



A French adaptation of a short version of the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ)

Claudia Lardi^{a,*}, Joël Billieux^a, Mathieu d'Acromont^b, Martial Van der Linden^{a,b,c}

^a Cognitive Psychopathology and Neuropsychology Unit, University of Geneva, Geneva, Switzerland

^b Swiss Centre for Affective Sciences, University of Geneva, Geneva, Switzerland

^c Cognitive Psychopathology Unit, University of Liège, Liège, Belgium

ARTICLE INFO

Article history:

Received 17 October 2007

Received in revised form 11 July 2008

Accepted 23 July 2008

Available online 2 September 2008

Keywords:

Sensitivity to punishment

Sensitivity to reward

Behavioural inhibition system

Behavioural activation system

Confirmatory factor analysis

ABSTRACT

According to Gray's Reinforcement Sensitivity Theory (RST; Gray, 1982), personality results from the interaction of three major systems: a Behavioural Activation System (BAS), a Behavioural Inhibition System (BIS) and a Fight/Flight System (FFS). Based on this model, Torrubia, Avila, Molto, and Caseras (2001) developed an instrument, the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ), which assesses the two major systems that explain individual differences in sensitivity and reactions to punishing and rewarding stimuli. In the present study, we have proposed a short version of the SPSRQ, based on O'Connor, Colder, and Hawk's (2004) findings. To this end, 360 participants were screened using the French translation of a short version of the SPSRQ. Confirmatory factor analysis showed that a two-factor model has acceptable fit. Moreover, the results indicated that there was very good internal reliability for both the sensitivity to reward and sensitivity to punishment scales.

© 2008 Elsevier Ltd. All rights reserved.

1. Introduction

According to Gray's Reinforcement Sensitivity Theory (RST; Gray, 1982), personality results from the interaction of three systems, each associated with an independent neurobiological system. These three motivational systems guide behaviours, thereby explaining individual differences in sensitivity and reactions to punishing and rewarding stimuli. The first of these systems is the Behavioural Inhibition System (BIS), which operates as a comparator that is sensitive to conditioned stimuli for punishment, novel stimuli, signals of frustrative non-reward and innate fear stimuli. Once activated, the BIS promotes the inhibition of behaviours and increases attention and arousal. According to Gray, individual differences in BIS activity are related to individual differences in anxiety traits. The second system described by Gray is the Behavioural Activation System (BAS). This system is sensitive to conditioned stimuli for reward or non-punishment, enhances cortical arousal and promotes approach and active avoidance behaviours. Moreover, Gray proposes that individual differences in BAS activity are related to individual differences in impulsivity. The third system described by Gray, the Fight/Flight System (FFS), mediates behavioural responses, notably escape and defensive aggression, to conditioned and unconditioned aversive stimuli, such as punish-

ment and non-reward stimuli (see also Gray & McNaughton, 2000). This last system has been less explored than the others and remains poorly defined.

There have been several attempts to develop self-report questionnaires that would assess Gray's BIS and BAS. The most widely used of these instruments are the BIS/BAS scales (Carver & White, 1994), the Gray–Wilson Personality Questionnaire (GWPQ; Wilson, Barrett, & Gray, 1989) and the Generalized Reward and Punishment Expectancy Scales (GRAPES; Ball & Zuckerman, 1990). Nevertheless, to the best of our knowledge, no Confirmatory Factor Analysis (CFA) supports the factor structure of any of these three instruments (for the BIS/BAS scales, see Cogswell, Alloy, van Dulmen, & Fresco, 2006; for the GRAPES, see Gomez & Gomez, 2005; for the GWPQ, see Wilson, Gray, & Barrett, 1990). In view of the lack of a satisfactory instrument to measure Gray's two major systems, Torrubia, Avila, Molto, and Grande (1995) created a new scale, the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ). This scale describes many situations in which there is a given probability of activating the BIS or the BAS (but never both). The final Spanish version of the SPSRQ (Torrubia, Avila, Molto, & Caseras, 2001; Torrubia et al., 1995) contains 48 yes/no response items, subdivided into two independent measures of 24 items each: a Sensitivity to Punishment (SP) scale and a Sensitivity to Reward (SR) scale. Items on the SP scale were designed to measure individual differences in the functioning of the BIS, whereas items on the SR scale are postulated to measure the functioning of the BAS. Principal component analyses showed an

* Corresponding author. Tel.: +41 22 379 93 58; fax: +41 22 379 93 59.
E-mail address: Claudia.Lardi@unige.ch (C. Lardi).

acceptable fit for a two-factor solution and the independence of the two scales has been demonstrated (highest correlation of 0.08; [Torrubia et al., 2001](#)). Reliability explorations showed good results, with Cronbach's α ranging from 0.75 to 0.84 and strong test-retest correlations (0.89 for the SP scale and 0.87 for the SR scale after 3 months, 0.74 for the SP scale and 0.69 for the SR scale after 1 year). In addition, several experiments have provided data on the validity of this questionnaire (for more details, see [Caseras, Avila, & Torrubia, 2003](#); [Smillie & Jackson, 2005](#); [Torrubia et al., 2001](#)).

Although this questionnaire has been translated into several languages, no study has yet confirmed the two-factor structure proposed by [Torrubia et al. \(2001\)](#). For example, [O'Connor, Colder, and Hawk \(2004\)](#) computed a CFA on 603 students' data with the English version of the SPSRQ and showed that the two-factor model did not fit the data very well. The authors of the study then removed some problematic items with weak factor loadings, creating a short questionnaire containing 35 of the original 48-items. New CFA were applied to the data for this initial sample and for two independent samples. This shorter instrument fit the data better and allowed a perceptible improvement in the factor structure. Similar findings were obtained by [Cogswell et al. \(2006\)](#) in a more recent study undertaken with the English version of the original long questionnaire and with a new short version (without nine items the authors considered to be problematic). The SPSRQ was also translated into Romanian by [Sava and Sperneac \(2006\)](#), who proposed another modified version, excluding eight items with poor factor loading or with gender differences in factor loading, according to the data of [Torrubia et al. \(2001\)](#). Data collected from 345 Romanian undergraduate students did not support the two-factor model; in fact, a three-factor model fit the data better. The proposed model includes an SP scale, an SR scale and a sensitivity to financial reward scale.

Finally, the psychometric properties of a French version of the SPSRQ were investigated in a recent study by [Caci, Deschaux, and Bayle \(2007\)](#). CFA were conducted on data collected from 136 undergraduate students. Once again, the two-factor model did not fit the data for the original 48-item version or for the short version proposed by [O'Connor et al. \(2004\)](#). Moreover, a significant correlation between the two scales was found. After conducting some exploratory analyses, the authors proposed a four-factor model with factors named fear of being rejected, fear of the unknown, competition and arousal. The results of this study suggest that there is a problem with the internal validity of the questionnaire. However, these puzzling results might tentatively be attributed to the translation of the scale. Indeed, in [Caci et al.'s \(2007\)](#) French version, the items were reworded to allow answers on a different sort of scale. Thus, participants read statements worded in the first person singular (e.g., item 17: 'I am shy') and have to evaluate whether these items fit their personality on a 4-point Likert scale, with 1 = *totally true* and 4 = *totally wrong*. However, in the original version, the items are worded as questions (e.g., item 17: 'Are you a shy person?'), and participants have to evaluate their agreement with the items on a *yes/no* answer format scale. This adaptation may well have modified the meaning and interpretation of some sentences. In addition, several of the French translations are not perfectly accurate compared to the English versions. These differences consist of omissions of part of a sentence (e.g., item 2: 'Does the good prospect of obtaining money motivate you strongly to do some things?' is translated as 'I am strongly motivated by the good prospect of obtaining money.') or the use of an inappropriate translated word (e.g., item 22: 'As a child, did you do a lot of things to get people's approval?' is translated as 'As a child, I did a lot of things to get adults' approval.')

Consequently, the aim of the present study was to develop and validate a new French version of the SPSRQ. Considering the findings of previous studies demonstrating inadequate psychometric

properties for the 48-item version, a short version based on [O'Connor et al.'s \(2004\)](#) results is proposed.

2. Method

2.1. Participants

The sample was composed of 360 volunteer participants from the community (217 women, 132 men and 11 participants who did not specify their gender) aged from 17 to 30 years old ($M = 22.13$; $SD = 3.19$). In light of the nature of this study, only native French speakers were selected. The anonymity of the participants was guaranteed.

2.2. Instrument

The items of the SPSRQ were translated into French from the English translation of the SPSRQ provided by [Torrubia et al. \(1995\)](#). The French items were then translated back into English by a French–English translator. Problematic translations were discussed and agreement was reached. Prior to the present study, we collected data on the 48 original items of the SPSRQ from 113 undergraduates. However, CFA carried out on this sample showed that a two-factor model based on the original French 48-item SPSRQ did not fit the data, $\chi^2(1079) = 1947.539$, $p < .001$, $RMSEA = 0.084$, $SRMR = 0.106$, $CFI = 0.466$. Consequently, we decided to create a short version of the questionnaire, similar to that developed by [O'Connor et al. \(2004\)](#), by removing 13 items from the original version. The ratings in this new short version are done on a 4-point Likert scale, ranging from 1 (*totally no*) to 4 (*totally yes*). This answer format is consistent with the [Caci et al. \(2007\)](#) version and is used in order to reduce the bias of Pearson correlation coefficients ([Bollen & Barb, 1981](#); [Martin, 1978](#)).

2.3. Statistical analysis

Confirmatory factor analyses were computed with Mplus ([Muthén & Muthén, 2006](#)). For these analyses, the Full-Information Maximum Likelihood (FIML) estimator was used for missing data. Goodness of fit was tested with the χ^2 (a non-significant value corresponds to an acceptable fit). However, the power of the χ^2 is known to increase with sample size, and it has been emphasized ([Byrne, 1994](#)) that it is unusual to obtain a non-significant χ^2 when performing CFA on self-report questionnaires. Therefore, two other indices that depend on conventional cut-offs ([Hu & Bentler, 1999](#)) were also computed: the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). An RMSEA of between 0 and 0.05 indicates a good fit and between 0.05 and 0.08 an acceptable fit. An SRMR of between 0 and 0.05 indicates a good fit and between 0.05 and 0.10 an acceptable fit ([Schermelleh-Engel & Moosbrugger, 2003](#)). Many authors have used the Comparative Fit Index (CFI) in CFA and we also report this index. A CFI $>.90$ is generally interpreted as an acceptable fit. It should be noted that fit indices are only one of several sources of information to evaluate the quality of a model. In addition, there is no universal and definitive cut-off (e.g., [Chen, Curran, Bollen, Kirby, & Paxton, 2008](#)), so we used fit indices as useful indicators, but not for rejecting or accepting a model.

In addition to these overall fit indices, comparative fit indices were also used to compare nested models. To this end, a software application (FITMOD) that provides point interval estimates for RMSEA differences ([Browne, 1992](#)) was used. Finally, Pearson's point-biserial correlation (r_{pb}) was used to evaluate the effect of gender on sensitivity to reward and punishment. Women were set at -1 and men at 1 . Thus, a positive correlation corresponds

to a higher score for men whereas a negative correlation corresponds to a higher score for women. According to Cohen (1988), a correlation of between .10 and .30 indicates a small effect, between .30 and .50 a medium effect, and above .50 a large effect. Correlations are given within the 95% Confidence Interval (CI).

3. Results

Of the 360 participants, 32 had one or more items with missing values. A CFA was done on the 35-items of the SPSRQ. In line with O'Connor et al.'s (2004) revised SPSRQ, a two-factor model was specified in which the 18 sensitivity to punishment items were hypothesized to be indicators of one factor and the 17 sensitivity to reward items were hypothesized to be indicators of another factor. The χ^2 statistic for the model was significant, $\chi^2(559) = 1593.195$, $p < .001$. For the other fit indices, we obtained an RMSEA = 0.072, an SRMR = 0.089, and a CFI = 0.681 (see model 1, Table 1). The maximum modification indices in the $\theta-\Delta$ matrix (covariance between errors on observed variables) were found between items 21 and 32 and between items 18 and 26. We let the two pairs of errors covariate because these two pairs of items were semantically very similar. Items 21 and 32 both refer to 'competition' (item 21: 'Do you like to compete and do everything you can to win?', item 32: 'Do you like to put competitive ingredients in all of your activities?'), whereas items 18 and 26 both refer to the tendency to desire immediate gains (item 18: 'Do you generally give preference to those activities that imply an immediate gain?', item 26: 'Do you sometimes do things for quick gains?'). The χ^2 of the modified model was significant, $\chi^2(557) = 1380.317$, $p < .001$, RMSEA = 0.064, SRMR = 0.086, and the CFI = 0.746 (see model 2, Table 1). Comparisons between the RMSEA for model 1 and model 2 indicated that model 2 is better. The CFI is low in the two models we tested. However, it has been pointed out that the CFI is very sensitive to small misspecifications of factor structure, which are very common in the domain of personality research (Beauducel & Wittmann, 2005).

Table 2 shows the main descriptive statistics on the sensitivity to punishment and sensitivity to reward scales. The reliability of each latent factor was calculated with the formula reported by Raines-Eudy (2000). Reliability was equal to .87 for sensitivity to punishment, and .81 for sensitivity to reward. These values are comparable to Cronbach's α and indicated that the two latent factors of the SPSRQ have excellent internal reliability (sensitivity to punishment and sensitivity to reward). Interestingly, it appears that sensitivity to punishment and sensitivity to reward are not related, $r = .02$, $CI = (-.09, .12)$.

A CFA to compare males and females was not performed because of the relatively small number of males in the sample. How-

ever, gender differences could be considered by computing Pearson's point-biserial correlation (r_{pb}). It appears that women are more sensitive to punishment, $r_{pb} = -.18$, $CI = (-.28, -.07)$, whereas men are more sensitive to reward, $r_{pb} = .24$, $CI = (.13, .33)$. Finally, it appears that sensitivity to reward is negatively correlated with age, $r_{pb} = -.16$, $CI = (-.26, -.06)$, whereas no relationship was found between sensitivity to punishment and age, $r_{pb} = .01$, $CI = (-.10, .11)$.

4. Discussion

The aim of this study was to propose a new short French version of the Sensitivity to Punishment and Sensitivity to Reward Questionnaire developed by (Torrubia et al., 2001; Torrubia et al., 1995) and to present a preliminary examination of its psychometric properties. This short version based on O'Connor et al.'s (2004) version contains 35 of the original 48-items. Confirmatory factor analysis showed that a two-factor model has an acceptable fit. Moreover, the results indicated that both scales had very good internal reliability. Finally, the sensitivity to punishment and sensitivity to reward scales were found to be independent (correlation near 0). On the whole, the results are similar to O'Connor et al.'s findings obtained with the 35-item scale, endorsing the importance of using the short version of the SPSRQ proposed by these authors. In fact, previous studies using the SPSRQ translated into other languages do not confirm a two-factor structure for the original 48-item questionnaire (e.g., Caci et al., 2007; Cogswell et al., 2006; O'Connor et al., 2004), nor for other short versions (e.g., Sava & Sperneac, 2006). Caci et al. (2007) had already provided a French version of the SPSRQ. However, the CFA performed on data collected with the long version and the short version proposed by O'Connor et al. (2004) provided unsatisfactory results. After having observed several problems with the French translation realized by Caci et al. (2007), we attempted to improve the French translation of the questionnaire. In the light of the results obtained with this new French version, it is possible to argue that the unsatisfactory findings obtained by Caci et al. can probably be attributed, at least in part, to their translation of the scale.

It should be noted that a limitation of this study is that the sample was not balanced in terms of gender. Therefore, a CFA to compare males and females was not performed due to the small number of males (37% of the sample). However, correlation analyses between gender and the two scales indicated that women are significantly more sensitive to punishment than men. According to Gray's (1982) hypothesis that BIS activity is related to anxiety traits, this result is consistent with several studies that have proved that women are more likely to develop anxiety disorders (e.g., Van Diest et al., 2005) and depression (e.g., Nolen-Hoeksema, 2001). Another finding of the correlation analyses is that men present higher scores than females on the sensitivity to reward scale. Previous studies also showed that men are more sensitive to reward than women and these data have been confirmed in different cultures, including Spanish (Castella & Perez, 2004; Torrubia et al., 2001), Canadian (Davis, Patte, Tweed, & Curtis, 2007) and Taiwanese (Li, Huang, Lin, & Sun, 2007) samples.

Another limitation of this study is the mean age of the population. The data were collected from young adults aged from 17 to 30 years old. Thus, it is not possible to generalize these findings to older people. Genetic analyses on twins have shown that individual differences in BIS and BAS activation are moderately genetically influenced and their continuity in early and middle adulthood is due to genetic influences (Takahashi et al., 2007). Nevertheless, correlation analyses between the two scales and age indicated a decline in sensitivity to reward with age. In line with these findings and with studies on age-related motivation differences (e.g., Baltes

Table 1
Fit indices of the CFA

Model	χ^2	df	RMSEA	SRMR	CFI
Model 1	1593.195 [*]	559	0.072	0.089	0.681
Model 2	1380.317 [*]	557	0.064	0.086	0.746

Note: Model 2 had the best fit and was retained.

^{*} $p < .001$.

Table 2
Number of items, reliability, means and standard deviations (SD) of the two SPSRQ scales and scale-score correlation with confidence interval

	No. items	Reliability	Mean	SD	r (CI)
SP	18	.87	40.75	8.92	.02 (-.09, .12)
SR	17	.81	38.46	7.72	

& Baltes, 1990; Freund, 2006), it seems that in late adulthood there is a shift from a focus on striving for gains (optimization), which is typical of young adulthood, to a focus on impeding or counteracting losses (compensation). Consequently, the two-factor solution highlighted in the present study with the short scale should be confirmed with an elderly sample in future studies.

In light of the failed attempts to validate the long version of SPSRQ¹, this study proposes a short version in French of this BIS and BAS measure that presents adequate psychometric properties. Nevertheless, further studies should examine the convergent and divergent validity of this revised scale. Moreover, future research should use a gender-balanced sample and different age ranges to confirm the gender and age differences observed in the present study.

References

- Ball, S. A., & Zuckerman, M. (1990). Sensation seeking, Eysenck's personality dimensions and reinforcement sensitivity in concept formation. *Personality and Individual Differences*, 11, 343–353.
- Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1–34). Cambridge: Cambridge University Press.
- Beauducel, A., & Wittmann, W. (2005). Simulation study on fit indices in a confirmatory factor analysis based on data with slightly distorted simple structure. *Structural Equation Modeling*, 12, 41–75.
- Bollen, K. A., & Barb, K. (1981). Pearson's r and coarsely categorized measures. *American Sociological Review*, 46, 232–239.
- Browne, M.W. (1992). FITMOD: Point and interval estimates of measures of fit of a model [computer software].
- Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/windows*. Thousand Oaks, CA: Sage.
- Caci, H., Deschaux, O., & Bayle, F. J. (2007). Psychometric properties of the French versions of the BIS/BAS scales and the SPSRQ. *Personality and Individual Differences*, 42, 987–998.
- 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, 319–333.
- Caseras, X., Avila, C., & Torrubia, R. (2003). The measurement of individual differences in behavioural inhibition and behavioural activation systems: A comparison of personality scales. *Personality and Individual Differences*, 34, 999–1013.
- Castella, J., & Perez, J. (2004). Sensitivity to punishment and sensitivity to reward and traffic violations. *Accident Analysis and Prevention*, 36, 947–952.
- Chen, F., Curran, P. J., Bollen, K. A., Kirby, J., & Paxton, P. (2008). An empirical evaluation of the use of fixed cutoff points in RMSEA test statistic in structural equation models. *Sociological Methods and Research*, 36, 462–494.
- Cogswell, A., Alloy, L. B., van Dulmen, M. H. M., & Fresco, D. M. (2006). A psychometric evaluation of behavioral inhibition and approach self-report measures. *Personality and Individual Differences*, 40, 1649–1658.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Davis, C., Patte, K., Tweed, S., & Curtis, C. (2007). Personality traits associated with decision-making deficits. *Personality and Individual Differences*, 42, 279–290.
- Freund, A. M. (2006). Age-differential motivational consequences of optimization versus compensation focus in younger and older adults. *Psychology and Aging*, 21, 240–252.
- Gomez, R., & Gomez, A. (2005). Convergent, discriminant and concurrent validities of measures of the behavioural approach and behavioural inhibition systems: Confirmatory factor analytic approach. *Personality and Individual Differences*, 38, 87–102.
- Gray, J. A. (1982). *The neuropsychology of anxiety. An enquiry into the functions of the septo-hippocampal system*. New York: Oxford University Press.
- Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system* (2nd ed.). New York: Oxford University Press.
- Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1–55.
- Li, C.-S. R., Huang, C.-Y., Lin, W.-Y., & Sun, C.-W. V. (2007). Gender differences in punishment and reward sensitivity in a sample of Taiwanese college students. *Personality and Individual Differences*, 43, 475–483.
- Martin, W. (1978). Effects of scaling on the correlation coefficient: Additional considerations. *Journal of Marketing Research*, 15, 304–308.
- Muthén, L. K., & Muthén, B. O. (2006). *Mplus user's guide* (4th ed.). Los Angeles: Muthén & Muthén.
- Nolen-Hoeksema, S. (2001). Gender differences in depression. *Current Directions in Psychological Science*, 10, 173–176.
- O'Connor, R. M., Colder, C. R., & Hawk, J. L. W. (2004). Confirmatory factor analysis of the Sensitivity to Punishment and Sensitivity to Reward Questionnaire. *Personality and Individual Differences*, 37, 985–1002.
- Raines-Eudy, R. (2000). Using structural equation modeling to test for differential reliability and validity: An empirical demonstration. *Structural Equation Modeling*, 7, 124–141.
- Sava, F. A., & Sperneac, A.-M. (2006). Sensitivity to reward and sensitivity to punishment rating scales: A validation study on the Romanian population. *Personality and Individual Differences*, 41, 1445–1456.
- Schermelleh-Engel, K., & Moosbrugger, H. (2003). Evaluating the fit of structural equation models: Test of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, 8, 23–74.
- Smillie, L. D., & Jackson, C. J. (2005). The appetitive motivation scale and other BAS measures in the prediction of Approach and Active Avoidance. *Personality and Individual Differences*, 38, 981–994.
- Takahashi, Y., Yamagata, S., Kijima, N., Shigemasa, K., Ono, Y., & Ando, J. (2007). Continuity and change in behavioral inhibition and activation systems: A longitudinal behavioral genetic study. *Personality and Individual Differences*, 43, 1616–1625.
- Torrubia, R., Avila, C., Molto, J., & Caseras, X. (2001). The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) as a measure of Gray's anxiety and impulsivity dimensions. *Personality and Individual Differences*, 31, 837–862.
- Torrubia, R., Avila, C., Molto, J., & Grande, I. (1995). Testing for stress and happiness: The role of the behavioral inhibition system. In C. D. Spielberger, I. G. Sarason, J. Brebner, E. Greenglass, P. Laungani, & A. M. O'Roark (Eds.), *Stress and emotion: Anxiety, anger, and curiosity* (Vol. 15, pp. 189–211). Washington, DC: Taylor and Francis.
- Van Diest, I., De Peuter, S., Eertmans, A., Bogaerts, K., Victoir, A., & Van den Bergh, O. (2005). Negative affectivity and enhanced symptom reports: Differentiating between symptoms in men and women. *Social Science and Medicine*, 61, 1835–1845.
- Wilson, G. D., Barrett, P. T., & Gray, J. A. (1989). Human reactions to reward and punishment: A questionnaire examination of Gray's Personality Theory. *British Journal of Psychology*, 80, 509–515.
- Wilson, G. D., Gray, J. A., & Barrett, P. T. (1990). A factor analysis of the Gray–Wilson Personality Questionnaire. *Personality and Individual Differences*, 11, 1037–1044.

¹ Readers can contact the corresponding author to obtain the French short version of the SPSRQ.