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The Junior Temperament and Character Inventory (JTCI): Psychometric Properties of Multi-Informant Ratings

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Abstract

The aims of the study were (a) to establish norms for the Swedish child self-report and caregiver rating versions of the Junior and Temperament Character Inventory (JTCI) among young adolescents; (b) to investigate its psychometric properties; and (c) to investigate congruence between children's self-reports and caregivers' ratings of a child's personality. The sample was a general population of 1046 children aged from 12 to 14 years and 654 caregivers JTCI was found to be reliable on all dimensions except Persistence in the child self-report version. Caregivers rate their own children's personalities as more mature than the children themselves. Caregivers especially overestimate their daughters' self-reported capabilities for self-acceptance and self-efficacy and might have underestimated their daughters' need for emotional support. This highlights the importance of including the child's self-report on personality in both research and clinical assessments. The results also support the importance of age- and gender-separated norms.

Keywords: Adolescence; multi-informant; The Junior Temperament and Character Inventory (JTCI); psychometric properties; Longitudinal Research program on Development In Adolescence (LoRDIA)

Public Significance Statement: This study found that the Swedish version of Junior Temperament and Character Inventory (JTCI) is a reliable assessment of young adolescents' personality on most dimensions. However, caregivers tend to overestimate their daughters' capabilities for self-acceptance and self-efficacy and might underestimate their daughters' need for emotional support.

The Junior Temperament and Character Inventory (JTCI) (Luby, Svrakic, McCallum, Przybeck, & Cloninger, 1999) is an adapted version for children and adolescents of The Temperament and Character Inventory (TCI) (Cloninger, Przybeck, Švrakić, & Richard, 1994; Cloninger, Švrakić, & Przybeck, 1993). The inventory consists of four dimensions of temperament (Novelty Seeking [NS], Harm Avoidance [HA], Reward Dependence [RD] and Persistence [P]) and three of character (Self Directedness [SD], Cooperativeness [CO] and Self-Transcendence [ST]) to describe the underlying structure of an individual's personality.

The JTCI comes in a self-report version and a caregiver rating version. Research on the JTCI is emerging, and the instrument has been investigated psychometrically among children and adolescents in clinical samples (e.g. Hemphälä, Gustavsson, & Tengström, 2012), general samples (Andriola et al., 2012; Asch et al., 2009; Luby et al., 1999; Lyoo et al., 2004; Vangberg et al., 2013), and twin samples (e.g. Kerekes et al., 2010). However, norms and psychometric validation for the Swedish self-report version of JTCI are still lacking, as are norms for caregiver ratings of adolescents aged 12 to 14 years. Regarding the congruence between children´s and caregivers ratings, to our knowledge, only one study has investigated the 108 items self-report version and the caregiver version parallel in a general sample. The results showed that children's scores were higher on NS, RD, P, and ST in comparison to their caregivers (Lyoo et al., 2004). Comparison analyses, using a slightly different version of JTCI have been conducted in France (Asch et al., 2009) showing moderate correlations between children's self-reports and caregiver's ratings. Gender differences in JTCI test scores have been found on HA and NS, with girls reporting higher levels on HA and boys reporting higher levels on the NS scale (Andriola et al., 2012).

The aim of present study was three-fold: (a) to establish norms for the Swedish self-report and caregiver versions of JTCI among adolescents aged 12 to 14 years; (b) to investigate the

psychometric properties of both the self-report and caregiver versions of the JTCI; and (c) to investigate the congruence between children's self-reports and caregiver ratings of the JTCI. Gender analyses were conducted throughout the study. We hypothesized that children's self-reports and their caregiver's ratings would overlap moderately but articulated no hypotheses regarding potential differences between caregivers' rating of sons and caregivers' rating of daughters.

Method

This study is a part of the ongoing prospective longitudinal program Longitudinal Research on Development In Adolescence (LoRDIA). The research program is carried out in four small to middle-sized municipalities in Sweden, for details see Boson, Berglund, Wennberg, & Fahlke (2016).The Regional Research Ethics Board in Gothenburg, Sweden approved the study (No. 362-13; 2014-05-20). Young adolescents aged 12-14 are an under-studied age group due to ethical considerations and caregiver's consent. The majority of studies therefore include adolescents aged 15 and older when they are allowed to participate without their caregiver's permission. The ability to study personality in young adolescents is exclusive and can provide knowledge about the importance of personality dimensions in development.

For the present study originally 1449 adolescents (aged 12–14) who had answered the JTCI were included. However, 403 of these had missing information about the child's age and gender and/or more than 5% of items missing and/or incorrectly answered on control items. Thus, the actual adolescent study group included 1046 (girls 582 [56%]; boys: 464 [44%]), mean ages (standard deviations) were 13.4 years (0.6) for girls and 13.3 (0.6) for boys. Approximately 74% had caregivers (parental figures) who lived together.

The sample also included 654 caregiver ratings (originally the caregiver sample was 709, but 56 were excluded due to missing information about the child's age and gender and/or

more than 5% of items missing and/or incorrectly answered on control items). All participants with a valid self-report and a valid and overlapping caregiver rating were included in the comparison analyses. Double ratings on one child let to systematic exclusion of one of the parent ratings. Father ratings were systematically saved due to under representation of fathers in the sample. However, this was the case only in approximately 10 cases. We believe that the sample size is large enough to correct any problematic dependencies caused by caregivers having more than one child in these age groups. The final subsample for comparison analyses consisted of 481 adolescents (girls: 275 [57 %]; boys: 206 [43 %]) and 481 caregivers (313 mothers, 63 fathers, 87 joint caregivers, one "other caregiver," and 17 unclassified caregivers).

Data were collected over four weeks in October and November, 2014. Initially, all caregivers and children received an information letter that briefly explained the purpose of the study. Passive consent from the caregiver was requested for the children's participation, as well as written consent from the adolescent on the day of the survey. JTCI was administered at schools in classrooms. Absent students were posted the survey to their homes by regular mail. See Boson et al. (2016) for a more detailed description of the procedure.

The caregivers also received a paper survey by regular mail parallel to the data collection in their children's schools. Joint caregivers could choose to answer the survey about their child together or fill in the questionnaire separately.

The Swedish JTCI is a translation of the original American version (Luby et al. 1999) and was developed in several steps, including translation, back-translation, and population-testing according to Brislin's (1976) recommendations and best practice. There are no earlier Swedish versions of the JTCI self-report and already exciting versions in Sweden are caregiver rating versions. It is therefore well justified to use these norms for this translation of JTCI in Sweden.

The self-reported and caregiver versions of JTCI each consist of 108 items to be answered as “true” or “false” (see Table 1 for number of items in each dimension). The two versions are almost identical except for modification of pronouns.

For investigating psychometric properties, internal consistency, correlation patterns, and convergent validity were analyzed. Approximately .6 or less was used for adequate internal consistency. The JTCI does not include sub-dimensions compared to the 240-item adult TCI; thus the JTCI-subscales aim to capture a broader breadth of the construct with the selected items. It was therefore suitable to accept a lower Cronbach's alpha than 0.7 which is often the cut-off for acceptable internal consistency. Multivariate analyses of variances (MANOVA) were used to investigate age and gender distributions and their impact on JTCI dimensions. Paired-sample *t*-tests were conducted to compare children’s self-reports with their caregivers’ ratings on JTCI. All analyses were conducted with SPSS (version 22.0, 2013).

Results

Sample descriptors (means and standard deviations) and internal consistency of the self-report and caregiver versions of the JTCI are presented in Table 1. Cronbach’s alpha scores of the JTCI dimensions for the child self-report version ranged from 0.28 (P) to 0.82 (HA) for the temperament dimensions and from 0.63 (CO) to 0.72 (SD) for the character dimensions, as shown in Table 1.The Average Inter-Item Correlations ranged from 0.06 (P) to 0.19 (ST) for children. Norms for caregiver ratings were higher in NS, RD, SD, and CO and lower in HA, P, and ST than the norms on the children’s self-reports. For the sample of caregivers, the alpha scores ranged from 0.52 (RD) to 0.82 (HA) for the temperament dimensions and 0.65 (ST) to 0.80 (SD) for the character dimensions. Cronbach’s alpha values are dependent on both the number of items within the scale as well as the correlation strength between the items included in the scale. The Average Inter-Item Correlations for caregivers ranged from 0.11 (RD) to 0.19 (P). The lowest alpha coefficient in the results of the child version was on

P (0.28), which included fewer items than the other scales. Removal of single items did not affect the alpha value on the P dimension, and thus, revisions of single items would not increase the internal consistency. For the caregivers, these results improved on P from 0.50 to 0.52, which was one of the lowest alpha coefficients in all dimensions. Hence, the internal consistency could be increased by removing or revising some of the items in the caregiver rating version.

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Insert Table 1 about here

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We used MANOVA to investigate personality differences using the personality dimensions as dependent variables and age cohort and gender as independent variables (Table 2). Significant main effects of gender were found on NS, HA, RD, and CO, where girls rated themselves as lower than boys on NS and higher on HA, RD, and CO. A main effect of age was also found as NS increased with age. One significant interaction effect was also found between age and gender on NS. A significant interaction effect on gender and age was found on NS. The between-subject effect on age was mainly for the girls on NS, where the mean results on this dimension increased from 5.6 (12 years) to 7.8 (14 years), as seen in Table 1.

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Insert Table 2 about here

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According to the correlation pattern, significant relationships with $r > 0.30$ consistently emerged for both children's and caregivers' results between SD and HA, RD, P, and CO, and between CO and NS, RD, and SD (Table 3). However, the inconsistency in the correlation pattern between children and caregivers were mainly on the magnitude level and not on the overall pattern of correlations.

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Insert Table 3 about here

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Comparisons and evaluations of the similarities between children's self-reports and their caregiver's ratings are seen in Table 4. The results showed that caregivers of daughters perceived their child higher in NS, RD, SD, and CO and lower in HA and ST compared to caregivers of sons. Caregivers of sons rated their child higher on RD, SD, and CO and lower on HA, P, and ST compared to caregivers of daughters. The differences were significant and the effects ranged from very small to large.

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Insert Table 4 about here

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Discussion

This study provides norms for the Swedish JTCI child self-report version and the caregiver rating version for adolescents aged from 12 to 14 years. The JTCI dimensions showed fair to good internal consistency, except that Persistence in children's self-reports showed low internal consistency. These results are similar to the Korean study, which also reported the lowest Cronbach's alpha value for the Persistence dimension (Lyoo et al., 2004). The low internal consistency is potentially due to the low number of items included (i.e., 6 for Persistence compared with 22 for Harm Avoidance). The questions concerning Persistence might be difficult for adolescents aged 12 to 14 years to understand, although the internal consistency was questionable in the caregiver version as well. We conclude that the internal structure of the JTCI as a whole is satisfactory, but the temperament dimension Persistence does not form a reliable construct in the Swedish self-report version in these age groups. Furthermore, low levels on the Average Inter-Item Correlations might reflect that items in the

JTCI-dimensions are based on different constructs (subscales) according to the biopsychosocial model of personality (Cloninger et al., 1994). A sample consisting of wider range of age groups is needed before revision and/or expansion of the Persistence dimension can be performed.

The multivariate analyses on age and gender effects showed that boys had significantly higher scores on NS than girls and girls reported higher scores in HA, RD, and Cooperativeness, which are consistent with findings in the adult version (Brändström, Richter, & Przybeck, 2001). These findings are comparable to observations on mental health problems. Consistent gender differences have been reported, with boys having higher degree of externalizing (hyperactivity, aggression) problems and girls having more internalizing (anxiety, depression) problems (Berlin, Modin, Gustafsson, Hjern, & Bergström, 2012; Boson et al., 2016). The analyses also showed large age and interaction effects, gender x age on Novelty Seeking indicating higher levels of novelty seeking behavior by age, especially for girls. The above differences highlight the importance of age- and gender specific norms of the JTCI, as recommended previously (Brändström et al., 2008).

The correlation structure corresponds well to previously reported observations on Cloninger's biopsychosocial model of personality among children and adolescents in community samples (Andriola et al., 2012; Asch et al., 2009; Luby et al., 1999; Lyoo et al., 2004; Vangberg et al., 2013). The correlations between the seven dimensions are weak to moderate. However, the moderately strong negative correlations between the temperament dimension of HA and the character dimension of SD indicate that these dimensions are intertwined and might be difficult for both the child and the caregiver to discriminate. Similar results in elder adolescents have been reported by (Vangberg et al., 2013) in a Norwegian sample. The moderately positive relations between SD and P and SD and CO also indicate that these constructs are related. Still, it is likely that correlations between these dimensions

may be due to interactions of various behaviors in the development of personality over time. In fact, SD and CO correlates significantly, though only moderately, with almost all the other temperament and character dimensions. The exception is the relation between CO and ST, which had zero correlation on both the children's and caregiver's ratings. Comparable findings on the JTCI have previously been reported (Andriola et al., 2012; Luby et al., 1999; Lyoo et al., 2004; Vangberg et al., 2013).

Concordance between children's self-reports and caregivers' ratings on their child's personality are modest and similar to previous research on spouses (Brändström et al., 2008) and child-parent-dyads (Lyoo et al, 2004). Our findings display differences with small to large effect sizes between the children's own reports on temperament and character traits and their caregiver's ratings. It seems that caregivers tend to overestimate their child's SD (i.e., ability to maneuver behavior and degree of self-acceptance and self-efficacy) and to underestimate the child's HA (i.e., anxiety and fear of the unknown). These results are especially noticeable among caregivers' ratings of girls. Caregivers also seem to underestimate their sons' ability on P (i.e., endurance in problem solving and commitment to tasks and goals despite frustration and fatigue). The same dissonance between caregivers' and their daughters' estimations did not exist even though girls and boys reported similar mean scores on Persistence. This highlights the importance of including the child's self-report on personality in both research and clinical settings.

A general pattern emerged in the comparison analyses, implying that caregivers rate their children as slightly more NS (i.e., active, impulsive, and in need of exploration) than the children self-report. Caregivers also rate their children as higher on RD (more reward seeking, with a higher level of attachment and social dependence) than the children report. The caregivers also rated the children higher (although with a small effect) on CO (ability to cooperate with, accept, and help others) and significantly lower on ST (spiritualism and

ability to experience a larger universal perspective) than the children themselves reported. This latter result was surprising, and even though the mean scores on ST were relatively low, these results might indicate that parents lack insight into their children's spiritual life. These results on personality ratings agree with the literature, in which a relatively low congruence between children's and caregivers' reports on a child's mental health problems (worry, anxiety, and depressive symptoms) have been reported (Waaktaar, Borge, Christie, & Torgersen, 2005).

When interpreting our findings, some limitations should be considered. First, even though valid measures were used, the data for this study were based on self-reported information that should be treated with caution when interpreting the results. The lack of external (to the JTCI) criterion measures is also a limitation. However, we believe that the study has strength in the multi-informant design with nearly 500 pairs of reports from both child and caregiver.

It is also worth noting that only adolescents with a valid self-report, 1046 (72 %) of the original 1449, were included in the analyses and of the originally 709 caregivers, only 654 were included for the norm data and 481 for the comparison analysis. There are several potential explanations for the more than 5% missing items and wrong answers on the control items. Children with reduced reading and/or concentration capabilities might have missed items and/or misinterpreted the control items that required them to answer true or false on certain questions. Missing items and incorrect answers on the control items might also be an indication of defiance. Further studies on how conduct problems and hyperactivity/inattention problems might be related to JTCI answering style are needed. Finally, it is important to recognize that personality, though apparent in early childhood, it is not stable until early adulthood and can continue to develop across the life course (Brändström et al., 2008).

The JTCI provides a complete inventory of both the adolescents' temperment (i.e., automatic emotional drives) and character (i.e., voluntary behavior and values). The Swedish

JTCI shows reliable test scores on all dimensions except Persistence on the child self-report version in age groups of 12 to 14 years. Further evaluation in a wider range of age groups, which could lead to revision and expansion of this dimension, is suggested. The results also support the assumption that age and gender separated norms are important.

It is recommended to further examine the structure of the JTCI, especially longitudinally, to be able to evaluate children's personality development (i.e., maturity) and its effect on psychometrics. Swedish caregivers tend to rate their children's personality as more mature (higher scores on SD and CO) than the children themselves. Caregivers especially tend to overestimate their daughters' self-reported capabilities for self-acceptance and self-efficacy and to possibly underestimate their daughters' needs for emotional support. These results are likely to go beyond a Swedish setting and highlights the importance of including the child's self-report on personality in both research and clinical settings. The child's own voice is essential if caregivers and adults aim to draw conclusions about the child's psychological constitution and perception of the world.

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Table 1. *Sample descriptors for JTCI self-report and caregiver versions*

Child self-report (n = 1046)				Girls			Boys		
Age				12 (n = 36)	13 (n = 280)	14 (n = 266)	12 (n = 33)	13 (n = 249)	14 (n = 182)
Personality dimensions	No of item	α	Average Inter-Item Correlation	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD
Novelty Seeking	18	.68	.11	5.6 ± 3.2	7.0 ± 3.4	7.0 ± 3.3	7.0 ± 3.7	7.9 ± 3.2	7.8 ± 3.1
Harm Avoidance	22	.82	.17	7.7 ± 3.7	7.9 ± 4.6	7.9 ± 4.6	5.0 ± 4.0	5.7 ± 4.0	6.4 ± 4.2
Reward Dependence	9	.53	.11	4.6 ± 2.2	5.1 ± 2.0	5.0 ± 1.9	3.6 ± 1.6	3.9 ± 1.9	3.7 ± 1.8
Persistence	6	.28	.06	3.3 ± 1.5	3.6 ± 1.4	3.5 ± 1.3	3.9 ± 1.1	3.5 ± 1.4	3.6 ± 1.3
Self-Directedness	20	.72	.12	13.9 ± 3.2	14.3 ± 3.6	13.7 ± 3.5	14.5 ± 3.0	14.1 ± 3.4	14.0 ± 3.4
Cooperativeness	20	.63	.08	15.8 ± 2.9	15.5 ± 2.6	15.5 ± 2.7	14.7 ± 2.8	14.3 ± 3.0	14.6 ± 3.1
Self-Transcendence	10	.69	.19	3.9 ± 2.1	3.9 ± 2.4	4.1 ± 2.4	3.8 ± 2.5	3.7 ± 2.3	3.8 ± 2.3

Caregiver rating (n = 652)									
Age				12 (n = 26)	13 (n = 178)	14 (n = 144)	12 (n = 18)	13 (n = 164)	14 (n = 122)
Personality dimensions	No. of items	α	Average Inter-Item Correlation	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD
Novelty Seeking	18	.72	.12	7.8 ± 4.0	7.9 ± 3.1	7.6 ± 3.3	6.6 ± 3.1	8.5 ± 3.4	8.3 ± 3.9
Harm Avoidance	22	.82	.17	4.7 ± 3.5	5.4 ± 3.8	5.2 ± 4.0	4.4 ± 2.7	5.0 ± 3.9	5.2 ± 3.7
Reward Dependence	9	.52	.11	5.3 ± 1.8	5.3 ± 1.7	5.2 ± 1.9	4.1 ± 1.4	4.3 ± 1.8	4.3 ± 1.8
Persistence	6	.58	.19	3.0 ± 1.4	3.2 ± 1.6	3.4 ± 1.7	2.2 ± 1.7	2.5 ± 1.6	2.7 ± 1.6
Self-Directedness	20	.80	.18	16.0 ± 3.4	16.1 ± 3.4	16.2 ± 3.5	15.3 ± 3.4	14.9 ± 3.8	15.3 ± 3.7
Cooperativeness	20	.70	.12	16.8 ± 2.7	16.7 ± 0.4	16.7 ± 2.5	16.4 ± 3.6	15.8 ± 3.1	15.2 ± 3.0
Self-Transcendence	10	.65	.17	1.8 ± 1.6	2.1 ± 1.9	1.9 ± 1.9	1.4 ± 1.8	1.8 ± 1.8	1.4 ± 1.6

Table 2. *Multivariate and between-subjects effects of JTCI dimensions. (age groups 12 to 14 years; n = 1046)*

	Multivariate				Between-Subject Effects (F-scores)						
Source	Pillai's Trace	F	Df[a]	η^2.	NS	HA	RD	PS	SD	CO	ST
Gender[b]	.10	16.92***	7/1034	.103	6.60**	28.88***	42.85***	3.06	0.52	17.64***	0.94
Age[b]	.03	2.20**	14/2070	.015	6.37**	1.34	1.82	0.00	1.34	0.47	0.68
Gender*Age[b]	.01	0.94	14/2070	.006	3.04*	0.84	0.16	2.13	0.61	0.43	0.09

Note. Multivariate F ratios were generated using Pillai's statistic.

[a]df for multivariate tests

[b]between-subject effects for gender: df = 1; for age and gender*age, df = 2.

*p <.05. **p <.01. ***p <.001.

Table 3. *Pearson Correlation between JTCI dimensions for children (lower left) and caregivers (upper right).*

Caregivers (n = 652)	Novelty Seeking	Harm Avoidance	Reward Dependence	Persistence	Self-Directedness	Cooperativeness	Self-Transcendence
Children (n = 1046)							
Novelty Seeking		−0.24**	−0.07	**−0.33****	−0.25**	**−0.30****	−0.01
Harm Avoidance	−0.07*		−0.27**	−0.11**	**−0.46****	−0.24**	0.21**
Reward Dependence	−0.17**	−0.21**		0.19**	**0.39****	**0.37****	−0.07
Persistence	−0.27**	−0.26**	0.11**		**0.48****	**0.33****	−0.02
Self-Directedness	**−0.31****	**−0.51****	**0.30****	**0.39****		**0.50****	−0.23**
Cooperativeness	**−0.38****	−0.17**	**0.30****	0.25**	**0.46****		0.00
Self-Transcendence	0.07*	0.24**	−0.11**	−0.07*	−0.23**	−0.06	

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Only correlation ≥ 30 in **boldface**.

Table 4. *Comparison between child self-report and caregiver rating on JTCI dimensions, paired samples. (n = 481)*

	Child		Caregiver			
	Girl (n = 275) Mean ± SD	Boy (n = 206) Mean ± SD	Girl (n = 275) Mean ± SD	Boy (n = 206) Mean ± SD	ES Cohen's *d* Girl	Boy
Novelty Seeking	7.1 ± 3.3	7.7 ± 3.2	7.7 ± 3.3*	8.0 ± 3.4	−0.18	-
Harm Avoidance	7.7 ± 4.5	5.7 ± 4.2	5.4 ± 3.9***	5.0* ± 3.6*	0.56	0.17
Reward Dependence	5.0 ± 2.0	3.9 ± 1.8	5.3 ± 1.7*	4.4 ± 1.7**	−0.18	−0.29
Persistence	3.5 ± 1.4	3.6 ± 1.3	3.4 ± 1.6	2.7 ± 1.6***	-	0.63
Self-Directedness	14.3 ± 3.5	14.4 ± 3.3	16.3 ± 3.3***	15.5 ± 3.7***	−0.57	−0.32
Cooperativeness	15.9 ± 2.4	14.9 ± 3.1	16.7 ± 2.5***	15.7 ± 3.0**	−0.32	−0.26
Self-Transcendence	4.0 ± 2.4	3.6 ± 2.3	2.0 ± 1.9***	1.6 ± 1.7***	0.91	0.99

*p <.05. **p <.01. ***p <.001.

Note. For Cohen's *d* an effect size of 0.2 to 0.3 can be interpreted as "small," around 0.5 as "medium," and 0.8 to infinity as "large" (Cohen, 1988).