensitivity to Reward Questionnaire is a parent-report measure indexing PS and RS (Colder & O'Connor, 2004). Thirty-three items are scored on a 5-point scale (1=never, 2=a little typical, 3=more or less typical, 4=typical, 5=clearly typical). Fifteen items are related to PS and include statements as “Your child is a shy person”. Eighteen items are related to RS and include statements as “Your child sometimes does things for quick reward”. Validity of the SPSRQ is well established (Becker et al., 2013; Colder & O'Connor, 2004; Slobodskaya & Kuznetsova, 2013). Internal consistency in the present sample is good (SP: Cronbach’s \(\alpha=0.81\), SR: \(\alpha=0.84\)).

**1.2.2. Instruments measuring related personality traits**

**HiPIC.** The ‘Hierarchical Personality Inventory for Children’ is a parent-report measure for Big Five Personality in youth (Mervielde & De Fruyt, 2002). 144 items are scored on a 5-point scale (1=hardly typical, 2=a little typical 3=more or less typical, 4=typical, 5=clearly typical). The HiPIC describes 5 domains: Neuroticism, Extraversion, Imagination, Benevolence and Consciousness. In the present study, Neuroticism and Extraversion are considered proxies for PS and RS respectively. Validity of the HiPIC is

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\(^1\) the scale is available on request to the first author
PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

well established (Decuyper, De Bolle, De Fruyt, & De Clercq, 2011). Internal consistency in the present sample is good (Neuroticism: Cronbach’s $\alpha=0.88$, Extraversion: $\alpha=0.89$).

**CBQ.** The ‘Child Behavior Questionnaire-short’ is a parent-report instrument measuring temperament in children (Putnam & Rothbart, 2006). 94 items are scored on a 7-point scale (1=extremely untrue, 7=extremely true). The CBQ-short has three broad domains: Surgency/Extraversion (31 items: subscales ActivityLevel, Extraversion, Shyness, Impulsivity), NegativeAffectivity (35 items: subscales Anger/Frustration, Discomfort, FallingReactivity/Soothability, Fear, Sadness) and EffortfulControl (28 items: subscales InhibitoryControl, AttentionalFocussing, LowIntensityPleasure, PerceptualSensitivity).

Apart from these domains, there are additional scales: Approach/PositiveAnticipation, HighIntensityPleasure, SmilingLaughter. In the present study, NegativeAffectivity and Surgency/Extraversion are considered proxies for PS and RS respectively. Because of their specific content, Approach/PositiveAnticipation (‘amount of excitement and positive anticipation for expected pleasurable activities’) and InhibitoryControl (‘the capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations’) will additionally be explored.

Validity of the CBQ is well established (Gartstein, Putnam, & Rothbart, 2012; Putnam & Rothbart, 2006). Internal consistency in the present sample is acceptable to excellent for InhibitoryControl ($\alpha=0.70$), NegativeAffectivity ($\alpha=0.83$) and Surgency/Extraversion ($\alpha=0.91$), but questionable for Approach/PositiveAnticipation ($\alpha = 0.62$).

### 1.2.3. Instruments measuring psychopathology

**CBCL.** The Child Behavior Checklist (CBCL 1-5 and CBCL6-18) (Achenbach & Rescorla, 2001; Verhulst & van der Ende, 2000 2001) measures emotional and behavioral problems. The CBCL1-5 consists of 100 items, the CBCL6-18 of 113 items, rated on a 3-point scale (0=not true, 1=somewhat true, 2=very or often true). Item scores are summed up to form two broad-band scales: Internalizing (INT) and Externalizing Problems (EXT). T-scores, based on Flemish normative scores, are reported. Higher T-scores represent more problems. Psychometrics are good to excellent (Verhulst & van der Ende, 2000.
PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

2001). Internal consistency in the present sample is good (INT: Cronbach’s $\alpha=0.84$ for CBCL1-5, $\alpha=0.88$ for CBCL6-18; EXT: $\alpha=0.89$ for CBCL1-5 and CBCL6-18).

1.3. Missing data handling and data inclusion

If one or two items of a questionnaire were missing, the missing was replaced by the scale mean. If more items were missing, data for that subject on that questionnaire were excluded.

To minimize participant burden and accommodate for the fact that personality and psychopathology symptoms in different age groups are measured with different questionnaires, mothers completed child age appropriate instruments. All mothers completed the BIS/BAS parent-report.

1.4. Analyses

Reliability is indexed by Cronbach’s $\alpha$. Gender- and age differences in BIS/BAS-scores are tested using separate Univariate Analyses of Variance with gender and age group as between-subject factors. Follow-up analyses are tested with polynomial contrasts. Relationships between BIS/BAS-scales and other questionnaires are described by Pearson correlations. Because of the significant correlation between BIS and BAS ($r=0.24$, $p<0.001$), partial correlations are computed to control for shared variance. Results are considered significant if $p<0.001$.

2. RESULTS

2.1. Reliability of BIS/BAS subscales

Regarding the BIS/BAS-subscules (Carver & White, 1994) internal consistency was good for BAS_Total ($\alpha=0.86$) and BAS_Drive ($\alpha=0.85$), acceptable for BIS_Total ($\alpha=0.76$) and BAS_RR ($\alpha=0.74$). Because of its low internal consistency ($\alpha=0.57$), BAS_FS was excluded from further analyses.

2.2. Descriptives, and gender and age effects

Table 1 displays all descriptive statistics. There were no significant main effects of gender on BIS/BAS-scale scores. There were significant main effects of age group on BIS_total (quadratic contrast,
PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

p<.001), BAS_total (linear contrast, p<.001). The significant main effect of age group on BAS_RR was qualified by a marginally significant gender x age group interaction, F(2,535)=6.39, p=.002. In girls, BAS_RR decreased linearly with age (2-5 years: M=14.44, SD=2.57, 6-11 years: M=14.21, SD=2.32, 12-18 years: M=13.83, SD=2.58), while in boys, BAS_RR peaked at ages 6-11 (2-5 years: M=14.86, SD=2.60, 6-11 years: M=15.69, SD=2.44, 12-18 years: M=13.42, SD=2.60). There were no other significant interactions nor significant effects related to BAS_D.

There were no significant main nor interaction effects of gender and age on other questionnaires.

2.3. **Relationships with the SPSRQ**

The BIS-subscale correlated significantly positively with the SPSRQ_SP-scale, but not with the SPSRQ_SR-scale. The BAS-subcales correlated significantly positively with the SPSRQ_SR-scale and significantly negatively with the SPSRQ_SP-scale (Table 2).

2.4. **Relationships with other personality traits**

The BIS-subscale correlated significantly positively with HiPIC_Neuroticism, CBQ_NegativeAffectivity and CBQ_InhibitoryControl, significantly negatively with HiPIC_Extraversion and CBQ_Surgency/Extraversion, but not with CBQ_Approach/PositiveAnticipation (Table 2).

The BAS-subcales correlated significantly positively with HiPIC_Extraversion, CBQ_Surgency/Extraversion and CBQ_Approach/PositiveAnticipation, significantly negatively with HiPIC_Neuroticism, but not with CBQ_NegativeAffectivity. BAS_Total, but not BAS_RR, correlated significantly negatively with CBQ_InhibitoryControl. BAS_Drive correlated significantly positively with CBQ_NegativeAffectivity, CBQ_Surgency/Extraversion, CBQ_Approach/PositiveAnticipation, significantly negatively with CBQ_InhibitoryControl, but not with HiPIC subscales (Table 2).

2.5. **Relationships with psychopathology**

The BIS-subscale correlated significantly positively with CBCL_INT and CBCL_EXT. The BAS-subcales correlated significantly positively with CBCL_EXT, but not with CBCL_INT (Table 2).
3. CONCLUSION AND DISCUSSION

The present study examined validity and reliability of a parent-version of Carver and White’s (1994) BIS/BAS-scales. Age and gender differences in BIS/BAS-scores were explored. The present study provides evidence for the validity of the BIS/BAS parent-version by describing favorable relationships with other instruments assessing PS and RS, personality and psychopathology.

First, the BIS/BAS parent-version relates meaningfully to the SPSRQ (Colder & O’Connor, 2004). BIS_total correlated significantly positively with SPSRQ_SP, and not with SPSRQ_SR. BAS_total, BAS_RR and BAS_Drive correlated significantly positively with SPSRQ_SR and significantly negatively with SPSRQ(SP). Since the SPSRQ is considered a validated parent measure for RST-concepts, these relations support the usability of the BIS/BAS parent-version to assess PS and RS as well. Given its shorter length, the BIS/BAS parent-version might be preferred over the SPSRQ, especially when the PS/RS-measurement is embedded in an extensive assessment procedure.

Second, the associations between BIS/BAS parent-version and personality questionnaires (HiPIC and CBQ) are generally consistent with RST-assumptions, and with studies investigating this with other instruments (Bjørnebekk, 2009; Muris et al., 2005). Higher levels of parent-reported PS were related to higher levels of HiPIC_Neuroticism, CBQ_NegativeAffectivity and CBQ_InhibitoryControl and to lower levels of HiPIC_Extraversion and CBQ_Surgency/Extraversion. The positive associations of the PS-subscales with CBQ_InhibitoryControl and the absence of significant associations with CBQ_Approach are consistent with the interpretation of BIS as an inhibition/avoidance system. Higher levels of parent-reported RS were related to higher levels of of HiPIC_Extraversion and CBQ_Surgency/Extraversion. It is unclear, however, why BAS_Drive is associated with CBQ_scales, but not with HiPIC_scales. The positive associations of the RS-subscales with CBQ_Approach and their negative associations with CBQ_InhibitoryControl are consistent with the interpretation of BAS as an impulsivity/approach system. However, the relationship with BAS_RR and CBQ_InhibitoryControl failed to reach significance.
Presumably, this is because BAS_RR can be better conceptualized in terms of Reward Sensitivity than in terms of Impulsiveness (Franken & Muris, 2006).

Third, consistent with RST stating that extreme PS or RS levels are predictive of psychopathology (Bijttebier et al., 2009; Gray, 1982; Harnett et al., 2013; Vervoort, 2010), BIS correlated significantly positively with CBCL Internalizing and Externalizing Problems. BAS correlated significantly positively with Externalizing Problems. The association of BIS with both internalizing and externalizing problems is consistent with the idea that temperamental emotionality or Negative Affectivity (which is strongly related to BIS) is involved in all domains of psychopathology (Muris et al., 2005; Rothbart & Bates, 2006).

The exploratory analyses of age effects suggest developmental changes in PS and RS. However, these changes are only partly consistent with expectations based on developmental brain research suggesting age-related decreases in PS and age-related increases in RS (Galvan, 2013). BIS_total-scores indeed decreased from school age to adolescent age, but only after an initial increase from preschool to school age. BAS_D-scores were relatively stable across different ages. The age-related decreases in BAS_total-scores and (after an initial increase) in BAS_RR-scores are at odds with brain research studies showing increased RS in adolescence. The BIS/BAS parent-version seems to tap developmental differences in PS and RS, other than those described in brain research. Despite differential activity in PS and RS-related brain areas between boys and girls (Guyer et al., 2009), BIS/BAS-scores did not differ between genders. It seems difficult to capture the overt behavioral gender differences in PS and RS related to differences in brain activity between girls and boys with the BIS/BAS parent-version.

The present study supports the validity of the BIS/BAS parent-version. However, there are some considerations that need to be taken into account when interpreting the results.

Carver and White’s BIS/BAS-scales were originally developed as indices of BIS and BAS as conceptualized by the original version of RST. As such, the present parent-version also considers PS and RS from the original viewpoint. It is essential that future research also adopts the new perspective from
PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES

the revised versions, and that more instruments based on rRST, and suitable for use in youth samples, are developed.

The large sample size and broad age range of the present study sample makes it tempting to use data of this sample to derive normative scores. However, the non-random selection of this sample precludes this. In particular, the unbalanced distribution of gender is problematic. Although no information on ethnicity or income was collected, we assume that the majority of parents participating in this study were Caucasian and from a higher socio-economic background. Future work is required to determine the generalizability of the findings to a more diverse population.

Although the present findings support the hypothesis that high levels of PS or RS are associated with psychopathological symptoms, the cross-sectional nature of the study precludes causal conclusions. Additionally, future research might investigate associations of this parent-report with instruments assessing specific psychopathology symptoms (e.g. anxiety, ADHD).

The present study focused on validity and reliability. Future research should investigate additional psychometric qualities. A thorough examination of the scales factor structure (both within the original and revised framework of RST) could advance the field, especially given the inconsistent results of several earlier factor analytical studies with the BIS/BAS-scales (Franken et al., 2005; Kingsbury, Coplan, Weeks, & Rose-Krasnor, 2013; Muris et al., 2005; Vervoort et al., 2010).

The present study shows that the BIS/BAS parent-version can be used to assess a child’s PS and RS, but other sources of information might provide additional insight. In the present study, only mothers participated. However, it might be interesting to collect data from fathers or teachers. Consistent with RST’s neuropsychological nature, several performance-based measures are found to be good indicators of PS and RS as well (Avila & Torrubia, 2008; Colder & O’Connor, 2004; Colder et al., 2011; Vervoort, 2010). Investigating the relationship between such measures and parent-reported PS and RS might strengthen their support. Furthermore, given the idea that PS and RS are manifestations of reactivity to environmental stimuli, observations in real life situations might be informative as well. Observational
measures of children’s temperament or personality do exist (Dyson, Olino, Durbin, Goldsmith, & Klein, 2012), but they do not focus on PS or RS. Construction of an observational measure to assess reactivity to punishing or rewarding stimuli might be a way forward in the study of RST concepts.

In conclusion, the present study supports the use of BIS/BAS-scales parent-version as a valid and reliable index of Punishment and Reward Sensitivity in children of a broad age range.
Table 1

Descriptive statistics for all questionnaires.

<table>
<thead>
<tr>
<th>BIS/BAS-scales</th>
<th>Total sample</th>
<th>Boys</th>
<th>Girls</th>
<th>Gender difference</th>
<th>2-5 years</th>
<th>6-11 years</th>
<th>12-18 years</th>
<th>Age difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>F(1,535)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>F(2,535)</td>
</tr>
<tr>
<td>BIS_total</td>
<td>15.96 (3.57)</td>
<td>15.64 (3.66)</td>
<td>16.16 (3.50)</td>
<td>p=.29</td>
<td>14.88 (3.61)</td>
<td>16.76 (3.65)</td>
<td>15.88 (3.45)</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>BAS_total</td>
<td>31.00 (6.44)</td>
<td>31.93 (6.77)</td>
<td>30.43 (6.17)</td>
<td>p=.02</td>
<td>33.00 (6.30)</td>
<td>32.03 (6.48)</td>
<td>30.10 (6.30)</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>BAS_RR</td>
<td>14.16 (2.64)</td>
<td>14.45 (2.73)</td>
<td>13.97 (2.53)</td>
<td>p=.06</td>
<td>14.68 (2.58)</td>
<td>14.93 (2.48)</td>
<td>13.71 (2.59)</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>BAS_D</td>
<td>8.67 (2.88)</td>
<td>8.88 (2.98)</td>
<td>8.53 (2.82)</td>
<td>p=.12</td>
<td>9.27 (2.85)</td>
<td>8.76 (2.96)</td>
<td>8.48 (2.84)</td>
<td>p=.09</td>
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<td>SPSRQ</td>
<td></td>
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<td>F(1,90)</td>
<td></td>
<td></td>
<td></td>
<td>F(1,90)</td>
</tr>
<tr>
<td>SP</td>
<td>33.71 (9.12)</td>
<td>32.79 (9.03)</td>
<td>34.88 (9.20)</td>
<td>p=.60</td>
<td>32.79 (8.13)</td>
<td>37.55 (11.93)</td>
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</tr>
<tr>
<td>SR</td>
<td>52.05 (8.39)</td>
<td>53.13 (7.90)</td>
<td>50.68 (8.88)</td>
<td>p=.99</td>
<td>52.24 (8.60)</td>
<td>51.28 (7.61)</td>
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<td>HIPIC</td>
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<td>F(1,149)</td>
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<tr>
<td>N</td>
<td>40.73 (9.79)</td>
<td>40.96 (10.44)</td>
<td>40.67 (9.69)</td>
<td>p=.59</td>
<td>na</td>
<td>na</td>
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<td>40.68 (9.77)</td>
</tr>
<tr>
<td>E</td>
<td>113.69 (14.83)</td>
<td>119.37 (11.50)</td>
<td>112.48 (15.21)</td>
<td>p=.22</td>
<td>na</td>
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<td></td>
<td>F(1,191)</td>
<td></td>
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<td>F(1,191)</td>
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<tr>
<td>NA</td>
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<td>107.33 (20.57)</td>
<td>p=.03</td>
<td>107.53 (20.51)</td>
<td>106.05 (21.35)</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>S/E</td>
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<td>115.35 (19.72)</td>
<td>108.20 (19.61)</td>
<td>p=.67</td>
<td>113.00 (20.18)</td>
<td>108.69 (18.72)</td>
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<tr>
<td>App</td>
<td>28.39 (4.95)</td>
<td>27.87 (4.81)</td>
<td>29.03 (5.08)</td>
<td>p=.22</td>
<td>28.76 (4.91)</td>
<td>26.83 (4.96)</td>
<td>na</td>
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<tr>
<td>IC</td>
<td>26.28 (5.92)</td>
<td>25.24 (6.32)</td>
<td>27.56 (5.18)</td>
<td>p=.34</td>
<td>25.63 (5.95)</td>
<td>29.00 (5.13)</td>
<td>na</td>
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PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS- SCALES

<table>
<thead>
<tr>
<th></th>
<th>CBCL</th>
<th></th>
<th></th>
<th>F(1,520)</th>
<th></th>
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<th>F(2.520)</th>
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<tr>
<td>INT</td>
<td>50.85</td>
<td>(11.65)</td>
<td>50.68</td>
<td>(11.56)</td>
<td>50.96</td>
<td>(11.72)</td>
<td>p=.92</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>47.37</td>
<td>(10.10)</td>
<td>51.86</td>
<td>(10.90)</td>
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<td>EXT</td>
<td>47.82</td>
<td>(9.58 )</td>
<td>48.35</td>
<td>(9.83)</td>
<td>47.48</td>
<td>(9.42)</td>
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<td>48.03</td>
<td>(8.78)</td>
<td>46.10</td>
<td>(8.62)</td>
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Notes. BIS_total=BIS/BAS-scales total Behavioral Inhibition System Score, BAS_total=BIS/BAS-scales total Behavioral Activation System Score, BAS_RR= BIS/BAS-scales Reward Responsiveness subscale, BAS_DRIVE=BIS/BAS-scales Drive subscale, SP=SPSRQ total Sensitivity to Punishment score, SR=SPSRQ total Sensitivity to Reward score, S/E=Child Behavior Questionnaire Surgency/Extraversion , NA=Child Behavior Questionnaire Negative Affectivity, App=Child Behavior Questionnaire Approach/ Positive Anticipation, IC=Child Behavior Questionnaire Inhibitory Control, INT=CBCL Internalizing Problems T-score, EXT=CBCL Externalizing Problems T-score, na=not applicable
Table 2
Correlations between BIS/BAS-scales scores and other measurements

<table>
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<tr>
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<th>BIS_total</th>
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<th>BAS_RR</th>
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<td>BAS_RR</td>
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<td>.81***</td>
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<td>BAS_D</td>
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<td>.18***</td>
<td>.52***</td>
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<tr>
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<th>BIS_total&lt;sup&gt;a&lt;/sup&gt;</th>
<th>BAS_total&lt;sup&gt;b&lt;/sup&gt;</th>
<th>BAS_RR&lt;sup&gt;b&lt;/sup&gt;</th>
<th>BAS_D&lt;sup&gt;b&lt;/sup&gt;</th>
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<td>SPSRQ (n=93)</td>
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<td>SP_M</td>
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<td>-.21*</td>
<td>-.33**</td>
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<td>SR_M</td>
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<td>.43***</td>
<td>.59***</td>
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<td>HIPIC (n=154)</td>
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<td>-.16*</td>
<td>-.25***</td>
<td>-.02</td>
</tr>
<tr>
<td>E</td>
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<td>.28**</td>
<td>.33***</td>
<td>.10</td>
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<tr>
<td>CBQ (n=94)</td>
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<tr>
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<td>.10</td>
<td>-.07</td>
<td>.21*</td>
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<tr>
<td>S/E</td>
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<td>.58***</td>
<td>.39***</td>
<td>.58***</td>
</tr>
<tr>
<td>App</td>
<td>.03</td>
<td>.61***</td>
<td>.53***</td>
<td>53***</td>
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<tr>
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<td>-.35**</td>
<td>-.11</td>
<td>-.35***</td>
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<tr>
<td>INT</td>
<td>.50***</td>
<td>-.02</td>
<td>-.07</td>
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### Punishment and Reward Sensitivity in Children and Adolescents: A Parent-Report Version of the BIS/BAS-Scales

<table>
<thead>
<tr>
<th></th>
<th>EXT</th>
<th>.15**</th>
<th>.32***</th>
<th>.13**</th>
<th>.30***</th>
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**Notes.** * = correlations corrected for BAS_total, ** = correlations corrected for BIS_total, *** = p < .001, p < .01, p < .05. BIS_total = BIS/BAS-scales total Behavioral Inhibition System Score, BAS_total = BIS/BAS-scales total Behavioral Activation System Score, BAS_RR = BIS/BAS-scales Reward Responsiveness subscale, BAS_DRIVE = BIS/BAS-scales Drive subscale, SP = SPSRQ total Sensitivity to Punishment score, SR = SPSRQ total Sensitivity to Reward score, INT = CBCL Internalizing Problems T-score, EXT = CBCL Externalizing Problems T-scores
REFERENCES


PUNISHMENT AND REWARD SENSITIVITY IN CHILDREN AND ADOLESCENTS: A PARENT-REPORT VERSION OF THE BIS/BAS-SCALES


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A detailed discussion of oRTS vs. rRST is beyond the scope of this article, but can be found elsewhere (e.g., Corr, 2008)

The revisions made to RST are described to have minimal impact on how RST-concepts should be measured (e.g., Smillie, Jackson, & Daglgeish, 2006, for a different view see Dissabandara, Loxton, Dias, Daglish, & Stadlin, 2012). Most instruments used to measure RST-concepts are based on the oRTS. Only recently, implications of rRST for assessment are considered (Harnett, et al., 2013; Colder et al., 2011). To the best of our knowledge, there exist no rRST measures for use with children and adolescents. We therefore focus on the original conceptualizations of RST.