

**Validation of the Portuguese version of the Structure of Temperament
Questionnaire (STQ-77Pt) based on a Brazilian sample**

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Abstract

This paper reports the validation of the Portuguese version of the Structure of Temperament Questionnaire (STQ-77Pt) using a Brazilian sample of 248 participants (M/F = 126/122). The study examined STQ-77Pt's factorial structure and its psychometric properties in terms of reliability, and construct and concurrent validity. Maximum-likelihood confirmatory factor analysis showed that STQ-77Pt has a factor structure similar to that found in the English, Russian, Chinese and Polish versions. The study also compared the STQ-77Pt scales with two other tests available in the Portuguese language (the NEO-Five Factor Inventory, NEO-FFI; and the Sensation Seeking Scale Form V, SSS-V). The STQ-77Pt Social Endurance and Social Tempo scales showed high correlations with the NEO-FFI scale of Extraversion; there were also high positive correlations between the scales of Neuroticism of the STQ-77Pt and that of the NEO-FFI, as well as between Sensation Seeking as measured by the STQ-77Pt and the SSS-V. The STQ-77Pt Empathy scale was found to have a positive relationship with the NEO-FFI scale of Agreeableness, and a negative relationship with the SSS-V scale of Disinhibition. These results suggest high reliability and concurrent validity of the STQ-77 measure for Portuguese-speaking researchers and practitioners.

Keywords: temperament, concurrent validity, Structure of Temperament Questionnaire, Five Factor Inventory, Sensation Seeking scales, Functional Ensemble of Temperament.

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The concept of temperament refers to neurochemically-based individual differences in behavioral regulation, which are present both in pre-cultural individuals (animals, infants) and adult humans (Trofimova, Robbins, Sulis, & Uher, 2018). As a tool for psychological assessment, the temperament approach contrasts to that of personality. Personality describes individual differences primarily from the socio-cultural perspective and temperament relates to universal dynamical features of behavior that are most consistent and most predictable across a variety of situations. Thus, temperament traits are considerably stable as compared to other individual attributes such as personality (Strelau, 1987). Moreover, the instruments derived from the temperament approach are less amenable to biases provided by the social use of language and subjective social desirability, and are more prone to be associated with the more objective neurophysiological and behavioral measures (see Trofimova et al., 2018; Robbins, 2018).

Since temperament pertains to the most consistent and biologically (neurochemically)-based aspects of behavior, it could be a basis of what are considered the “soft skills”, or the interpersonal qualities, social skills, and personal attributes that are highly in-demand in today’s workplace, such as communication, responsibility, positive attitude, professionalism, flexibility, teamwork, and work ethic (Robles, 2012). A most comprehensive neurophysiologically-based model of temperament was offered in the form of the Structure of Temperament Questionnaire (STQ) over 30 years ago by Vladimir Rusalov (Rusalov, 1989, 1997, 2004, Rusalov & Trofimova, 2007). This model was then upgraded and rearranged by Irina Trofimova based on her analysis of the functionality of neurotransmitter systems and opioid receptor systems, known as neurochemical model Functional Ensemble of Temperament (FET; Trofimova, 2016, 2018, 2020; Trofimova & Robbins, 2016). The upgraded STQ is more compact and has 77 items, which is highlighted in its name: Compact STQ-77. The STQ-77 is structured in line with the FET, which has 12 components. These components are

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divided into three functional groups, based on Luria's (1962) model of three neuroanatomic functional "blocks" regulating human behavior (Rusalov & Trofimova, 2007; Trofimova, 2010b, 2010c, 2016, 2018, Trofimova & Sulis, 2010, 2011).

A critical difference between the STQ and other models of temperament is that the STQ inherits the activity-specific approach to the structure of temperament proposed by Rusalov (1989; 1997; 2018). Thus, instead of the following a "general arousal" approach, that considers only one general energetic trait (such as Extraversion or Activity), in the STQ-77/FET model, the temperament traits pertain to different aspects of activity, such as the motor-physical, social-verbal and mental aspects, which are based on different neurophysiological systems and should be assessed separately (see also Trofimova & Robbins, 2016). Furthermore, it uses the benefits of the FET model, which validates the STQ-77 with the links to specific neurochemical biomarkers.

The final STQ-77/FET model considers twelve different temperament traits: nine systems (and traits) regulating the formal functional aspects of behavior (energetic, dynamic and orientational, each assessed in three domains (intellectual, physical and social-verbal), together with three systems related to emotionality (neuroticism, impulsivity and dispositional satisfaction) (see Figure 1).

[Figure 1]

Evidence for construct, concurrent and discriminatory validity of the English, Russian, Chinese, and Polish versions of the STQ-77 was demonstrated through significant correlations with internationally known scales, such as the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1984) (Rusalov, 1989), the Beck Anxiety Inventory (BAI; Beck & Steer, 1991) (Trofimova & Sulis, 2016); the Five Factor Inventory of personality (NEO-FFI; Costa & McCrae, 1989) (Trofimova, 2010a); the Pavlovian Temperamental Survey (PTS; Strelau, Angleitner, & Newberry, 1999) (Trofimova, 2010a); the I7 Impulsiveness Questionnaire (Eysenck, Eysenck, & Barrett, 1985) (I-7) (Trofimova & Sulis, 2011); Zuckerman's Sensation Seeking Scale (SSS-V; Zuckerman, 1994) (Trofimova, 2010); the Hamilton Depression Inventory (HDI; Kobak & Reynolds, 1999) (Trofimova

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& Sulis, 2016); estimated high school grades, speed of reading and writing (Trofimova & Sulis, 2011) and time of performance on the verbal classification tasks (Trofimova, 2014, Rusalov & Trofimova, 2007). The STQ-77 has been utilized in variety of contexts, such as (i) organizational settings (selection of candidates for job or allocation of the staff; stress conditions at work, uncertainty conditions at work, and management style), (ii) educational and (iii) clinical settings (Rusalov & Trofimova, 2007).

In the present study, we verified the translation of the STQ-77 to the Portuguese language and conducted a series of psychometric investigations regarding the properties of the newly developed Portuguese STQ-77 (STQ-77Pt). First, we examined whether the STQ-77Pt demonstrates sufficient internal consistency, testing the following hypothesis:

H1: The internal consistency of the STQ-77Pt scales will be sufficient.

Next, we examined STQ-77Pt's factorial structure and its psychometric properties in terms of reliability and contribution of items to the scales. For this, we tested the following hypothesis:

H2: The factor structure of the STQ-77Pt will follow the activity-specific structure reported in other language versions of the STQ-77, separating between the scales of physical, social, mental and emotional aspects of behavior.

Then, with the goal to assess the concurrent validity of the STQ-77Pt, we compared it with two other internationally well-known scales that measure stable biobehavioral individual differences and that are available in the Portuguese language: the NEO-Five Factor Inventory (NEO-FFI; Costa & McCrae, 1989) and the Sensation Seeking Scale Form V (SSS-V; Zuckerman, 1994). Based on the theory and previous research using the English, Russian, Chinese, and Polish versions of the STQ-77, we developed three hypotheses regarding the relationship between four STQ-77Pt dimensions and their analogues in other scales:

H3: The STQ-77Pt scale of Sensation Seeking will have a significant positive correlation with the analogue scale of the SSS-V.

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H4: The STQ-77Pt scales of Social Endurance and Social Tempo will have significant positive correlations with the NEO-FFI scale of Extraversion.

H5: The STQ-77Pt scale of Neuroticism will have a significant positive correlation with the NEO-FFI scale of Neuroticism.

Besides examining closely analogue scales, we also tested hypotheses regarding less conspicuous relationships among the STQ-77 and other scales. First, a positive relationship is theorized between STQ-77's Empathy scale and NEO-FFI's Agreeableness scale. Empathy refers to the sensitivity of an individual to another person's state and expectations. Individuals high in empathy are described as very attentive to the sense of justice, equality and appreciation, tending to participate in altruistic and volunteer activities, even having problems keeping subordination boundaries in issues of community values and in the helping of others. Likewise, individuals high in Agreeableness are described to also be altruistic, putting the interest of others before their own needs and interests, they also tend to have a high opinion of human nature and dislike being the center of attention, and to (Costa & McCrae, 1989). Given these similarities, we hypothesize that:

H6: The STQ-77Pt scale of Empathy will have a significant positive correlation with the NEO-FFI scale of Agreeableness.

Second, we theorize that there will be a negative relationship between STQ-77's Empathy and the Disinhibition scale of the SSS-V. Disinhibition items refer to "seeking sensation through other people, a hedonistic lifestyle, 'wild' parties, sexual variety, and drinking to disinhibit" (Zuckerman, 2007, p. 13). Individuals high in Disinhibition tend to participate more in drug use, alcohol use, vandalism, and/or unsafe sex. This is a sharp contrast with the previous description of the behavior of those high in Empathy, who tend to be pro-social, caring, and even have difficulties in establishing their boundaries (Rusalov & Trofimova, 2007). Given this contrast, we hypothesize that:

H7: The STQ-77Pt scale of Empathy will have a significant negative correlation with the SSS-V scale of Disinhibition.

Method

Sample

The STQ-77 was administered to 248 subjects (M/F = 126/122, *Mean* age in years = 29.48, *SD* = 9.06), including 132 undergraduate students enrolled at the entrepreneurship program in Universidade Federal Fluminense, Brazil, who received course credit in a general management course. We also recruited 116 senior-level professionals who volunteered for this study. All participants signed a consent form to participate in this study.

Measures

Compact Structure of Temperament Questionnaire (STQ-77) (Rusalov & Trofimova, 2007). The STQ-77 has 77 statements, assigned to 12 temperamental scales (6 items each) and the validity scale (5 items) listed below. Subjects respond according to a Likert scale format: "strongly disagree (1)," "disagree (2)," "agree (3)," "strongly agree (4)". The STQ-77 organizes the 12 temperament scales into four sub-groups:

1. The Physical Aspects group: Physical Endurance, (ERM), Physical Tempo (TMM) and Sensation Seeking (SS).
2. The Social Aspects group: Social Endurance (ERS), Social Tempo (TMS) and Empathy (EMP) (orientation of actions in response to another person's emotional state).
3. Mental (Probabilistic) Aspects group: Mental (Intellectual) Endurance (ERI), Plasticity (PL) (the ability to adapt quickly to changes in situations, to change the program of action, and to shift between different tasks) and Probabilistic Processing scale (PRO) (the ability of an individual for adequate understanding and expectations of probabilities and causal relationships between events, the efficient extraction and processing of new knowledge).
4. The Emotionality group involves three scales referring to a tendency to be optimistic, confident (sometimes overly optimistic) regarding one's own performance, and unaffected by other people's warnings and criticism (dispositional Satisfaction, SF); the emotional reactivity, a poor ability to

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control immediate impulses for actions (Impulsivity, IMP), and a tendency for expectations of negative outcomes and low tolerance of uncertainty (Neuroticism, NEU). Finally, the Validity scale assesses the social desirability bias in the answers, with results within the range of 15-20 on this scale being considered invalid as this indicates a positive impression bias in the responses.

NEO-Five Factor Inventory (NEO-FFI). The NEO-FFI is a shortened version of the NEO-PI-R with 60 items (Costa & McCrae, 1989). The NEO-FFI is derived from the North American lexical approach and it organizes personality in terms of five broad factors: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. For this study, we utilized the Portuguese version by Magalhães et al. (2014). The reliability coefficients reported ranged between .75 and .82.

Sensation Seeking Scale Form V (SSS-V). The SSS-V was elaborated by Zuckerman (1994) and is a self-report questionnaire consisting of 40 forced-choice questions designed to assess individual differences in optimal level of stimulation along four sub-scores: Thrill and Adventure Seeking; Disinhibition; Experience Seeking, and Boredom Susceptibility. For this study, we utilized the Portuguese version by Oliveira (2008). The reliability coefficients reported ranged between .69 and .86.

This study was approved by the Ethics Committee of Universidade Federal Fluminense and written informed consent was obtained from the participants before they entered the study.

Procedures

All subjects received debriefing and signed an informed consent form before testing. All participants completed a brief biographical questionnaire as well as the above-described tests. In completing the tests subjects were instructed that their time of testing was recorded. University students received a practicum credit for their participation. Statistical processing included the calculations of the descriptive scale statistics (means, SD, confidence intervals), reliability coefficients (Cronbach's alphas) and correlations among all the measures applied. We also performed

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exploratory and confirmatory factor analysis with the aim to assess how well the measured variables represent the theoretical latent dimensions.

Translation. The translation of the STQ-77 into Brazilian Portuguese involved five steps. First, two bilingual researchers, from Universidade Federal Fluminense and Pontifícia Universidade Católica do Rio de Janeiro, independently translated the English version of the STQ-77 into Brazilian Portuguese. Second, each version was independently back-translated by a native speaker. Third, the two independent versions were compared, and the semantic equivalence was discussed with another bilingual researcher, with expertise on psychometrics. Fourth, a third version was developed by consolidating the two previous versions. It was subsequently submitted to an expert panel discussion composed of one clinical psychiatrist, one clinical psychologist and one psychometrist, all of whom with the expertise and qualifications to perform an appropriate evaluation of not only the language but also the content of the items. Finally, this consolidated version was back-translated and assessed by the authors of the original STQ-77.

Factor analysis. For the confirmatory factor analysis, three models were evaluated in this study. Model 1 is a first-order model consisting of the twelve temperament scales. Models 2 and 3 are second-order models consisting of four and seven factors, respectively. The two latter models were based on the results of the exploratory factor analysis conducted in this study and on previous factor solutions of the STQ-77 (see also Trofimova, 2010a).

Results

Descriptive statistics

Table 1 shows the descriptive statistics. Means and standard deviations (SD) are reported for for the male and female sub-samples and for the full sample. Confidence intervals of the standard deviations (CISD) are also reported for the full sample. It is noteworthy to highlight that our sample—composed of university students and senior-level professionals—displayed high means in the scales

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of PRO (high average ability to extract and process new knowledge) and ERS (high average capacity of social endurance).

The rightmost column in Table 1 shows the reliability coefficients measured by the Cronbach alphas (Alpha). All alpha values were in the acceptable range (0.70-0.79). These results lend support to H1, indicating that the STQ-77Pt scales have sufficient internal consistency.

[Table 1]

Item-total correlations of the STQ-77Pt scales and Confirmatory Factor Analysis

Table 2 shows the item-total correlations of each STQ-77Pt scale. The results show that all items but one (item 3 of the ERM scale) had an absolute correlation coefficient of at least ‘.50’ with their respective scale. Moreover, about half of the items had a strong absolute correlation coefficient of at least ‘.70’. All reversed items entered with a negative sign, as expected. Finally, all values were significant at $p < 0.05$. These results lend additional support to H1.

[Table 2]

We evaluated three different structural models in this study, using maximum-likelihood Confirmatory Factor Analysis (CFA). Model 1 represents the twelve-factor solution (Figure 2). Model 2 represents the four-factor solution (Figure 3, left side). Model 3 represents the seven-factor solution (Figure 3, right side). The results indicate that the factor structure of the STQ-77Pt follows the activity-specific structure of previous versions of the STQ-77. Specifically, it distinguishes between the scales of physical, social, mental and emotional aspects of behavior, thus providing support for H2.

[Figure 2]

[Figure 3]

Concurrent validity

Table 3 shows the results of correlational analysis (ρ) of the associations between the scales of the STQ-77Pt, NEO-FFI and SSS-V. The results were in accordance with all proposed hypotheses regarding concurrent validity (H3-H7). In line with H3, the STQ-77Pt scale of Sensation Seeking had a very significant positive correlation with the total Sensation Seeking score in the SSS-V ($\rho = .53$; $p < 0.001$). Likewise, in line with H4, the scales of Social Endurance and Social Tempo had significant positive correlations with the NEO-FFI scale of Extraversion ($\rho = .22$; $p < 0.01$ and $\rho = .17$; $p < 0.05$, respectively). Also, in line with H5, the STQ-77Pt scale of Neuroticism also had a very significant positive correlation with the NEO-FFI scale of Neuroticism ($\rho = .31$; $p < 0.001$). Additionally, we tested correlations between the STQ-77's Empathy scale and the NEO-FFI scale of Agreeableness, as well as the SSS-V scale of Disinhibition. In line with H6, there was a significant positive correlation between Empathy and Agreeableness ($\rho = .53$; $p < 0.01$). Finally, in line with H7, there was a significant negative correlation between Empathy and Disinhibition ($\rho = -.20$; $p < 0.01$).

[Table 3]

Discussion

Internal Consistency

Our study shows that the reliability and internal consistency of the STQ-77Pt are sufficient, thus supporting for H1. The alphas for each of the 12 STQ-77Pt scales were within the acceptable range. The scales with the worst but still acceptable performances were PRO and SLF. This can be an artifact of the sample, given that it consists mostly of university students or professionals with a high level of education, thereby the high average PRO. The distribution of SLF, with a greater variation than the other variables, may also have been affected by the large presence of entrepreneurs in the professional sample since previous research identified a relationship between overconfidence and entrepreneurship (Baron, 1998). Despite these remarks, the alpha values obtained were

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satisfactory even for these variables. In sum, the overall results suggest that the items are internally consistent and a valid representative of their scales.

Factor Structure

To gauge whether the STQ-77Pt follows the activity-specific structure of previous versions of the STQ-77, we conducted Confirmatory Factor Analysis (CFA). Specifically, we evaluated three different structural models: four-, seven- and twelve-factor solutions. These models were particularly useful to compare the factor structure of the new STQ-77Pt with those in the validated English, Chinese, Polish and Russian versions of the STQ (Rusalov & Trofimova, 2007; Trofimova, 2010a,b). These previous results showed that the factor structures of all four language versions were consistent with the theoretical STQ model and found four factors unifying 12 scales: the factors of Physical (Motor), Social, Mental (Intellectual) Activity, and the factor of Emotionality.

In this study, our results were consistent with the theorized factor structure of the STQ, thus lending support to H2. For the twelve-factor solution (Figure 2), all but one observed variable (i.e., the scale items) displayed an absolute loading of more than ‘.30’ in their respective scales, which is in the acceptable range (Figure 2). The exception was item “erm3” with a small loading of ‘.18’ in its factor, ERM, which refers to the ability to sustain prolonged physical activities. It is a surprising result, given the item description “I can finish a prolonged manual job without taking a break” and the good results regarding its variance ($\sigma^2 = .93$ on a 4-point Likert scale) and distribution (skewness = -.01; kurtosis = 2.03). Still, this exception does not change the conclusion that, overall, the twelve-factor solution of STQ-77Pt is consistent with both the theorized structure and with previous versions of the STQ.

The four-factor solution (figure 3, left side) was identified as the best fit for the data. The first factor (MOTOR) represents the deterministic and more explicit physical-motor aspects of behavior: Motor Tempo (TMM); Motor Endurance (ERM); and Sensitivity to Sensations (SS). The second factor (INTELLECT) represents the functional aspects of behaviors geared toward more implicit,

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probabilistic, and complex contexts: Probabilistic Processing (PRO) and Mental Endurance (ERI). The third factor (SOCIAL) represents the social-verbal aspect of behavior: Social-verbal Endurance (ERS); Social Tempo (TMS); and Empathy (EMP). Finally, the fourth factor (EMOTIONALITY) represents the emotional reactivity aspects of behavior. It is the combination of four sub-scales: low tolerance of uncertainty and novelty (Neuroticism; NEU), inability to adapt quickly to changes in situations (the reverse of Plasticity; PL); tendency to be unsatisfied, untrusting and non-optimistic about reality (the reverse of Satisfaction; SLF); and the initiation of actions based on immediate emotional reactivity rather than by advanced planning or reasoning (Impulsivity; IMP). Therefore, this four-factor model is well aligned with the theory and previous studies regarding the STQ-77 and the functional ensemble of temperament (Trofimova et al. 2018; Trofimova & Robbins, 2016; Trofimova & Sulis, 2011; Trofimova, 2010; Rusalov & Trofimova, 2007). These results, showing a good separation between the scales of physical, social, mental and emotional aspects of behavior, thus, lend support for H2.

We also included a seven-factor solution (figure 3, right side) to offer an intermediate version that is more granulated than the suggested four-factor solution. The same initial factors of the four-factor solution remain (MOTOR, INTELLECT, SOCIAL and EMOTIONALITY), but some items are redistributed to compose three new factors. The factor RISK TAKING is composed by the combination of Sensation Seeking (SS), which includes the underestimation of outcomes of risky behavior, and Satisfaction (SLF), which includes the tendency to sometimes be overly optimistic about reality. The factor of EMOTIONALITY, which had “lost” the element of SLF to the RISK TAKING factor, loses another element—impulsivity, which now composes a new factor of its own (IMPULSIVITY). Finally, Empathy (EMP) is dissociated from the SOCIAL factor to constitute another factor of its own (EMPATHY). This redistribution of elements among the three extra factors is also consonant with the functional ensemble of the temperament theory and with previous studies of the STQ-77.

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In sum, in line with H2, we find that the factor structure of the Brazilian Portuguese version of the STQ-77 is consistent with that found in other studies using STQ-77 versions in English, Chinese, Polish and Russian versions (Trofimova, 2010a,b). Furthermore, we found that our best factor solution (the four-factor solution) largely replicates that found in Trofimova (2010a), with the factors of pertaining to physical (MOTOR), social-verbal (SOCIAL), and mental (INTELLECT) activities composing the first three factors, and the last factor being that related to emotionality.

Concurrent validity

We used two internationally known tests that were available in the Portuguese language to gauge the concurrent validity of the STQ-77Pt. We organize our discussion into four sub-topics, each reflecting one of the big functional group (Physical-Motor; Social-Verbal; Probabilistic-Intellectual; Emotional Amplifiers), as follows.

Physical-Motor Scales (ERM; TMM; SS). The investigation of concurrent validity of this group of scales was mostly limited to the Sensation Seeking scale of the STQ-77; however, the results also showed significant correlations between TMM and some dimensions of the SSS-V. Regarding the SS results, they largely support H3: we found that the STQ-77Pt's SS scale was correlated with all the sub-items of Zuckerman's SSS-V, as well as the overall SSS score. This result is not surprising, given that both scales measure stable biobehavioral individual differences regarding sensation seeking. Moreover, we found that the STQ-77Pt's SS scale had a positive correlation with the NEO-FFI scale of Openness. We understand that this relationship may be due to the aspects of Openness that regard to the enjoyment of new and different activities, and the association of Openness with a high need for variety in the respondent's life, and with liberal beliefs regarding the social, political, and moral spheres (Costa & McCrae, 2008). Thus, it is not surprising that people high in Openness will also display sensation seeking behaviors, as those have also been associated with high levels of Experience Seeking, susceptibility to boredom and disinhibition. Moreover, we found an interesting relationship between TMM and SSS-V scales. This correlation was mainly driven by the Thrill and

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Adventure Seeking (TAS) and the Experience Seeking (ES) scales, indicating a connection between a high level of TMM, which measures the speed of using pre-learned physical elements of actions, and the desire to engage in physical activities, such as mountain climbing, skydiving, or scuba diving, as well as the desire to experiment with new things, especially those that provide unusual sensations and experiences.

Social-Verbal Scales (ERS; TMS; EMP). ERS was positively correlated with NEO-FFI's Extraversion, corroborating the first part of H4. ERS also had a positive correlation with Agreeableness, and a negative correlation with Neuroticism. The former relationship may be due to the sociability factor embedded in both Agreeableness and Social Endurance scales. The latter may be due to the fact that Neuroticism has been associated with "embarrassment or shyness when dealing with people, especially strangers" (Costa & McCrae, 2008, p. 244), which in turn would not be expected to go hand-in-hand with high Social Endurance. Interestingly, ERS had a positive correlation with SSS-V total score, mainly driven by the experience seeking dimension, indicating a connection between Social Endurance and the seeking of new experiences through the mind and the senses (music, art, travel) and, perhaps particularly, through a "nonconforming general lifestyle with like-minded friends" (Zuckerman, 2007, p. 13). Regarding the results of the TMS scale, they were in line with its hypothesized positive relationship with Extraversion, thus corroborating the second part of H4. TMS was also negatively related to Neuroticism, again replicating the result found for ERS. Regarding EMP, the results were in line with H6, showing a positive correlation with Agreeableness. Interestingly, EMP was also slightly correlated with Neuroticism and Openness. These results could motivate further studies. Finally, in line with H7, EMP showed a negative correlation with Disinhibition (SSS-V), indicating that those with a behavioral orientation toward emotional states and needs of others may be less prone to be hedonistic, "wild" or utilize alcohol as a means for disinhibition.

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Probabilistic-Intellectual Scales (ERI; PL; PRO). Although we did not hypothesize a priori about the relationships for the group of scales, there were some significant results. ERI had a positive correlation with Conscientiousness while being negatively correlated Neuroticism. The association between ERI and Conscientiousness may be due to the fact that ERI involves the suppression of stimuli other than those related with the task at hand, which can be useful for the facets of Conscientiousness related to getting chores done without delay, completing tasks successfully, and being deliberative. The same ERI characteristic of suppressing stimuli may be negatively related to the facet of Neuroticism regarding immoderation (i.e., the non-capacity to resist temptations) and, perhaps, Hostility, with ERI helping to withhold the likelihood of manifesting anger or irritation. PL was correlated with Conscientiousness and with the Thrill and Adventure Seeking dimension of the SSS-V, which are interesting results to explore in further studies. Also of interest are the results regarding PRO. Like PL, PRO was also positively correlated with Conscientiousness. PRO also had a very significant negative correlation with Extraversion, as well as a slight negative correlation with Agreeableness, results which could also be explored in further studies.

Emotional Amplifiers (SLF; IMP; NEU). NEU, as measured by the STQ-77Pt, had a positive correlation with NEO-FFI's Neuroticism, corroborating H5. IMP was also positively correlated with NEO-FFI's Neuroticism. This result is not surprising, given that impulsiveness and immoderation are facets of the lexical approach to Neuroticism (Costa & McCrae, 2008, 1989). Additionally, IMP had a negative relationship with Conscientiousness. This association is also not surprising given that Conscientiousness entails the facets of self-discipline and deliberation, both of which go counter to the premature the integration of actions represented by IMP. SLF did not have any significant relationship with the NEO-FFI scales. Interestingly, all emotional amplifiers (SLF; IMP; NEU) were significantly correlated with the total SSS-V score. NEU was negatively correlated with the SSS, while SLF and IMP were positively correlated with the SSS. Although we did not have specific

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hypotheses for these relationships, they in fact replicate previous findings (Trofimova, 2010; Trofimova & Sulis, 2011).

Overall, the results regarding the concurrent validity of the STQ-77Pt are in line with the predictions from theory and with findings from previous studies.

Conclusion

In conclusion, this study aimed to investigate psychometric properties of the STQ-77Pt using a Brazilian sample. The STQ-77Pt provides a brief screening for temperament traits, i.e., the most consistent and biologically (neurochemically)-based aspects of behavior. The results show that the STQ-77Pt has internal and structural validities similar to the initial version. Specifically, the reliability analysis showed sufficiently high alpha values, and the structure of the STQ-77Pt analyzed using the CFA showed that the STQ-77Pt items were grouped according to the assigned scales. That is, the grouping of scales followed the activity-specific approach, resulting in the aprioristic theorized factors of Motor aspects, Social aspects, Mental aspects and Emotionality, also largely replicating previous CFA studies using other STQ-77 versions (Rusalov & Trofimova, 2007; Trofimova, 2010a).

The correlations between scales were in line with the theory (Rusalov & Trofimova, 2007), and corroborated our hypotheses. The STQ-77Pt scale of Sensation Seeking had a significant positive correlation with the total Sensation Seeking score in the SSS-V. The scales of Social Endurance and Social Tempo had significant positive correlations with the NEO-FFI scale of Extraversion. Neuroticism also had a significant positive correlation with its analogue scale in the NEO-FFI. Finally, STQ-77's Empathy scale had a significant positive correlation with the NEO-FFI scale of Agreeableness, and a very significant negative correlation with the SSS-V scale of Disinhibition. This study, therefore, demonstrated sufficient psychometric properties of the STQ-77Pt as an adaptation of this test to Brazilian sample.

The use of the STQ-77Pt will be beneficial in a series of settings, helping academics, practitioners in clinics and in the industry to assess the most stable neurochemically-based individual

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differences and gauge their association with a myriad of other individual and behavioral characteristics. For instance, practitioners in the industry may utilize the STQ-77Pt to study the basis of what are considered important “soft skills”, such as communication, responsibility, positive attitude, professionalism, flexibility, teamwork, work ethic, etc., which are in high demand in the workplace (Robles, 2012). In academia, it opens new avenues of research for Portuguese-speaking scholars, as well as practitioners, allowing them to perform novel research, draw new insights or make important decisions informed by the most consistent biologically-based traits in adults.

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Figure 1. The design, descriptions and abbreviations of the scales of the Structure of Temperament Questionnaire (Compact, STQ-77) that follows the framework of the neurochemical model Functional Ensemble of Temperament (FET).

<i>Functional aspects of behavior</i>	<i>Behavioral orientation to types of reinforcers:</i>	<i>Preferred speed of integration of actions</i>	<i>Energetic aspects: The ability to sustain prolonged and/or intense activities</i>
<i>Implicit, more probabilistic, Mental aspects</i>	... to learning causality and probabilities of events Probabilistic processing PRO	(in generation of new behavioral programs in changing situations) Plasticity PL	(<i>Sustained attention</i>) Intellectual (Mental) Endurance ERI
<i>Explicit, more deterministic: Social-verbal aspects</i>	...to others people's motivation Empathy-autism EMP	(speed of pre-learned social-verbal elements of actions) Social Tempo TMS	(<i>Sociability</i>) Social-verbal Endurance ERS
Physical-motor aspects	...to physical sensations and HPA arousal Sensation Seeking SS	(speed of using pre-learned physical elements of actions) Motor-Physical Tempo TMM	Motor-Physical Endurance ERM
<i>Emotional amplifiers of orientational, dynamical and energetic aspects</i>	Low tolerance of uncertainty and novelty, negativity bias in expectations Neuroticism, NEU	A degree of how premature the integration of actions is, emotional reactivity Impulsivity, IMP	A tendency to be (sometimes overly) optimistic /confident in one's own capacities Satisfaction-confidence, SF

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Table 1. Means, Standard Deviations (SD) and Alphas for the STQ-77Pt scales

	Male Sample		Female Sample		Total Sample			Alpha
	Mean	SD	Mean	SD	Mean	SD	CI SD	
ERM	15.42	3.68	14.83	3.69	15.13	3.69	3.39-4.05	.76
TMM	15.62	3.73	15.00	3.92	15.31	3.83	3.52-4.20	.79
SS	16.95	3.51	15.44	3.88	16.21	3.76	3.46-4.13	.77
ERS	17.12	3.73	17.48	3.71	17.30	3.72	3.42-4.08	.76
TMS	16.30	3.39	16.56	3.48	16.43	3.43	3.15-3.76	.74
EMP	15.95	2.59	15.98	2.44	15.97	2.51	2.31-2.75	.71
ERI	16.59	3.12	16.48	3.42	16.54	3.27	3.00-3.58	.71
PL	15.03	3.30	15.06	3.50	15.04	3.39	3.12-3.72	.72
PRO	18.86	3.19	17.27	3.33	18.08	3.35	3.08-3.67	.70
SLF	14.66	3.83	13.16	3.32	13.92	3.66	3.36-4.01	.70
IMP	16.23	3.44	16.92	3.51	16.57	3.49	3.20-3.82	.74
NEU	15.19	3.40	15.89	3.53	15.53	3.48	3.20-3.81	.71

Note. SD: standard deviations; CI SD: confidence intervals for the standard deviations; Alpha: Cronbach coefficient. Male sample, N=126. Female sample, N=122. Total sample, N= 248.

Table 2. Item-total correlations of the STQ-77Pt items

	ERM	TMM	SS	ERS	TMS	EMP	ERI	PL	PRO	SLF	IMP	NEU
item 1	.73	.70	-.59	.65	.67	.69	.56	.62	-.64	.66	.66	.65
item 2	.73	.72	.75	.57	.66	-.56	-.71	.64	-.53	-.55	.70	.61
item 3	.46	.73	.70	.67	.69	-.69	.63	.69	.64	.51	.63	.63
item 4	.76	.76	.61	-.74	-.70	.53	.62	-.63	.69	.65	.65	.64
item 5	-.57	.74	.65	-.64	-.62	.68	-.58	.66	.68	.70	.71	.63
item 6	.78	.53	.65	-.75	-.62	.68	.72	.62	.62	.72	.61	.65

Note: Zeros before the comma are omitted. All values are significant at $p < 0.001$.

Figure 2. CFA of the twelve-factor model

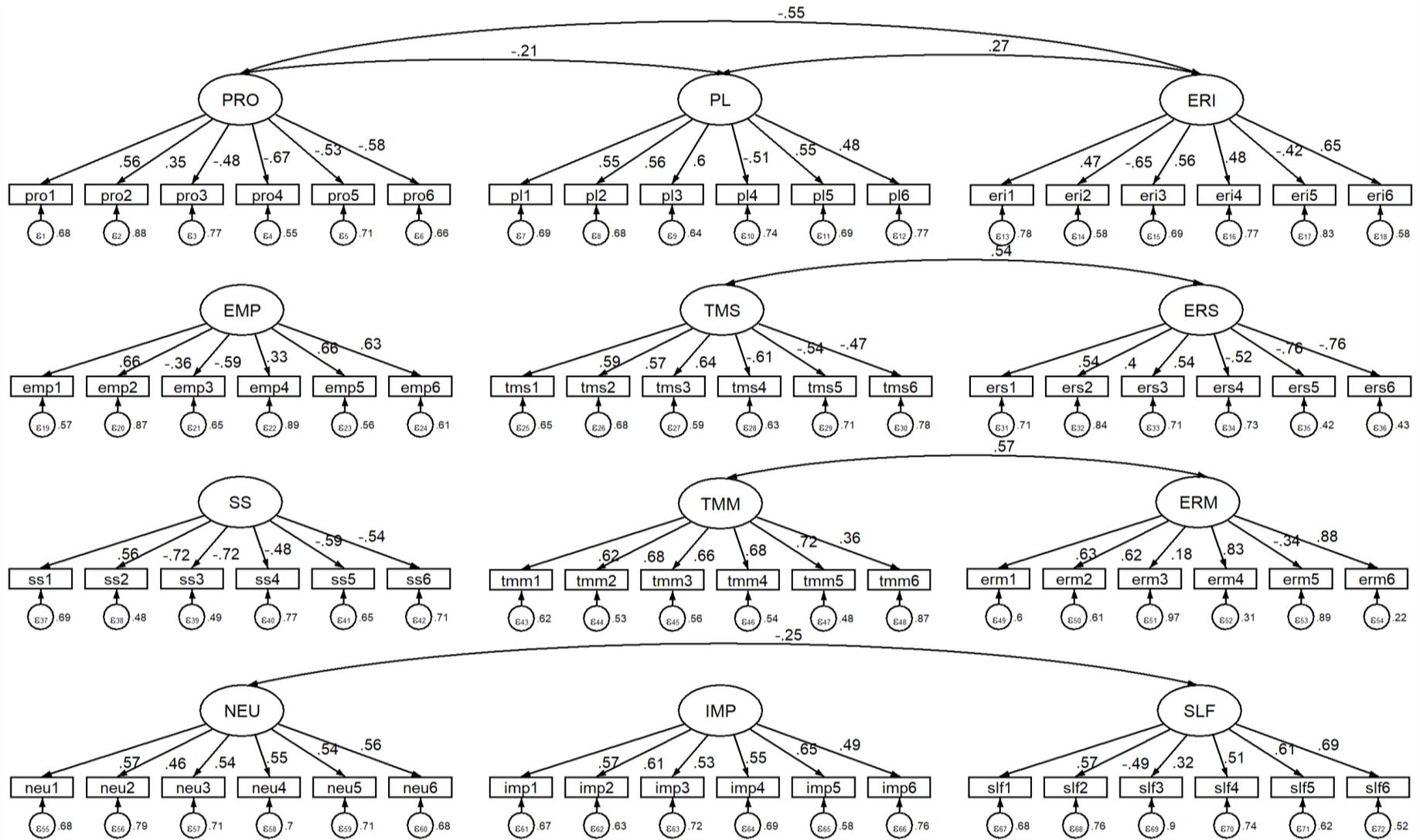
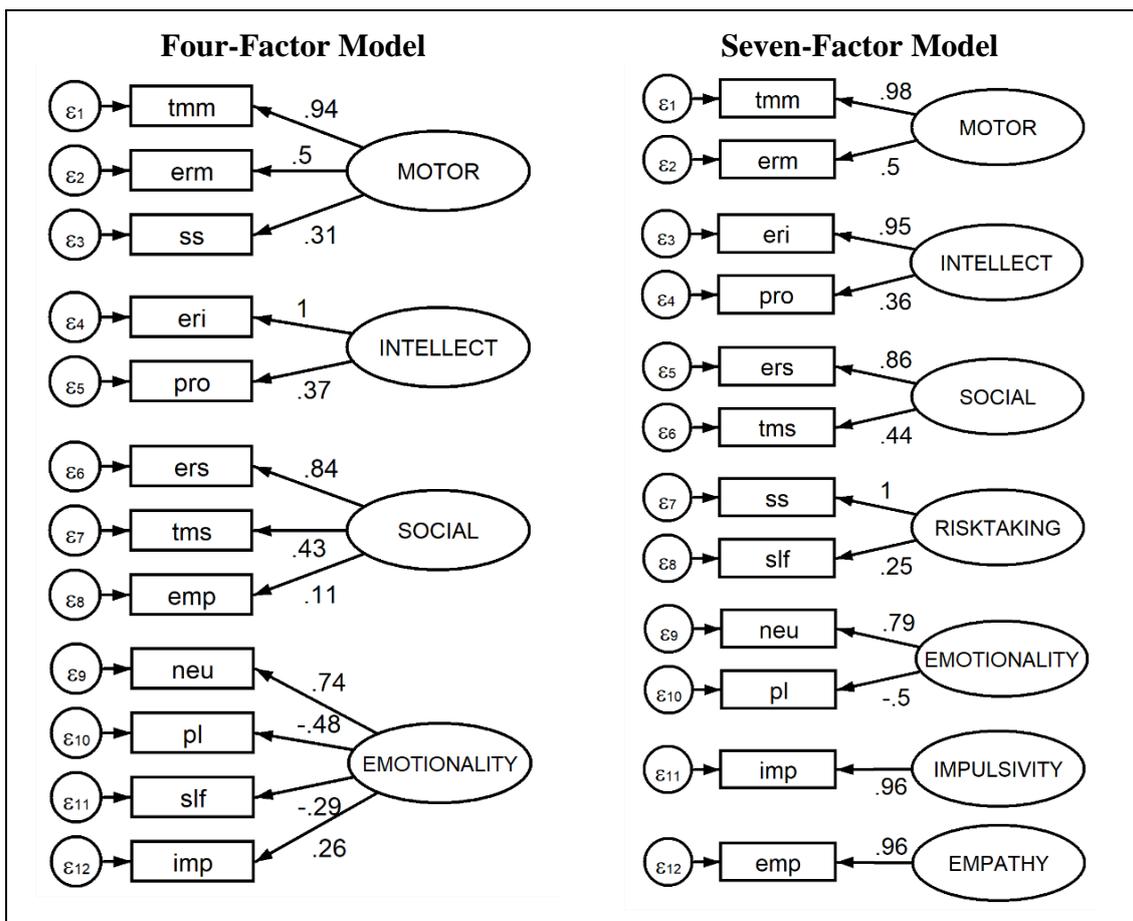


Figure 3. CFA of the second-order models.



Note. The numbers represent the factor loadings.

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Table 3. Correlations among the STQ-77Pt and comparison scales.

		NEO-FFI (<i>N</i> = 181)												
		ERM	TMM	SS	ERS	TMS	EMP	ERI	PL	PRO	SLF	IMP	NEU	V
N					-.13 ⁺	-.14 ⁺	.13 ⁺	-.19 ^{**}				.18 [*]	.31 ^{***}	
E					.22 ^{**}	.17 [*]				-.25 ^{***}				-.19 ^{**}
O				.21 ^{**}			.12 ⁺							
A				-.19 ^{**}	.16 [*]		.22 ^{**}			-.12 ⁺				
C				-.14 ⁺				.25 ^{***}	.15 ⁺	.13 ⁺		-.18 [*]		.30 ^{***}
		SSS-V (<i>N</i> = 187)												
		ERM	TMM	SS	ERS	TMS	EMP	ERI	PL	PRO	SLF	IMP	NEU	V
TAS			.18 [*]	.50 ^{***}					.17 [*]		.17 [*]		-.19 [*]	
ES			.17 [*]	.44 ^{***}	.17 [*]						.15 [*]	.22 ^{**}		
DIS				.31 ^{***}			-.20 ^{**}				.20 ^{**}	.16 [*]	-.14 ⁺	-.15 [*]
BS				.21 ^{**}										-.17 [*]
SSS			.18 [*]	.53 ^{***}	.18 [*]						.22 ^{**}	.17 [*]	-.16 [*]	

Note. *N* = number of observations. NEO-FFI = NEO-Five Factor Inventory; N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness; SSS-V = Zuckerman's Sensation Seeking Scale; TAS = Thrill and Adventure Seeking; ES = Experience seeking; DIS = Disinhibition; BI = Boredom susceptibility; SSS = Summation of the SSS-V scales. ⁺ *p* < 0.10, ^{*} *p* < 0.05, ^{**} *p* < 0.01, ^{***} *p* < 0.001.