

## Abstract

**Objective:** Impulsivity is a multifaceted construct known to play a crucial role in the development and maintenance of a wide range of problematic behaviors and psychological disorders in children.

**Method:** In this study, we adapted the short French adult version of the UPPS-P Impulsive Behavior Scale for use with children (short UPPS-P-C) and tested its psychometric properties.

**Results:** Confirmatory factor analyses conducted on a sample of 425 children (aged from 8 to 14 years) supported the five-factor structure of the scale. Additional analyses emphasized the good internal and test-retest reliability of the short UPPS-P-C. Furthermore, our results also revealed that lack of premeditation and urgency subscales were able to discriminate between children diagnosed with attention-deficit/hyperactivity disorder (ADHD) and their matched controls.

**Conclusion:** These results suggest that the short UPPS-P-C may be considered as a promising time-saving tool to assess impulsivity traits in healthy children and in children with psychiatric disorders.

Keywords: Impulsivity; Psychometric properties; Confirmatory factor analysis; ADHD; UPPS

## Measuring impulsivity in Children: Adaptation and Validation of a Short Version of the UPPS-P

### Impulsive Behaviors Scale in Children and Investigation of Its Links with ADHD

Impulsivity – characterized by poorly conceived, prematurely expressed, or excessively risky behaviors that often result in undesirable outcomes (Evenden, 1999) – is a key construct that is of great interest for a wide range of domains in psychology. A decade ago, Whiteside and Lynam (2001) clarified the multifaceted nature of impulsivity and developed an instrument to assess its different dimensions in adults: the UPPS (Urgency-Premeditation-Perseverance-Sensation seeking) Impulsive Behavior Scale. This scale measures four dimensions: (1) *negative urgency*, defined as the tendency to act rashly while faced with intense negative emotional contexts; (2) (lack of) *premeditation*, defined as the tendency to take into account the consequences of an act before engaging in that act; (3) (lack of) *perseverance*, defined as the ability to remain focused on a task that may be boring and/or difficult; and (4) *sensation seeking*, defined as a tendency to enjoy and pursue activities that are exciting and openness to trying new experiences.

More recently, an additional component was added to the original UPPS model, pertaining to impulsive actions in intense positive emotional contexts, and labeled *positive urgency* (Cyders & Smith, 2008; Cyders et al., 2007). Accordingly, the most recent versions of questionnaires assessing the UPPS model of impulsivity generally include a positive urgency subscale in addition to the original negative urgency subscale (UPPS-P; Billieux et al., 2012; D’Orta et al., 2015).

Since the seminal work of Whiteside and Lynam (2001), various versions of the UPPS have been shown to have robust psychometric properties, including a consistent, theory-based factor structure supported by exploratory and confirmatory factor analyses, high internal consistency, and adequate test-retest validity of the various subscales (Billieux et al., 2012; Kämpfe & Mitte, 2009; Magid & Colder, 2007; Schmidt, Gay, d’Acremont, & Van der Linden, 2008; Van der Linden et al., 2006; Verdejo-García, Lozano, Moya, Alcázar, & Pérez-García, 2010; Whiteside, Lynam, Miller, & Reynolds, 2005). Furthermore, several studies have revealed specific relationships between the five UPPS-P dimensions and different

psychopathological symptoms and psychiatric disorders in adulthood, such as substance abuse and related disorders (e.g., alcohol abuse or pathological gambling) or personality disorders (e.g., borderline personality) (Magid & Colder, 2007; see Berg, Latzman, Bliwise, & Lilienfeld, 2015, for a meta-analysis).

In children and adolescents, functional difficulties associated with impulsive behaviors (e.g., emotional dysregulation, difficulties managing social relations) are pervasive in numerous psychological disorders, such as pathological video game use (Gentile et al., 2011) or conduct disorders (Pihet, Suter, Halfon, & Stephan, 2012). However, contrary to what has been observed in adults, few studies have examined children's impulsive behaviors according to the UPPS model (e.g., Marmorstein, 2013; Zapolski & Smith, 2013; Zapolski, Stairs, Fried Settles, Combs, & Smith, 2010). Nonetheless, these sparse data revealed that the impulsivity traits measured with the self-reported version of the UPPS offer a valid, reliable framework to evaluate impulsive behaviors in children. For instance, Marmorstein (2013) found that positive and negative urgency were associated with both externalizing symptomatology (e.g., conduct disorders, alcohol consumption) and internalizing symptomatology (e.g., depression, panic disorders, and generalized anxiety) in children, while a lack of premeditation was related only to externalizing symptomatology.

The most representative impulsivity-related disorder in children is undoubtedly Attention-deficit/hyperactivity disorder (ADHD), which is characterized by three primary symptoms: inattention, hyperactivity, and impulsivity. These symptoms can appear in isolation or in combination in forms of ADHD known as ADHD combined presentation, ADHD inattentive presentation, and ADHD hyperactive/impulsive presentation (American Psychiatric Association, 2013; see also Chhabildas, Pennington, & Willcutt, 2001; Pham, Fine, & Semrud-Clikeman, 2011). Recently, Miller et al. (2010) examined the ability of the parent version of the UPPS to differentiate between two of these three ADHD subtypes, namely the combined presentation and the inattentive presentation. Their study indicated that children with the ADHD combined presentation scored higher than children with the ADHD inattentive presentation on the

negative urgency and lack of premeditation subscales of the UPPS. Note, however, that one important limitation of that study was that the children's impulsivity was measured with the adult version of the questionnaire, which contains statements and vocabulary that are not necessarily adapted for young children. Furthermore, they did not use a scale allowing the measurement of positive urgency.

To our knowledge, the only scale based on the UPPS model of impulsivity that is specifically adapted to children's speech and reasoning abilities is the 59-item version of the English UPPS-P (Zapolski & Smith, 2013; Zapolski et al., 2010). In the present study, we decided to create and test the psychometric properties of an adaptation for children of the short version of the UPPS-P Impulsive Behavior Scale (Billieux et al., 2012): the short UPPS-P Impulsive Behavior Scale – Child version (short UPPS-P-C), which uses 20 items to assess the five impulsivity components described by Whiteside and Lynam (2001) and Cyders et al. (2007). Children – and particularly impulsive children – quickly lose motivation during testing sessions and their sensitivity to interference frequently prevents them from completing unattractive tasks, such as long self-reports (e.g., Crone, Jennings, & van der Molen, 2003). In this context, the short version of the scale (20 items) developed by Billieux et al. (2012) for adult (French-speaking) participants could represent a more appropriate tool to assess impulsive behaviors in children than the time-consuming 59-item original version of the scale. We also conducted an in-depth adaptation of the items to make sure the statements can be well understood by children aged from 8 to 14 years.

The main goal of this study was to examine the psychometric properties of the short UPPS-P-C. Specifically, we investigated its construct validity, internal consistency, and test-retest reliability. We also examined whether the questionnaire was able to discriminate between patients with ADHD and control participants, and if so which factors were involved. As stated above, impulsivity is one of the core symptoms of ADHD, particularly in the combined and hyperactive presentations (Miller et al., 2010). Accordingly, a group of children with these two presentations of ADHD was included to test the discriminant validity of the scale.

## Method

### Participants

A total of 425 typically developing children and adolescents whose ages ranged from 8 to 14 years ( $Mean = 10.88$  years,  $SD = 1.33$ ) participated in the study. Eight years was chosen as the cutoff age because a pretest conducted on a small sample of children aged from 7 to 9 years old indicated that this is the earliest age at which children are able to read the items on the questionnaire without needing substantive external help. Forty-eight percent of the subjects were girls. The mean of both parents' years of education was used to appraise socioeconomic status ( $Mean = 13.85$  years,  $SD = 2.49$ ). Thirty-two additional participants were recruited but not included in the final analyses because they did not respond to all the questionnaire items. Exclusion criteria for participation in this sample were a suspicion or a reported history of acquired brain injury or neurological, psychiatric, learning, or developmental disorders (including ADHD). The sample was recruited from French-speaking kindergartens and elementary schools in the province of Liège (Belgium;  $n = 134$ ), the province of Brabant (Belgium;  $n = 100$ ), and the canton of Valais (Switzerland;  $n = 191$ ). No differences were found between the short UPPS-P-C scores of these three subsamples,  $F_s < 1$ ,  $p_s > .31$ .

In addition, we included a group of 31 French-speaking children (7 females) who consulted for attention disorders from September 2016 to August 2017 at the Psychological and Speech Therapy Consultation Center of the University Clinic (Belgium) and were diagnosed with ADHD by a pediatrician and a neuropsychologist on the basis of a behavioral and cognitive evaluation. This sample size was sufficient to reach a predicted power of .80 ( $\alpha = .05$ ) for a medium effect size. Of these 31 children ( $Mean = 11.06$  years,  $SD = 1.60$ ), 18 met the criteria for the combined presentation of ADHD (ADHD-C) and 10 for the hyperactive presentation (ADHD-H), according to the DSM-5 (American Psychiatric Association, 2013). This information was missing for 3 patients. All of these children were aged between 8 and 14 years at the

time of assessment. Exclusion criteria included a history of neurological or psychiatric disorders and an established diagnosis of intellectual disabilities. Each of the patients included was matched as closely as possible with a control participant for age,  $t(60) = 0.08, p = .94$ , parental education level,  $t(60) = 0.01, p = .98$ , and gender.

### **Material and Procedure**

Both groups of children were enrolled following their oral consent and the written informed consent from their parents and with the agreement of the Faculty of Psychology, Speech Therapy, and Educational Sciences' ethics committee. The typically developing children completed the questionnaire individually in a quiet room at school. The children with ADHD completed the questionnaire in a quiet room of the institution where they were recruited. Participants under the age of 10 were instructed to read the statements aloud so that the experimenter could help them read the items and could define the words they did not know. All participants were invited to ask the experimenter for help when they did not understand an item. Moreover, a subgroup of 50 randomly selected typically developing children were asked to complete the questionnaire a second time an average of 8 weeks (6–10 weeks) after the initial assessment so we could examine test-retest reliability.

**UPPS Impulsive Behavior Scale for Children (short UPPS-P-C).** A first version of the questionnaire was designed based on the short version of the UPPS-P for adults (Billieux et al., 2012) by two experienced neuropsychologists (MG and CC), who specialize in children's cognitive and affective development. The items were adapted so they could be easily understood by children. The questionnaire is composed of 20 items. The items generated were circulated to three experts in the field of child clinical psychology for critical review and feedback. The experts were asked to judge the developmental appropriateness of the items, the adequacy of the survey response choices, and the comprehensibility of the instructions. Finally, they were given the names of the five subscales of the questionnaire and were asked to blindly decide

which subscale each item belonged to. Cohen's kappa correlations (interrater reliability) for the different subscales ranged from .84 to .95, which suggested substantial to almost perfect agreement. Following this face validity step, the a priori structure of the questionnaire was confirmed overall. However, the wording of some statements was then adjusted until agreement was reached. All the words composing the items of the questionnaire had to be included in the vocabulary of 8-year-old children. The reading level of the short UPPS-P-C is around a second or a third grade level on the basis of the Lexile reading level method (M. Smith, Schiano, & Lattanzio, 2014).

The final version of the scale contains 20 easily understandable items that are rated on a 4-point Likert scale indicating the level of agreement with the statement ranging from 1 ("Totally agree") to 4 ("Totally disagree"). The questionnaire was divided into five a priori subscales labeled positive urgency (4 items), negative urgency (4 items), (lack of) premeditation (4 items), (lack of) perseverance (4 items), and sensation seeking (4 items). The order of the 20 items was similar to that of the original short version of the UPPS-P (Billieux et al., 2012); specifically, items were randomized so that two items measuring the same impulsivity facet are never presented successively. The scores obtained for each item included in the sensation seeking, positive urgency and negative urgency subscales were reversed so that higher scores on each subscale of the short UPPS-P-C indicated greater impulsivity. The items are provided in French and English in the Appendix. (Note that the English version of the scale has not yet been validated).

## Results

Statistical analyses were done using *Mplus* software version 7.31 (Muthén & Muthén, 2007) and *IBM SPSS* statistics version 23 (George & Mallery, 2016). The first goal of our study was to examine the psychometric properties of the short UPPS-P-C. For this purpose, we first conducted a regular item analysis to determine whether conceptualizing our data continuously was appropriate. These preliminary analyses are presented in Table 1.

< Insert Table 1 >

Secondly, the factor structure of the questionnaire was investigated using confirmatory factor analyses (CFAs). We decided to rely on CFA instead of exploratory factor analysis because the former allows one to test specific *a priori* hypotheses regarding factor structure, which is particularly appropriate for the validation of scales that have already been extensively validated. Maximum likelihood parameter estimates with standard errors and a mean-adjusted chi-square test were used. Several goodness-of-fit indices were considered to evaluate the model's fit: the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the standardized root mean square residual (SRMR). An RMSEA of <.08, a CFI of >.90, and an SRMR of <.10 are generally interpreted as acceptable fits (Brown, 2006; Hu & Bentler, 1999). We did not use the  $\chi^2$  test (a non-significant value corresponds to an acceptable fit) because  $\chi^2$  is known to increase with sample size, and Byrne (1994) has noticed that it is unusual to obtain a non-significant  $\chi^2$  when performing CFA on self-report questionnaires.

In the present study, four models were tested. The first model (Model A) holds that there is a single impulsivity construct. The second model (Model B) identifies five interrelated impulsivity constructs. Two additional models were computed based on previous validation studies of the UPPS-P model showing that lack of premeditation and lack of perseverance may be related to a higher-order construct of "consciousness" while positive and negative urgency could represent a higher-order construct of "general urgency" (Billieux et al., 2012; Cyders & Smith, 2007; Smith et al., 2007). Thus, the third model (Model C) identifies three interrelated factors, namely a broad urgency factor (grouping together positive and negative urgency items), a consciousness factor (grouping together the premeditation and perseverance items), and a sensation seeking factor. Finally, the fourth model constitutes a hierarchical model (Model D) in which (1) lack of perseverance and lack of premeditation are two distinct factors both loading on a higher-order factor called lack of consciousness; (2) positive and negative urgency are two distinct factors both loading on a higher-order factor called general urgency; and (3) sensation seeking is a separate



dimension. We used the Expected Cross-Validation Index (ECVI) to compare the fit of these different models. The ECVI gauges the applicability or generalizability of results; the model with the smallest ECVI value is considered to be the most stable in a given population (Schumacker & Lomax, 2010).

Next, as the age range was large in our sample and covered a wide period of child development, we tested measurement invariance between young and older children. A well-fitting configural invariance model would suggest that a similar factorial model is plausible across age groups (Vandenberg & Lance, 2000). Specifically, once the best model selected, we conducted separate CFAs for 8- to 10-year-old children and 11- to 14-year-old children. This procedure was employed because 8- to 10-year-old children were more likely than older children to experience difficulty when completing the questionnaire and, thus, to show potentially inconsistent results. Secondly, metric invariance was tested. Metric invariance examined the extent to which the relationships between the factors and the items were equivalent across the two age groups (Byrne, 1998). Finally, we tested whether the two groups use the response scale in a similar way (i.e., scalar invariance; Campbell, Barry, Joe, & Finney, 2008). Because each of the increasingly constrained invariance models was nested within the previous models, the change in fit was assessed by comparing fit indices from one step to the next. Specifically, model comparisons were made by examining the change in  $\chi^2$  ( $\Delta\chi^2$ ), in the CFI index ( $\Delta\text{CFI}$ ), and in the RMSEA index ( $\Delta\text{RMSEA}$ ). Decreases of 0.01 or less in the CFI index and of .015 in the RMSEA index suggested invariance (Chen, 2007).

Once the factor structure was determined, the internal reliability and test-retest reliability of each subscale were inspected using Cronbach's alpha and Pearson's correlations, respectively. Finally, we carried out analyses of variance (ANOVAs) and Receiver Operating Characteristic (ROC) curves to assess the short UPPS-P-C's ability to discriminate between children with ADHD and typically developing children.

## Confirmatory Factor Analysis

The four hypothetical models were tested with CFA using the sample of 425 typically developing children. Standardized factor loadings for items are summarized in Figure 1. Model A was found to yield a poor fit (RMSEA = .14; CFI = .66; SRMR = .16). The results showed that Model B (RMSEA = .05; CFI = .94; SRMR = .08), Model C (RMSEA = .07; CFI = .92; SRMR = .09), and Model D (RMSEA = .06; CFI = .93; SRMR = .08) all fit the data well. Nevertheless, using the ECVI as a comparison index, it was found that Model B had the best fit (ECVI = 1.169), followed by Model D (ECVI = 1.290), and Model C (ECVI = 1.642). In this context, Model B, which considers impulsivity to be composed of five interrelated traits, was retained.

< Insert Figure 1 >

Finally, to test developmental invariance, we conducted separate CFAs for young (Mean = 9.62 years,  $n = 176$ ) and older children (Mean = 11.74,  $n = 249$ ). The results showed an adequate fit of Model B for both young (RMSEA = .06; CFI = .93; SRMR = .08) and older participants (RMSEA = .05; CFI = .95; SRMR = .07). Given that configural invariance was supported, we tested for metric invariance. We found support for metric invariance ( $\Delta\text{CFI} = .01$ ;  $\Delta\text{RMSEA} = .009$ ;  $\Delta\chi^2$  not statistically significant), suggesting that the items have equal salience for young and older children. Similar results were found for scalar invariance ( $\Delta\text{CFI} = .01$ ;  $\Delta\text{RMSEA} = .011$ ;  $\Delta\chi^2$  not statistically significant). Overall, these results confirmed the developmental invariance at each level: configural, metric, and scalar.

## Internal Reliability

The reliability coefficients (Cronbach's alpha) can be considered good for sensation seeking ( $\alpha = .70$ ), negative urgency ( $\alpha = .71$ ), and lack of perseverance ( $\alpha = .81$ ). Internal reliability was lower but acceptable for the lack of premeditation ( $\alpha = .64$ ) and positive urgency subscales ( $\alpha = .67$ ). As indicated previously, there was four items on each subscale. Deleting items did not significantly increase the reliability coefficients of these subscales.

### **Test-Retest Reliability**

We asked 50 children to complete the short UPPS-P-C a second time six to eight weeks after the first assessment. The analyses showed good test-retest reliability. Indeed, the correlations between the subscales of the questionnaire were .90 for the lack of premeditation factor, .83 for the sensation seeking factor, .92 for the positive urgency factor, .65 for the negative urgency factor, and .97 for the lack of perseverance factor, all  $ps < .001$ .

### **Discriminant Validity**

First, the ability of the different subscales of the short UPPS-P-C to discriminate between children with ADHD and typically developing children matched for sex, age, and parental education level was explored. An alpha level of .01 was applied to reduce multiple testing error (Bonferroni, 1936). The children with ADHD had higher scores than neurotypical children for the positive urgency subscale ( $Mean = 8.52$  vs. 11.94),  $F(1,60) = 26.29$ ,  $p < .001$ ,  $\eta^2_p = .30$ , for the negative urgency subscale ( $Mean = 10.26$  vs. 12.29),  $F(1,60) = 8.20$ ,  $p = .006$ ,  $\eta^2_p = .12$ , and for the (lack of) premeditation subscale ( $Mean = 8.19$  vs. 10.39),  $F(1,60) = 9.48$ ,  $p = .003$ ,  $\eta^2_p = .13$ . No other comparison reached significance, all  $F_s < 1.16$ ,  $ps > .28$ .

In addition, the ROC curve method was used to further investigate the discriminant validity of the short UPPS-P-C. The area under the ROC curve would be 1.0 for a measure that discriminates perfectly between two groups, and .50 for a measure that discriminates with an accuracy no better than chance. An area under the ROC curve greater than .70 indicates adequate discrimination (Rice & Harris, 2005). The results revealed that the area under the ROC curve was .77 for the total questionnaire score, .51 for the sensation seeking scale, .61 for the perseverance scale, .72 for premeditation scale, .70 for the negative urgency scale, and .82 for the positive urgency scale. The positive predictive values (PPV; i.e., the proportion of people with a positive test result who actually have ADHD) and the negative predictive values (NPV; i.e., the proportion of people with a negative test result who do not have ADHD) for the best cutoff

scores as well as means and standard deviations for the two groups are presented in Table 2. These values confirm that the positive and negative urgency and the premeditation subscales are the only factors that adequately discriminate between healthy and ADHD children, as revealed by both PPV and NPV > .65.

< Insert Table 2 >

### **Discussion**

The main goal of this study was to adapt and validate an instrument allowing the assessment in children of the five impulsivity dimensions composing the UPPS-P impulsivity model. The results indicate that the short UPPS-P-C is characterized by a robust, theoretically driven, and developmentally stable factor structure. The scale also possesses good discriminant validity for some subscales (i.e., lack of premeditation, positive and negative urgency) as well as adequate internal and test-retest reliability for most factors. On the whole, our findings suggest that the short UPPS-P-C is a valid instrument for assessing the multidimensional construct of impulsivity in children. Importantly, our results also replicate those found by Zapolski et al. (2010) with the 59-item version of the scale, and further confirm that the five dimensions of impulsivity largely established in adults (Cyders et al., 2007; Whiteside & Lynam, 2001) are also relevant for measuring the impulsivity traits influencing children's behaviors.

A complementary aim of this study was to examine the scale's discriminant power, namely its ability to distinguish between children with ADHD and their matched controls. Replicating and extending the results of Miller et al. (2010) with the adult version of the scale, comparisons revealed significant differences between the two groups with regard to the lack of premeditation, positive, and negative urgency facets of impulsivity. Furthermore, ROC analyses reinforced this finding by showing that these three facets are the only ones that display a good level of specificity and sensitivity, confirming that these three facets of impulsivity appear to discriminate between children with ADHD and typically developing children. Interestingly, the fact that the lack of premeditation and the positive and negative urgency

factors of the short UPPS-P-C were the only dimensions of impulsivity that discriminated between children with ADHD and their matched controls suggests that difficulties regulating behaviors under intense (negative or positive) affective conditions and difficulties taking into account the consequences of an act before engaging in that act are more frequently encountered by children with ADHD than by neurotypical children. Combined with the results of several recent studies showing a specific association between urgency, lack of premeditation, and reduced prepotent response inhibition capacity (Gay, Rochat, Billieux, d'Acromont, & Van der Linden, 2008; Rochat, Beni, Annoni, Vuadens, & Van der Linden, 2013; Wilbertz et al., 2014), this finding, if confirmed, could help to improve our understanding of the behavioral consequences of cognitive deficits that are associated with ADHD. Indeed, from a cognitive point of view, ADHD is mainly characterized by difficulties inhibiting a dominant response and stopping an ongoing response (see Barkley, 1997, for an overview). Importantly, the other forms of impulsivity failed to distinguish between the two groups of children. Replication of these findings in a larger sample of children with ADHD is however warranted. Indeed, the present sample size was large enough to allow us to detect differences of medium but not small effect size between children with ADHD and typically developing children. Moreover, to further confirm the discriminant validity of the short UPPS-P-C and its ability to discriminate among children with psychological disorders associated with different forms of impulsivity, future studies should be carried out in samples of children with other impulsivity-related pathologies (e.g., children who sustained traumatic brain injury, conduct disorders, emotional disorders) or to explore differences between the three ADHD presentations.

Our study presents some potential limitations. Indeed, a relatively low internal reliability was found for the (lack of) premeditation (.64) and positive urgency (.67) subscales. However, it is well established that Cronbach's  $\alpha$  largely depend on the number of items (Tavakol & Dennick, 2011). Accordingly, it is likely that the small number of items included in each subscale (4 items) of the short UPPS-P-C at least partly explains the loss of reliability of the short form compared with the 59-item version

of the questionnaire. However, the number of items in our scale was intentionally kept low to allow young children to respond to all of them without losing motivation or concentration. Overall, the relatively small decline in validity between the 59-item and the short UPPS-P-C appears to be acceptable, given the reduction of assessment time and the alleviation of attentional demand that accompany the reduction in the number of items (see Smith, McCarthy, & Anderson, 2000, for a critical discussion of short form development). Furthermore, our results indicate a relatively poorer test-retest reliability for the negative urgency subscale as compared the other subscales. Actually, this result is not very surprising given negative urgency is conceptualized as an emotion-laden impulsivity heavily influenced by mood states, which are fluctuant in nature (e.g., Cyders & Smith, 2007).

Moreover, to confirm and extend the results of the present research, future studies should also be conducted to adapt the short UPPS-P-C to parents and teachers, relying on a similar approach to the one used by Rochat and colleagues when they developed short informant versions of the UPPS scale adapted to neurological populations (Rochat, Beni, et al. 2010; Rochat, Delbeuck, et al., 2008). Several previous works have indeed indicated that both young children and children with ADHD may underestimate their difficulties (Geurten, Catale, Geurten, Wansard, & Meulemans, 2016) or provide extremely positive reports of their own competence (Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007, for a review). In this context, it is difficult to ascertain if the impulsivity facets that failed to discriminate between children with or without ADHD in the present study are more easily influenced by a response bias (e.g., overoptimistic responses) than facets that were able to discriminate between these two groups. Still, there is reasons to belief that the self-reported version of the UPPS-P-C could be, in itself, an adapted tool to assess children's impulsivity. First, one should keep in mind that what a relative reports is not necessary an accurate picture of the participant's functioning. Family members' or teachers' perception are not free of response bias (e.g., Fleming et al., 1996). This is all the more true since several items of the UPPS-P-C require children to reflect on their internal states that are unobservable from the outside (e.g., "When I'm

very happy, it seems normal to just do whatever I want"). In some cases, parents/teachers are susceptible to misinterpret how children feel or what they think, leading them to misreport on the questionnaire. Second, this is not because children frequently overestimate their competence (calibration error) that they are unable to determine which areas of functioning are the most challenging for them as compared to others (resolution error). Indeed, many studies have revealed that calibration and resolution are independent metacognitive abilities (e.g., Van Overschelde & Nelson, 2006). The self-report version of the UPPS-P-S thus provides practitioners with important information about what participants consider to be their main difficulties, which constitutes an important step of case conceptualization and participates in the elaboration of a cognitive rehabilitation or psychological intervention.

Despite the above-mentioned limitations, our findings provide preliminary evidence that the short UPPS-P-C can be considered a promising instrument to screen for impulsivity traits in both typically developing children and children with ADHD, and further confirm the link established between urgency (both positive and negative), lack of premeditation, and ADHD symptomatology.

## References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, *121*, 65–94. doi:10.1037/0033-2909.121.1.65
- Berg, J. M., Latzman, R. D., Bliwise, N. G., & Lilienfeld, S. O. (2015). Parsing the heterogeneity of impulsivity: A meta-analytic review of the behavioral implications of the UPPS for psychopathology. *Psychological Assessment*, *27*, 1129–1146. doi:10.1037/pas0000111
- Billieux, J., Rochat, L., Ceschi, G., Carré, A., Offerlin-Meyer, I., Defeldre, A.-C., . . . Van der Linden, M. (2012). Validation of a short French version of the UPPS-P Impulsive Behavior Scale. *Comprehensive Psychiatry*, *53*, 609–615. doi:10.1016/j.comppsy.2011.09.001
- Bonferroni, C. E. (1936). *Teoria statistica delle classi e calcolo delle probabilita*. Libreria internazionale Seeber.
- Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford Press.
- Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications, and programming*. Thousand Oaks, CA: Sage.
- Byrne, B. M. (1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum.
- Campbell, H. L., Barry, C. L., Joe, J. N., & Finney, S. J. (2008). Configural, metric, and scalar invariance of the modified achievement goal questionnaire across African American and White University students. *Educational and Psychological Measurement*, *68*, 988–1007. doi:10.1177/0013164408318766
- Chen, F. F. (2007). Sensitivity of goodness of Fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*, 464–504. doi:10.1080/10705510701301834



- Chhabildas, N., Pennington, B. F., & Willcutt, E. G. (2001). A comparison of the neuropsychological profiles of the DSM-IV subtypes of ADHD. *Journal of Abnormal Child Psychology*, *29*, 529–540. doi:10.1023/a:1012281226028
- Crone, E. A., Jennings, R. J., & van der Molen, M. W. (2003). Sensitivity to interference and response contingencies in attention-deficit/hyperactivity disorder. *Journal of Child Psychology and Psychiatry*, *44*, 214–226. doi:10.1111/1469-7610.00115
- Cyders, M. A., & Smith, G. T. (2007). Mood-based rash action and its components: Positive and negative urgency. *Personality and Individual Differences*, *43*, 839–850.
- Cyders, M. A., & Smith, G. T. (2008). Emotion-based dispositions to rash action: Positive and negative urgency. *Psychological Bulletin*, *134*, 807–828. doi:10.1037/a0013341
- Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: Development and validation of a measure of positive urgency. *Psychological Assessment*, *19*, 107–118. doi:10.1037/1040-3590.19.1.107
- D’Orta, I., Burnay, J., Aiello, D., Niolu, C., Siracusano, A., Timpanaro, L., . . . Billieux, J. (2015). Development and validation of a short Italian UPPS-P Impulsive Behavior Scale. *Addictive Behaviors Reports*, *2*, 19–22. doi:10.1016/j.abrep.2015.04.003
- Evenden, J. L. (1999). Varieties of impulsivity. *Psychopharmacology*, *146*, 348–361. doi:10.1007/pl00005481
- Gay, P., Rochat, L., Billieux, J., d’Acremont, M., & Van der Linden, M. (2008). Heterogeneous inhibition processes involved in different facets of self-reported impulsivity: Evidence from a community sample. *Acta Psychologica*, *129*, 332–339. doi:10.1016/j.actpsy.2008.08.010
- Gentile, D., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: A two-year longitudinal study. *Pediatrics*, *127*, 219–329. doi:10.1542/peds.2010-1353

- George, D., & Mallery, P. (2016). *IBM SPSS Statistics 23 step by step: A simple guide and reference*. New York: Routledge.
- Geurten, M., Catale, C., Geurten, C., Wansard, M., & Meulemans, T. (2016). Studying self-awareness in children: validation of the Questionnaire of Executive Functioning (QEF). *The Clinical Neuropsychologist*, *30*, 558–578. doi:10.1080/13854046.2016.1178331
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*, 1–55. doi:10.1080/10705519909540118
- Kämpfe, N., & Mitte, K. (2009). A German validation of the UPPS Impulsive Behavior Scale. *European Journal of Psychological Assessment*, *25*, 252–259. doi:10.1027/1015-5759.25.4.252
- Magid, V., & Colder, C. R. (2007). The UPPS Impulsive Behavior Scale: Factor structure and associations with college drinking. *Personality and Individual Differences*, *43*, 1927–1937. doi:10.1016/j.paid.2007.06.013
- Marmorstein, N. R. (2013). Associations between dispositions to rash action and internalizing and externalizing symptoms in children. *Journal of Clinical Child and Adolescent Psychology*, *42*, 131–138. doi:10.1080/15374416.2012.734021
- Miller, J., Derefinko, K. J., Lynam, D. R., Milich, R., & Fillmore, M. T. (2010). Impulsivity and attention deficit-hyperactivity disorder: Subtype classification using the UPPS Impulsive Behavior Scale. *Journal of Psychopathology and Behavioral Assessment*, *32*, 323–332. doi:10.1007/s10862-009-9155-z
- Muthén, L., & Muthén, B. (2007). *Mplus statistical software*. Los Angeles, CA: Muthén & Muthén.
- Owens, J. S., Goldfine, M. E., Evangelista, N. M., Hoza, B., & Kaiser, N. M. (2007). A Critical Review of Self-perceptions and the Positive Illusory Bias in Children with ADHD. *Clinical Child and Family Psychology Review*, *10*, 335–351. doi:10.1007/s10567-007-0027-3

- Pham, A. V., Fine, J. G., & Semrud-Clikeman, M. (2011). The influence of inattention and rapid automatized naming on reading performance. *Archives of Clinical Neuropsychology, 26*, 214–224. doi:10.1093/arclin/acr014
- Pihet, S., Suter, M., Halfon, O., & Stephan, P. (2012). Profile of male adolescents with conduct disorder on intellectual efficacy, cognitive flexibility, cognitive coping, impulsivity and alexithymia: A comparison with high-risk controls. *The European Journal of Psychiatry, 26*, 215–226.
- Rice, M. E., & Harris, G. T. (2005). Comparing effect sizes in follow-up studies: ROC area, Cohen's d, and r. *Law and Human Behavior, 29*, 615–620. doi:10.1007/s10979-005-6832-7
- Rochat, L., Beni, C., Annoni, J.-M., Vuadens, P., & Van der Linden, M. (2013). How inhibition relates to impulsivity after moderate to severe traumatic brain injury. *Journal of the International Neuropsychological Society, 19*, 890–898. doi:10.1017/S1355617713000672
- Rochat, L., Beni, C., Billieux, J., Azouvi, P., Annoni, J.-M., & Van der Linden, M. (2010). Assessment of Impulsivity after moderate to severe traumatic brain injury. *Neuropsychological Rehabilitation, 20*, 778–797.
- Rochat, L., Delbeuck, X., Billieux, J., d'Acremont, M., Juillerat Van der Linden, A-C., & Van der Linden, M. (2008). Assessing impulsivity changes in Alzheimer's disease. *Alzheimer Disease & Associated Disorders, 22*, 278–283.
- Schmidt, R. E., Gay, P., d'Acremont, M., & Van der Linden, M. (2008). A German adaptation of the UPPS Impulsive Behavior Scale: Psychometric properties and factor structure. *Swiss Journal of Psychology, 67*, 107–112. doi:10.1024/1421-0185.67.2.107
- Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling* (3rd ed.). New York: Routledge.

- Smith, G. T., Fischer, S., Cyders, M. A., Annus, A. M., Spillane, N. S., & McCarthy, D. M. (2007). On the validity and utility of discriminating among impulsivity-like traits. *Assessment, 14*, 155–170. doi:10.1177/1073191106295527
- Smith, G. T., McCarthy, D. M., & Anderson, K. G. (2000). On the sins of short-form development. *Psychological Assessment, 12*, 102–111. doi:10.1037/1040-3590.12.1.102
- Smith, M., III, Schiano, A., & Lattanzio, E. (2014). Beyond the classroom. *Knowledge Quest, 42*, 20–29.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2*, 53–55. doi:10.5116/ijme.4dfb.8dfd
- Vandenberg, R. J., & Lance, C. E. (2000). A Review and Synthesis of the Measurement Invariance Literature: Suggestions, Practices, and Recommendations for Organizational Research. *Organizational Research Methods, 3*, 4–70. doi:doi:10.1177/109442810031002
- Van der Linden, M., d'Acremont, M., Zermatten, A., Jermann, F., Larøi, F., Willems, S., . . . Bechara, A. (2006). A French adaptation of the UPPS Impulsive Behavior Scale. *European Journal of Psychological Assessment, 22*, 38–42. doi:10.1027/1015-5759.22.1.38
- Van Overschelde, J. P., & Nelson, T. O. (2006). Delayed judgments of learning cause both a decrease in absolute accuracy (calibration) and an increase in relative accuracy (resolution). *Memory & Cognition, 34*, 1527–1538. doi:10.3758/bf03195916
- Verdejo-García, A., Lozano, Ó., Moya, M., Alcázar, M. Á., & Pérez-García, M. (2010). Psychometric properties of a Spanish version of the UPPS–P Impulsive Behavior Scale: Reliability, validity and association with trait and cognitive impulsivity. *Journal of Personality Assessment, 92*, 70–77. doi:10.1080/00223890903382369
- Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30*, 669–689. doi:10.1016/S0191-8869(00)00064-7

- Whiteside, S. P., Lynam, D. R., Miller, J. D., & Reynolds, S. K. (2005). Validation of the UPPS Impulsive Behaviour Scale: A four-factor model of impulsivity. *European Journal of Personality, 19*, 559–574. doi:10.1002/per.556
- Wilbertz, T., Deserno, L., Horstmann, A., Neumann, J., Villringer, A., Heinze, H.-J., . . . Schlagenhaut, F. (2014). Response inhibition and its relation to multidimensional impulsivity. *NeuroImage, 103*, 241–248. doi:10.1016/j.neuroimage.2014.09.021
- Zapolski, T. C. B., & Smith, G. T. (2013). Comparison of parent versus child-report of child impulsivity traits and prediction of outcome variables. *Journal of Psychopathology and Behavioral Assessment, 35*, 301–313. doi:10.1007/s10862-013-9349-2
- Zapolski, T. C. B., Stairs, A. M., Fried Settles, R., Combs, J. L., & Smith, G. T. (2010). The measurement of dispositions to rash action in children. *Assessment, 17*, 116–125. doi:10.1177/1073191109351372

## Appendix A

### *English version of the short UPPS-P-C (not validated)*

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#### Items

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1. Before doing something, I think about it a lot.
2. When I'm really happy, I do not necessarily think about the consequences of my actions (R).
3. From time to time, I like doing things that are a bit frightening (R).
4. When I'm in a bad mood, I act without thinking (R).
5. I usually prefer to finish what I've started.
6. I usually think in a careful, organized way.
7. When I'm arguing, I often say things that I regret later (R).
8. I finish what I've started.
9. I like taking risks (R).
10. When I'm very happy, I have trouble controlling myself (R).
11. Once I have started an exercise or homework, I almost always finish it.
12. When I'm in a bad mood, I often make things worse because I act without thinking (R).
13. Usually, I make decisions after a lot of thought.
14. I usually look for new and exciting things (R).
15. When I'm really happy, I act without thinking (R).
16. I'm an efficient person, and I always complete my work.
17. When I feel rejected, I often say things that I regret later (R).
18. I like new experiences and feelings even if they frighten me or are a bit against the rules (R).
19. Before making a decision, I think about all the good and bad things that could happen.
20. When I'm very happy, it seems normal to just do whatever I want (R).

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Note. (R) = reversed item

## Appendix B

### *French version of the short UPPS-P-C*

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#### Items

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1. D'habitude, je réfléchis longtemps avant de faire quoi que ce soit.
2. Quand je suis vraiment très content(e), j'ai tendance à ne pas penser aux conséquences de mes actions (R).
3. J'aime parfois faire des choses qui font un petit peu peur (R).
4. Quand je suis de mauvaise humeur, j'agis souvent sans réfléchir (R).
5. Je préfère généralement mener les choses jusqu'au bout.
6. Ma manière de penser est en général réfléchie et organisée.
7. Quand il y a une dispute, je dis souvent des choses que je regrette ensuite (R).
8. Je finis ce que je commence.
9. J'aime prendre des risques (R).
10. Quand je suis vraiment très content(e), j'ai de la peine à me contrôler (R).
11. Une fois que je commence un exercice ou un devoir, je le termine presque toujours.
12. J'aggrave souvent les choses parce que j'agis sans réfléchir quand je suis de mauvaise humeur (R).
13. D'habitude je me décide après avoir beaucoup réfléchi.
14. Je recherche généralement à faire des choses nouvelles et excitantes (R).
15. Quand je suis vraiment très content, j'agis souvent sans réfléchir (R).
16. Je suis quelqu'un d'efficace qui termine toujours son travail.
17. Quand je me sens rejeté(e), je dis souvent des choses que je regrette ensuite (R).
18. J'aime les nouvelles expériences et les nouvelles sensations même si elles font peur et si elles sont un peu en dehors des règles (R).
19. Avant de me décider, je pense à toutes les choses positives et négatives qui pourraient arriver.
20. Quand je suis très heureux/heureuse, j'ai l'impression qu'il est normal de céder à ses envies ou de faire tout ce qu'on veut (R).

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Note. (R) = reversed item

Table 1

*Results of the Item Response Analysis for Each Item of the Short UPPS-P-C.*

Item	Level	Rate	Item	Level	Rate	Item	Level	Rate	Item	Level	Rate
q1	1	0.13	q6	1	0.24	q11	1	0.53	q16	1	0.35
	2	0.49		2	0.43		2	0.25		2	0.38
	3	0.29		3	0.21		3	0.09		3	0.19
	4	0.09		4	0.12		4	0.13		4	0.09
q2	1	0.16	q7	1	0.12	q12	1	0.17	q17	1	0.20
	2	0.24		2	0.17		2	0.28		2	0.20
	3	0.35		3	0.27		3	0.32		3	0.28
	4	0.25		4	0.44		4	0.23		4	0.31
q3	1	0.12	q8	1	0.43	q13	1	0.28	q18	1	0.09
	2	0.14		2	0.32		2	0.35		2	0.21
	3	0.37		3	0.17		3	0.25		3	0.32
	4	0.36		4	0.09		4	0.12		4	0.38
q4	1	0.07	q9	1	0.15	q14	1	0.03	q19	1	0.29
	2	0.24		2	0.24		2	0.16		2	0.34
	3	0.38		3	0.33		3	0.40		3	0.25
	4	0.31		4	0.28		4	0.41		4	0.12
q5	1	0.39	q10	1	0.26	q15	1	0.19	q20	1	0.17
	2	0.33		2	0.25		2	0.23		2	0.32
	3	0.20		3	0.31		3	0.38		3	0.33
	4	0.08		4	0.18		4	0.20		4	0.18

*Note.* Level = each level of the 4-point Likert scale; Rate = Rate of participants who selected each level of the 4-point Likert scale.



Table 2

*Means, Standard Deviations, Positive, and Negative Predictive Values for Each Subscale of the Short UPPS-P-C*

	Control (n=31)	ADHD (n=31)	PPV	NPV
Lack of premeditation (cutoff score > 8.5)	8.19 (2.93)	10.39 (2.68)	71	65
Sensation seeking (cutoff score > 11.5)	11.58 (3.09)	11.74 (2.49)	55	58
Positive urgency (cutoff score > 10.5)	8.52 (2.79)	11.94 (2.45)	78	84
Negative urgency (cutoff score > 11.5)	10.26 (2.87)	12.29 (2.71)	70	65
Lack of perseveration (cutoff score > 7.5)	8.19 (2.93)	9.32 (3.50)	80	64
Total score (cutoff score > 47.5)	46.84 (7.85)	55.68 (8.78)	87	65

*Note.* PPV = Positive predictive value; NPV = Negative predictive value

### Figure captions

Figure 1. The five-factor model in which latent variables are represented by ovals and manifest variables are represented by rectangles. Arrows represent standardized factor loading.

