

Methodology

## The External Validity of Sluggish Cognitive Tempo Versus Inattention in Behavioral, Social Interaction, and Academic Performance Measures

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### ABSTRACT

**Background:** The main objective was to replicate data on the external validity of the Sluggish Cognitive Tempo (SCT) dimension, versus ADHD Inattention (IN), with the Spanish version of the Child and Adolescent Behavior Inventory (CABI) SCT subscale [*Cuestionario sobre el Comportamiento de Niños*] (Burns et al., 2015). **Method:** 273 mothers and 255 fathers evaluated their 9 to 13 year old children on SCT, IN and other CABI internalizing, externalizing, academic impairment and social interaction measures. **Results:** As hypothesized, the relationship between SCT and externalizing measures, in contrast to IN, was practically nonexistent, whereas both measures were related to internalizing and social interaction measures. Thus, the unique predictive capacity of SCT and IN was significant and similar on internalizing measures, except in the case of shyness, where SCT was better, while IN was better on externalizing measures. **Conclusions:** The data largely replicated previous results: SCT, despite its relationship with IN, is capable of predicting a significant proportion of anxiety, depression, and excessive shyness problems and, unlike IN, functions as a protective measure for externalizing problems.

## La Validez Externa del Tempo Cognitivo Lento Frente a la Inatención en Medidas Comportamentales, de Interacción Social y de Rendimiento Académico

### RESUMEN

**Antecedentes:** El objetivo principal del presente trabajo ha sido replicar datos de la validez externa de la dimensión Tempo Cognitivo Lento (TCL), frente a inatención del TDAH (IN), con la versión española de la medida del TCL del Child and Adolescent Behavior Inventory (CABI) [*Cuestionario sobre el Comportamiento de Niños*] (Burns et al., 2015). **Método:** 273 madres y 255 padres evaluaron a sus hijos entre 9 y 13 años en TCL, IN y otras medidas internalizadas, externalizadas, de dificultades académicas e interacción social del CABI. **Resultados:** La relación de TCL con las medidas externalizadas, al contrario de IN, fue prácticamente nula, en cambio ambas medidas se relacionaron con las medidas internalizadas y de interacción social. La capacidad predictiva única de TCL e IN fue significativa y similar sobre las medidas internalizadas, excepto en el caso de timidez, donde TCL fue superior y, en cambio, en las medidas externalizadas fue superior IN. **Conclusiones:** Los datos replican en gran parte los resultados previos: el TCL, a pesar de su relación con IN, es capaz de predecir una parte significativa de problemas de ansiedad, depresión y timidez excesiva y, en cambio, al contrario de IN, resulta una medida protectora para los problemas externalizados.

#### Palabras clave:

Tempo Cognitivo Lento  
Child and adolescent behavior  
inventory  
Capacidad predictiva

Sluggish Cognitive Tempo (SCT) is a psychological dimension that includes, among other symptoms, excessive daydreaming, being easily confused, lost in a fog and slowed behavior/thinking (Becker, 2021; Becker & Barkley, 2018). At the end of the eighties, the possibility was floated that it might be a subtype of attention deficit hyperactivity disorder (ADHD), differentiating it from inattention by the absence of impulsivity and hyperactivity symptoms. However, this was finally discarded considering that the assumed SCT behavior overlapped with items of inattention. The same was attempted at the beginning of this century, returning to the idea of a “pure” attention disorder (Becker et al., 2014b; Milich et al., 2001), which was not accepted in the DSM-5 either, although it served to generate an important line of research that has been consolidated in recent years (Becker et al., 2014b; Becker & Barkley, 2018).

The main problem with SCT was the lack of a unified, majority-accepted measure. Based on the pioneering study by Penny et al. (2009), and especially the meta-analysis by Becker et al. (2016), a symptom and behavior base became available for evaluating SCT that could be compared to the ADHD inattention items. This base is made up of 16 items which to a greater or lesser extent have been present in the SCT measures used in recent studies. These studies have focused on: (1) analyzing the reliability and convergent and discriminant validity of SCT symptoms compared to those of ADHD inattention (IN); (2) analyzing SCT symptom invariance among raters (mainly fathers, mothers, and teachers); and (3) analyzing the unique relationship and predictive capacity of SCT and IN with other child behavior, performance and social interaction measures.

The Child and Adolescent Behavior Inventory (CABI), [*Cuestionario sobre el Comportamiento de Niños*] (Burns et al., 2015) or the Child and Adolescent Disruptive Behavior Inventory (CADBI) [*Inventario de Comportamientos Disruptivos en Niños y Adolescentes*] (Burns et al., 2001), in its original version by G. Leonard Burns (see, Burns et al., 2021b) includes one of the most widely used measures of SCT. In the first place, because it includes 15 of the 16 basic items. In the second place, because it is open access and has been adapted to different languages and cultures (Başay et al., 2021; Belmar et al., 2017; Burns et al., 2008; 2014; Jung et al., 2021; Khadka et al., 2016; Lee et al., 2018; Servera et al., 2018). And in the third place, because it has multiple psychometric data (Burns & Becker, 2019; Burns et al., 2021a; Burns et al., 2021b; Sáez et al., 2019). The CABI SCT module has been the key to showing that this measure, even though it has moderately strong correlations with ADHD inattention, has adequate factorial, convergent and discriminant validity (Becker et al., 2019; Becker et al., 2020b; Burns & Becker, 2019; Burns et al., 2014; Burns et al., 2021a; Burns et al., 2021b; Sáez et al., 2019; Servera et al., 2018). The items on the SCT scale have shown factor loadings the same or higher than about .60 with the SCT factor and lower than about .30 with the inattention factor (and the reverse in the case of ADHD inattention items). It further shows high reliability (above .90) and evidence of invariance in evaluation of the items by mothers, fathers and teachers (Sáez et al., 2019), both within and between settings (Burns et al., 2017), and is stable over time (Burns et al., 2021a).

However, for the CABI SCT scale, and other similar measures based on the same items, the challenge has been in demonstrating external validity (Becker, 2021). That is, in spite of the good

factorial data, the evident correlation between inattention measures and SCT could cause SCT not to impact significantly on other clinical behavior or the child’s performance ratings. Studies on the subject comparing the predictive capacity of both measures, while controlling for their mutual effects, point toward acceptable external validity of SCT. First, this measure has shown a unique capacity for predicting internalizing problems, especially depression and anxiety symptoms (Becker et al., 2020a; Belmar et al., 2017; Burns et al., 2017; Lee et al., 2014; Penny et al., 2009; Servera et al., 2018). Second, it seems to predict much lower scores (almost zero) on externalizing problems (hyperactivity, impulsivity or oppositional defiant) (Belmar et al., 2017; Burns & Becker, 2019; Burns et al., 2017; Fenollar Cortés et al., 2017; Khadka et al., 2016; Lee et al., 2014; Sáez et al., 2019). And third, although the results are somewhat more variable, SCT is also associated with social interaction problems and shyness (Becker et al., 2019; Burns & Becker, 2019; Firat et al., 2019; Holdaway & Becker, 2018; Lee et al., 2014; McBurnett et al., 2014; Servera et al., 2018), sleep problems (Becker et al., 2014a; Langberg et al., 2014), lower academic functioning (Becker et al., 2019; Belmar et al., 2017; Lee et al., 2018; Tamm et al., 2016) and even with neurocognitive problems (Camprodón-Rosanas et al., 2019; Jarrett et al., 2017; Kofler et al., 2019).

Although the results, most of which have been found exclusively with samples in the USA, are of interest, there are few replication studies. The CABI/CABDI is an exception, as it has been the subject of the most cross-cultural studies: Chile (Belmar et al., 2017), Nepal (Khadka et al., 2016), South Korea (Lee et al., 2017; 2018), Turkey (Başay et al., 2021) and Spain (Bernad et al., 2014; Burns et al., 2013; 2017; Fenollar Cortés et al., 2017; Preszler et al., 2019; Servera et al., 2016; 2019). However, cross-cultural studies must also be subjected to replication, and recalling the replication crisis especially affecting psychology (Diener & Biswas-Diener, 2021), special care must be taken in establishing a relatively new dimension, such as SCT.

In view of the above, the main objective of this study was to replicate some of the overall results previously found related to the external validity of the CABI SCT and its relationship with ADHD IN, especially, those derived from the study by Sáez et al., (2019) with a Spanish sample. More specifically, the following two objectives were set:

The first was to compare the correlations of the SCT and IN measures with internalizing (anxiety, depression and shyness) and externalizing (hyperactivity, oppositional defiant, and limited prosocial emotions) measures, academic and social impairment. Based on previous studies (Becker et al., 2016; Becker et al., 2019; Belmar et al., 2017; Bernad & Servera, 2016; Burns et al., 2021b; Sáez et al., 2019), the working hypotheses were, first, that there would be moderately significant and similar correlations of SCT and IN with internalizing dimensions and social impairment, and further, that the correlations of IN would be higher with externalizing dimensions and academic impairment.

The second objective consists of comparing the unique predictive capacity of SCT and IN (that is, mutually controlling for each other) of the outcome measures mentioned above. From the most consistent cross-cultural results (Belmar et al., 2017; Burns et al., 2017; Fenollar Cortés et al., 2017; Firat et al., 2019; Khadka et al., 2016; Lee et al., 2014; Sáez et al., 2019; Servera et al., 2018), we expected to confirm the following hypotheses:

- First, SCT predicts significantly and to a higher degree than IN, the internalizing dimensions, and practically no predictive capacity, or even the reverse, for the externalizing dimensions.
- Second, IN significantly predicts both internalizing and externalizing dimensions, although the partial coefficients are higher for the latter.
- Third, both SCT and IN are expected to significantly predict social impairment and similar difficulties, while IN predicts academic impairment better.

## Method

### Participants

Twenty-three 3<sup>rd</sup> and 6<sup>th</sup> grade classes, five 3<sup>rd</sup> grade classes and six 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> grade classes from three primary schools in the province of the province of Sevilla participated. After applying inclusion criteria, 531 children were selected: 80 (28.99%) 3<sup>rd</sup> graders, 57 (20.65%) 4<sup>th</sup> graders, 75 (27.17%) 5<sup>th</sup> graders and 64 (23.19%) 6<sup>th</sup> graders. The inclusion criteria were children be from nine to thirteen years old (3<sup>rd</sup>-6<sup>th</sup> grades) with no psychological or learning disorder, and whose parents had good knowledge of the Spanish language. Finally, the families of 275 children filled out the evaluation protocol (*Age* = 11.13, *SD* = 1.18; 55% boys). The sample selection procedure is shown in Figure 1.

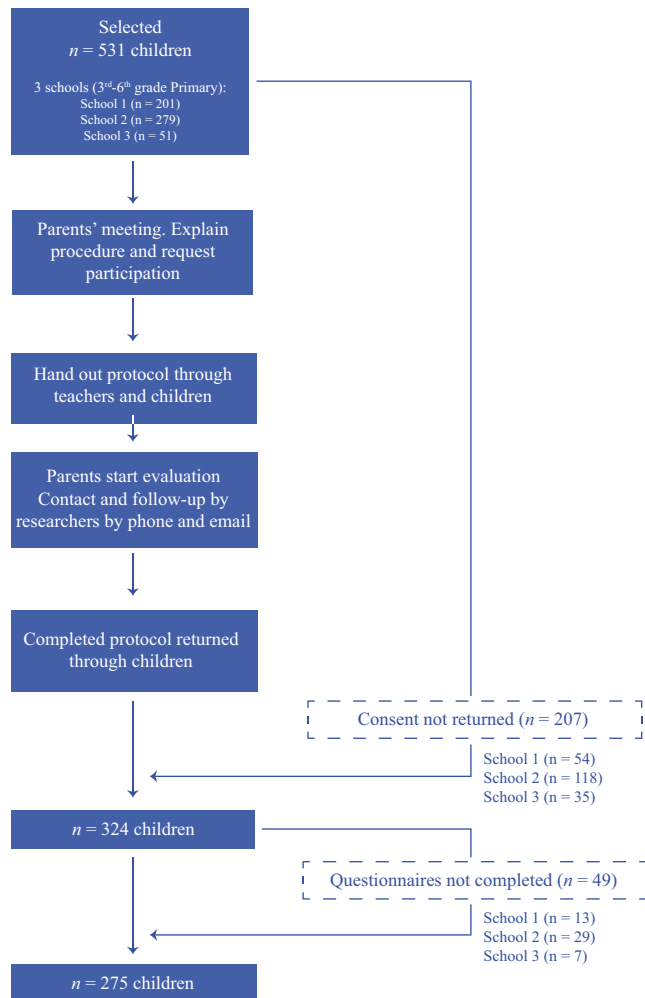
After signing their informed consent for participating in the study, mothers and fathers rated 273 and 255 children, respectively (253 were rated by both parents). The social dimension and socioeconomic class of the sample were incorporated in the variables: parents' education, marital status, type of job and current profession.

About 92% of the children lived in a family with married parents, 6% of the parents were separated, and only 2% lived in single-parent homes. Of the parents, 30% (19% of the mothers and 11% of the fathers) had university degrees and 48% (27% of the mothers and 21% of the fathers) had studied vocational training. 94% (both parents) had a permanent remunerated position, 24% were self-employed (15% of the fathers and 9% of the mothers), 19% were civil servants, (13% mothers and 6% fathers) and 7% entrepreneurs (5% mothers and 2% fathers). In general, the sociodemographic data refer to middleclass families.

### Instruments

**Child and Adolescent Behavior Inventory (CABI)** [*Cuestionario sobre el Comportamiento de Niños*] (Burns et al., 2015). Mothers and fathers filled out the Spanish version of the CABI (<https://tinyurl.com/CABI-Spanish>). The measures used were: Sluggish Cognitive Tempo (SCT, 15 items), Anxiety (ANX, 6 items), Depression (DEP, 6 items), ADHD Inattention (IN, 9 items), ADHD Hyperactivity/Impulsivity (HI, 9 items), Oppositional Defiant Disorder (ODD, 8 items), Limited Prosocial Emotions (LPE, 4 items), Academic Impairment (AI, 5 items), and Social Impairment (SI, 5 items). The items on all the measures, except AI and SI, are rated on a 6-point scale, from 0 (Almost never, never or once a month) to 5 (almost always, several times a day), where a higher score indicates more problems. The AI and SI items have a 7-point scale, from 0 (severe difficulty) to 6 (excellent relations

or performance). A lower score means more academic and social impairment: The normative data for the Spanish version showed good or excellent reliability coefficients (Cronbach's alpha) for all the scales (.71 to .95), the factor analyses showed good structural validity and factor correlations good discriminant validity (Burns et al., 2021b).



**Figure 1.**  
Sample selection procedure.

**Child Social Preference Scale (CSPS)** [*Escala de Preferencia Social del Niño*] (Coplan et al., 2004). The fathers and mothers completed this measure which has two subscales: shyness and social disinterest. This study only used the seven-item shyness scale, which is scored on a scale of 1 to 5, where higher scores show more problems with shyness.

### Procedure

Prior to selecting the participants, the researchers contacted the school directors and the children's teachers and met with them at the schools to explain the study to them, find out the approximate number of participating parents to be expected and include them in it. The parents were called to different meetings

by the directors, and the teachers were in charge of handing out and collecting the instruments used in the study.

After checking the inclusion criteria, the researchers met with the parents at their children’s school to explain the objectives of the study and the conditions for participating in it. Three meetings were held on different dates, one at each of the three participating schools.

The instruments administered were handed out by the teachers to the students whose parents had signed their consent. They were delivered in closed envelopes with the child’s name on it, although for coding and to protect their confidentiality and anonymity, the instruments bore the same code assigned by the school according to each student’s enrollment number. The parents were given two weeks to fill out the protocol at home. Before handing the envelopes to the children, a telephone contact number and a specific email account were set up where the researchers could immediately answer and resolve any doubts or questions posed by the parents during the evaluation. After two weeks, the children took the tests filled out by their parents (father and mother) back to the school, where they were later collected by the researchers, who had previously called the participating parents by phone to remind them that they would be collecting the instruments on the dates agreed.

**Data analysis**

The statistical analyses were done using R v.4.0 (R Core Team, 2021). First, a descriptive analysis of the variables was done. Then the correlations between the measures of the mothers and fathers with the gender and age variables, and intercorrelations were calculated. Next, the correlations between the SCT and IN predictive measures and other outcome measures were found for each rater and cross-loadings between raters. After that the internal consistency of the CABI ratings was studied (alpha coefficient and split half test). Finally, regression models were created with the SCT and IN scores, including the gender and age control variables. The dependent variables were both father and mother ratings. The partial regression coefficients for each rater and cross-loading between raters were calculated. Bootstrapping was used to validate the regression models (Chernik & LaBudde, 2011; Efron, 1979). With this procedure, the confidence interval for the sample distribution of the statistic of interest (BCa interval) was found without making parametric assumptions.

**Results**

The Shapiro-Wilk test indicated that the variables did not follow a normal distribution. Skewness was in the ± 2.5 range except for the father and mother’s SCT and depression scores. Kurtosis was also in the range of ± 2.5 except for father and mother’s SCT, anxiety and depression scores.

The alpha and reliability coefficients of the splithalf test of the CABI were found with the “psych” library’s “splitHalf” function (Revelle, 2021), which divides two halves of the test into all the possible parts and calculates the reliability coefficient for each of the parts, resulting in a minimum and maximum reliability. The maximum coefficients were from .77 (father’s anxiety) to

.96 (mother’s SCT, IN and HI and father’s SCT and IN). The minimum reliability coefficients were .68 (mother’s anxiety) to .92 (mother’s IN).

The alpha coefficients of the SCT and IN factors were very high, as were all the ratings in general, varying from .74 (ANX) to .95 (IN). The inter-rater correlations were also very high: only three were below, and even they were near, .70 (LPE, DEP and SI) and two were even over .80 (AI and SCT). The Spearman’s correlation coefficients between the gender variable (1=boy, 2=girl) and the two raters’ scores were generally significant, especially for fathers. However, the effect of these correlations is moderate or small: none were over -.24. The Pearson’s correlation coefficients for age and the two raters’ scores were not significant, except for HI (the lower the age the more problems) and DEP (the higher the age the more problems). The correlation with SI (the lower the age more problems) was also significant for fathers and for mothers with LPE (the lower the age the more problems). None of the correlations with the age variable was over +/- .17. However, for the post regression analyses, both gender and age variables were always controlled for.

The correlations between SCT and IN were high and significant for both raters: fathers  $r(253) = .72$  ( $SD = .04$ ,  $p < .001$ ) and mothers,  $r(271) = .75$  ( $SD = .04$ ,  $p < .001$ ). Table 1 shows the correlation coefficients of the SCT and ADHD-IN factors with the remaining CABI scores for each rater.

The correlations between the two raters were rather similar for all the factors. For SCT, the highest correlations were with DEP ( $r > .55$ ), followed by ODD, HI, ANX and AI (.35 to .46), and finally, with SHY, LPE and SI, they varied from ± .21 to -.34. For IN, the highest correlation was with HI ( $> .60$ ), followed by ODD, DEP and AI ( $r$  -.53 to .59). The correlation with AN was .35 to .42, and with SHY, LPE and SI, it varied from ± .21 to ± .30. Table 2 shows the cross-loadings between the two raters.

All the correlations were statistically significant with moderate values, from ± .30 to .53, except for LPE and SHY (for the two ratings and both raters), and SI (in fathers’ SCT and IN), which did not reach ± .30.

**Table 1.** Correlations (standard deviations) of the Sluggish Cognitive Tempo and Inattention (IN) scales with other scores by each rater.

	Mothers		Fathers	
	SCT	IN	SCT	IN
ANX	.42 (.06)**	.42 (.06)**	.35 (.06)**	.35 (.06)**
DEP	.58 (.05)**	.57 (.05)**	.55 (.05)**	.54 (.05)**
HI	.46 (.05)**	.60 (.05)**	.39 (.06)**	.64 (.05)**
ODD	.45 (.05)**	.58 (.05)**	.45 (.06)**	.59 (.05)**
LPE	-.21 (.06)**	-.21 (.06)**	-.24 (.06)**	-.22 (.06)**
SHY	.21 (.06)**	.12 (.06)*	.30 (.06)**	.22 (.06)**
AI	-.44 (.05)**	-.54 (.05)**	-.41 (.06)**	-.53 (.05)**
SI	-.24 (.06)**	-.27 (.06)**	-.34 (.06)**	-.30 (.06)**

Note. SCT (Sluggish Cognitive Tempo), ANX (anxiety), DEP (depression), IN (inattention), HI (hyperactivity/impulsivity), ODD (oppositional defiant disorder), LPE (limited prosocial emotions), SHY (shyness), AI (academic impairment), SI (social impairment).

\* $p < .05$ . \*\* $p < .01$ .

**Table 2.** Crossed correlations (standard deviations) of the Sluggish Cognitive Tempo (SCT) and Inattention (IN) with the other scores of the two evaluators.

	Mothers		Fathers	
	SCT	IN	SCT	IN
ANX	.30 (.06)**	.30 (.06)**	.31 (.06)**	.36 (.06)**
DEP	.47 (.06)**	.46 (.06)**	.45 (.06)**	.44 (.06)**
HI	.40 (.06)**	.53 (.05)**	.35 (.06)**	.52 (.05)**
ODD	.42 (.06)**	.51 (.05)**	.39 (.06)**	.48 (.05)**
LPE	-.22 (.06)**	-.24 (.06)**	.22 (.06)**	.24 (.06)**
SHY	.21 (.06)**	.13 (.06)*	.24 (.06)**	.19 (.06)**
AI	-.44 (.06)**	-.51 (.05)**	.39 (.06)**	.46 (.05)**
SI	-.36 (.06)**	-.35 (.06)**	.23 (.07)**	.18 (.07)*

Note. SCT (Sluggish Cognitive Tempo), ANX (anxiety), DEP (depression), IN (inattention), HI (hyperactivity/impulsivity), ODD (oppositional defiant disorder), LPE (limited prosocial emotions), SHY (shyness), AI (academic impairment), SI (social impairment). \*p < .05. \*\*p < .01.

Table 3 shows the unique standardized regression coefficient for SCT and IN over the other outcome results of each rater, controlling for the effect of gender and age. Bootstrapping was used to validate the regression models (Efron, 1979). This

**Table 3.** Standardized partial regression coefficients of the Sluggish Cognitive Tempo and Impulsivity scores over the other scores for each evaluator.

	Mothers					Fathers				
	R <sup>2</sup> adj	SCT	BCa	IN	BCa	R <sup>2</sup> adj	SCT	BCa	IN	BCa
ANX	.21	.10**	[.02, .21]	.10**	[.02, .19]	.13	.08*	[-.01, .25]	.09*	[.01, .16]
DEP	.39	.15***	[.07, .23]	.17***	[.10, .31]	.36	.14***	[.05, .23]	.15***	[.08, .24]
HI	.37	.04	[-.17, .21]	.55***	[.36, .73]	.42	-.10	[-.28, .09]	.70***	[.47, .86]
ODD	.34	.01	[-.12, .15]	.45***	[.30, .60]	.35	.01	[-.15, .13]	.43***	[.29, .61]
LPE	.06	-.04	[-.11, .03]	-.06	[-.13, .02]	.06	-.08	[-.18, .01]	-.06	[-.15, .04]
SHY	.03	.12**	[-.00, .14]	-.03	[-.06, .07]	.08	.15**	[.01, .16]	.02	[-.05, .13]
AI	.29	-.07	[-.15, .02]	-.29***	[-.40, -.17]	.28	-.05	[-.14, .04]	-.36***	[-.48, -.24]
SI	.08	-.04	[-.15, .08]	-.13*	[-.26, -.01]	.13	-.17*	[-.30, -.03]	-.08	[-.23, .07]

Note. SCT (Sluggish Cognitive Tempo), ANX (anxiety), DEP (depression), IN (inattention), HI (hyperactivity/impulsivity), ODD (oppositional defiant disorder), LPE (limited prosocial emotions), SHY (shyness), AI (academic impairment), SI (social impairment), BCa: Bias-corrected and accelerated Bootstrap Confidence Interval at 95% of the parameter estimation, R2 adj: R2 adjusted. \*p < .05. \*\*p < .01. \*\*\*p < .001.

**Table 4.** Crossed standardized partial regression coefficients of the Sluggish Cognitive Tempo and Impulsivity over the other outcome measures of the two evaluators.

	Mothers					Fathers				
	R2 adj	TCL	BCa	IN	BCa	R2 adj	TCL	BCa	IN	BCa
ANX	.09	.07*	[-.02, .19]	.06	[-.03, .14]	.13	.04	[-.07, .16]	.16**	[.07, .25]
DEP	.26	.10**	[-.02, .21]	.11**	[.03, .20]	.26	.13**	[.03, .24]	.16***	[.05, .26]
HI	.30	.05	[-.14, .24]	.41***	[.22, .57]	.28	-.01	[-.24, .23]	.58***	[.30, .83]
ODD	.26	.04	[-.08, .18]	.29***	[.16, .42]	.23	.05	[-.16, .21]	.39***	[.22, .61]
LPE	.06	-.03	[-.11, .05]	-.09*	[-.18, .00]	.07	-.02	[-.09, .06]	-.10*	[-.18, -.01]
SHY	.03	.11*	[.00, .15]	-.02	[-.07, .07]	.05	.10*	[-.03, .14]	.03	[-.03, .14]
AI	.26	-.10	[-.20, .00]	-.26**	[-.37, -.14]	.22	-.11	[-.22, .00]	-.25***	[-.38, -.11]
SI	.15	-.12*	[-.24, -.01]	-.13*	[-.25, .00]	.05	-.16*	[-.28, -.02]	.02	[-.15, .17]

Note. SCT (Sluggish Cognitive Tempo), ANX (anxiety), DEP (depression), IN (inattention), HI (hyperactivity/impulsivity), ODD (oppositional defiant disorder), LPE (limited prosocial emotions), SHY (shyness), AI (academic impairment), SI (social impairment), BCa: Bias-corrected and accelerated Bootstrap Confidence Interval at 95% of the parameter estimation, R2 adj: R2 adjusted. \*p < .05. \*\*p < .01. \*\*\*p < .001.

makes it possible to construct the probability function of a statistic and reproduce its original sample distribution. Based on this result, a confidence interval can be constructed for the parameter estimated. The model's validity is achieved when the parameter estimated in the regression model is included in the BCa confidence interval (see Tables 3 and 4).

The mother and father SCT ratings significantly predicted only the highest scores on the DEP, SHY and ANX internalizing factors, and those of fathers, social impairment (SI). The mother and father IN ratings also predicted more problems in the DEP and ANX internalizing measures, but not in SHY or SI, and higher scores on the externalizing HI and ODD factors and academic impairment (AI).

Table 4 shows the unique SCT and IN standardized regression coefficients between the two raters (cross-loaded), controlling for the effect of the gender and age variables.

The mother and father SCT cross-loaded ratings significantly predicted the internalizing DEP and SHY factors, and also social impairment (SI). In addition, mother SCT ratings predicted father ANX. Furthermore, mother and father IN cross-loaded ratings significantly predicted externalizing HI, ODD and LPE factors, internalizing AI and DEP factors and academic impairment (AI). Mother IN ratings also significantly predicted father interaction (SI) ratings.

## Discussion

Sluggish Cognitive Tempo (SCT) is a psychological dimension that has awakened interest in child psychopathology due to its capacity to relate to different behavior, performance and social impairment factors, distinct from the ADHD (IN) inattention measure, in spite of their high correlation (Becker, 2021; Becker & Barkley, 2018). For years, the main problem of SCT was that it lacked a reliable valid measure for its evaluation, but since the seminal study by Penny et al. (2009) and the review by Becker et al. (2016), scales have been developed based on a defined set of items. One of the main scales is the CADBI/CABI by G. Leonard Burns and colleagues (Burns et al., 2021a; Burns et al., 2021b). This scale, and others with a similar basis, have had acceptable factorial validity compared to ADHD-IN, so that even though both factors have highly significant correlations, they are technically different. The next step was to test SCT external validity after controlling for the mutual effects with IN, and in this sense, the CABI SCT scale not only has shown good first results, but also cross-cultural, although more studies are required, especially replication. Therefore, the general objective of this study was to replicate some of the external validity results of the Spanish version of the CABI SCT scale, following the original proposal by Sáez et al., (2019). A sample of middle-class Spanish families, 273 mothers and 255 fathers, rated their 9 to 13-year-old children using the CABI and other complementary measures. All the CABI measures showed high internal consistency coefficients and inter-rater correlations, similar to previous studies (Bernad et al., 2016; Sáez et al., 2019). Similarly, just as was observed in a CABI score standardization study in a Spanish population, the relationship with age was very limited, and however, significant with gender (although with low/moderate values), showing boys with a more problematic tendency than girls (Burns et al., 2021b).

The first objective focused on comparing the correlations of SCT and IN factors with the rest of the behavior, interaction and performance factors. As in the first hypothesis, the direct correlations of SCT and IN with internalizing anxiety, depression, excessive shyness factors, and further, with social interaction problems, were moderately significant and relatively similar. The second hypothesis was also met, as IN showed a higher and more significant relationship with externalizing and academic impairment factors. The logic of these results may be attributed to the IN scale, which contrary to SCT, always remains linked to hyperactivity/impulsivity, since both derive from ADHD. Among the many impacts of ADHD are especially the externalizing behavior and academic performance problems, so that IN would be expected to be higher than SCT in these areas, and much less so, of course, in internalizing behaviors.

The second objective compared the uniqueness of SCT and IN predictive capacity (that is controlling for each other) on the same measures. The first hypothesis derived from previous studies was partially met: First, as expected, the predictive capacity of SCT on externalizing behaviors was not significant. But the predictive superiority of SCT compared to IN on internalizing measures was only evident in excessive timidity, and similar in anxiety and depression. The second hypothesis, on the other hand, was met, since IN significantly predicted all the internalizing and externalizing measures (except limited prosocial emotions), with much higher regression coefficients in the latter. Finally, the third hypothesis also was met as IN superiority over SCT in predicting academic impairment, but inter-rater results on social interaction problems were inconsistent: mothers thought IN predicted these problems better, while fathers thought SCT did.

In conclusion, the data in our study replicate in large part the overall results of the relationship between SCT and IN, and especially SCT external validity data found with Spanish samples (Sáez et al., 2019). The main disagreement is that, in our case, the SCT scale did not surpass IN in predictive capacity of depression and anxiety scores as observed in other studies (Belmar et al., 2017; Bernad et al., 2016; Sáez et al., 2019). However, it is striking that, once the effect of IN was controlled for, the SCT scale still significantly predicted those scores, which clearly contradicts the reverse effect shown with externalizing behaviors. This result, with nuances, is the most consistent finding in practically all the studies on external validity, including with cross-cultural samples (Sáez et al., 2019).

Furthermore, two conclusions should be emphasized: our data have confirmed the superiority of IN over SCT in predicting academic impairment, but with a wider difference than usually observed. However, a fact in our study that should be further explained is that contrary to others, we only had the parents' ratings, while other studies have also used teachers' ratings (Belmar et al., 2017; Bernad & Servera, 2016; Burns et al., 2021b; Sáez et al., 2019), a point which seems important. On the other hand, even though the SCT scale did not surpass IN in predicting anxiety or depression, it did another internalizing measure: excessive shyness. This is a measure with greater transdiagnostic value, since the type of temperament to which it refers could be considered a risk factor for emotional disorders in general. As recently, transdiagnostic value has also been attributed to SCT, it is worth mentioning that both measures have been related, above more clinically specific measures (Becker, 2021; Becker & Barkley, 2018). From this perspective, the differences between a measure like IN, especially linked to a specific disorder, ADHD, and a measure like SCT, probably not relatable to any specific disorder, and yet, able to relate with and be linked to other measures that can trigger various clinical problems, at least in the internalizing spectrum, are becoming more and more clearly evident. This will doubtless be a line of study in the coming years, along with other clinical lines, such as the relationship of SCT with neuropsychological measures (Kofler et al., 2019) or treatment programs which can be used directly or indirectly (Becker & Barkley, 2021).

The limitations of this studio are first, that its sample was small, too small to apply structural regression procedures, such as those used in other studies (Sáez et al., 2019). Second, it is a cross-sectional study that should be complemented with other longitudinal studies (Becker et al., 2021; Bernad et al., 2014; Servera et al., 2016). Third, the data are based on two raters, but in the same context, and at least teachers should be included (Becker et al., 2019; Belmar et al., 2017; Burns et al., 2017; Sáez et al., 2019). Fourth, the data are based, as in most previous studies, on children in community primary schools, when SCT requires more studies with samples from preschool and adolescents, and should also include clinical samples (Becker, 2021). And finally, future studies should have a different type of design, such as mediation or moderation studies, to provide a wider perspective of the relationships and differences between IN and SCT.

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## Additional/Supplementary Material

<https://hdvirtual.us.es/discovirt/index.php/s/MypiZjWArKtTbTEp>

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