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DEVELOPMETRICS



A comparison of mother and father reports of children's theory of mind: further validation of the children's social understanding scale

Stephanie C. Gluck^a, Deniz Tahiroglu^b and Louis J. Moses^c

^aDepartment of Psychology, University of Oregon, Eugene, USA; ^bBogazici University, Istanbul, Turkey; ^cVictoria University of Wellington, Wellington, New Zealand

ABSTRACT

The reliability and validity of the Children's Social Understanding Scale (CSUS) was further assessed by examining fathers' as well as mothers' reports of children's social understanding, along with behavioural measures of children's mental state understanding. 112 families with children aged 38 to 64 months participated with both parents filling out the CSUS, while children were administered a language test and a battery of Theory of Mind (ToM) tasks. Internal consistency of the CSUS was high for both mothers and fathers, and maternal and paternal CSUS scores were moderately-highly correlated. In addition, mothers' and fathers' CSUS responses were each associated with children's behavioural ToM, even after controlling for age and verbal ability. Finally, both parents appeared to have roughly equally strong insights into their children's ToM and each parent's insight did not appear to add novel information about ToM over and above that of the other parent. These findings suggest that the CSUS is a reliable and valid tool in assessment of ToM by both mothers and fathers, and that researchers can safely use either one or the other as a complement to behavioural performance in studying ToM.

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KEYWORDS Theory of mind; mother report; father report; measurement; preschool children

Children's appreciation of mental life develops markedly throughout the preschool years, as evidenced by their performance on a range of theory of mind (ToM) measures including false belief, knowledge access, and appearance-reality tasks (Flavell et al., 1987; Wellman & Liu, 2004). Although these laboratory measures have uncovered a wealth of knowledge about the emergence of ToM, they are limited by their reliance on a single informant (child) tested in a single context (lab) with only a small number of task types. Hence, they

CONTACT Stephanie C. Gluck  sgluck@uoregon.edu  Department of Psychology, 1227 University of Oregon, Eugene OR 97403, USA

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provide a less than complete picture of the multi-contextual nature of mental state understanding. To help remedy that, the Children's Social Understanding Scale (CSUS; Tahiroglu et al., 2014) was developed as a broad parent-report measure aimed at assessing individual differences in children's understanding of mental states (e.g. desire, knowledge, intention, emotion, belief, perception), and thereby providing a potentially important supplement to behavioural ToM assessments. The scale is available in both long (42 items) and short forms (18 items), with the short form being a subset of items from the long form.

In its initial development and validation, the CSUS demonstrated strong psychometric properties, as evidenced in particular by its association with children's behavioural ToM performance over age and other cognitive abilities (e.g. working memory, planning, and prospective memory). To date, the CSUS has been translated, and to varying extents validated, for several other languages including: Turkish (Tahiroglu & Yagmurlu, 2014), Canadian-French (Brosseau-Liard & Poulin-Dubois, 2018), Mandarin Chinese (Gluck et al., 2017), and Polish (Bialecka-Pikul & Stepień-Nycz, 2017; Smogorzewska et al., 2019). Nonetheless, the initial validation and subsequent studies have relied mostly on mothers' reports (> 90%) of children's social understanding. The completion of the CSUS by other informants close to the child – fathers, teachers, grandparents, and others – may provide additional information about children's ToM, as different informants have varied opportunities to interact with the child. At the very least, joint information from several informants may provide a more reliable, stable assessment of children's ToM. Fathers are of particular interest given their important roles in children's lives. Current parenting research, for example, emphasizes how mothers and fathers may exert similar, different, complementary, or additive influences on children's development (Cabrera et al., 2018).

In the current research, we further examine the reliability and validity of the CSUS by assessing both mothers' and fathers' reports of children's social understanding, along with behavioural measures of children's performance using five standard ToM paradigms. The data reported here come from a larger study examining the relation between theory of mind and executive function. The research aims to address the following:

- (1) To what extent are mothers' and fathers' CSUS reports reliable, as assessed by measures of internal consistency?
- (2) To what extent are mothers' and fathers' reports related to each other?
- (3) Are mothers' and fathers' reports each associated with behavioural ToM individually, and do they remain so after controlling for age and verbal ability?
- (4) Are mothers' reports more strongly associated with behavioural ToM than fathers' reports, or vice versa?
- (5) Does the addition of fathers' reports contribute additional, unique information about children's behavioural ToM over and above mothers' reports, and vice versa?

Method

Participants

One hundred and nineteen families recruited from a university database participated. Seven children were later excluded – 1 for atypical development and 6 because neither parent provided sufficient CSUS data (see Procedure for details) – leaving a final sample of 112 families with children aged 38 to 64 months ($M = 48.34$, $SD = 7.06$; 53 boys). Sixty four percent of parents had a bachelor or graduate degree, 28% had some college or a 2-year degree, 4% had some high school, and 3% did not disclose. In terms of income, the sample was middle class but skewed towards incomes higher than are typical in the area from which it was drawn which has a median income of 43,000 USD: 76% of the sample earned 40,000 USD or above, 21% earned less than 40,000 USD; and 3% did not disclose.

Measures

Children's social understanding scale (CSUS)

Mothers ($N = 111$) and fathers ($N = 95$) completed the long version of the CSUS (42 items; Tahiroglu et al., 2014). The CSUS is measured on a 4-point scale ranging from (1) 'Definitely Untrue' to (4) 'Definitely True', along with a 'don't know' response option and encompasses questions in six domains of mental state understanding: belief, knowledge, perception, desire, intention, and emotion. The full CSUS is available on the Open Science Framework at <http://osf.io/2pywz/>.

Theory of mind

Children's behavioural ToM was measured with five widely used tasks administered in the following order: Contents False Belief for Self and for Other, Explicit False Belief, Appearance-Reality, and Knowledge Access (all adapted from Wellman & Liu, 2004, except Appearance-Reality from; Flavell et al., 1987). In the Contents False Belief task, a band-aid box was revealed to have unexpected content (a bird). Children were asked about their former belief about the content of the box, as well as what a naïve other would think is in the box. As a memory check, they were also asked what was really inside the box. In the Explicit False Belief task, children heard a story about a boy who thinks his mittens are in the closet when in fact they are in his backpack. Children were asked where the boy would look for the mittens and where the mittens really were. In the Knowledge Access task, children were shown a closed drawer and asked about the content inside. The content of the drawer was then revealed (a ball) and the drawer was closed again. Children were then introduced to a toy figure of a girl who had never seen inside the drawer, and were asked whether she knew what was in the drawer and whether she had seen inside it. Finally, in the Appearance-Reality task, children were shown an object with a misleading appearance – a sponge that looked like a rock – and asked to evaluate the real and apparent identity of the object.

A score of 1 was given for each task if the child answered both the test and memory control questions correctly with a maximum possible score of 5. Trials on which children failed the memory control questions were excluded. The ToM score was then the mean number of correct tasks after exclusions (possible range zero to 1).

Receptive vocabulary

The Peabody Picture Vocabulary Test 3rd Edition (PPVT-III; Dunn & Dunn, 1997) assessed children's receptive vocabulary. Children were shown four pictures per trial and were instructed to point to the picture that depicted the word spoken by the experimenter. The vocabulary score was the total number of correct pictures identified.

Procedure

Three to five days prior to their lab visit, parents were mailed the CSUS to complete at home. Families then came in for a single visit of approximately 60 minutes at our university lab. Children there completed

behavioural measures of ToM and the PPVT-III, while one parent completed a demographic questionnaire. All parents provided informed consent and all procedures were approved by the university's ethics committee.

Results

Data preparation and handling of missing data

The CSUS was scored using the following criteria: Parents with more than 20% missing data (more than 8 items) were excluded (7 mothers and 5 fathers). Missing data in the parent CSUS almost always took the form of 'don't know' responses, as opposed to unanswered items. Prior to exclusion, average 'don't know' response was 2.16 ($SD = 3.01$) for mothers and 2.55 ($SD = 3.02$) for fathers; average unanswered items was 0.10 ($SD = 0.30$) for mothers and 0.11 ($SD = 0.66$) for fathers. After exclusion, the average percentages of missing data per *item* for remaining CSUS data were: 4% (range 0% – 17%) for mothers' report and 5% (range 0% – 23%) for fathers' report.

Children with 60% or more missing data on behavioural ToM tasks (i.e. 3 or more of 5 ToM tasks not completed or control questions answered incorrectly, $n = 10$) were also excluded. The average percent of missing data per *task* was 12% (range 2% – 20%) for children's behavioural ToM. Remaining missing values for both parents and children were replaced using the multiple imputation predictive mean matching method ($m = 12$) implemented in the 'mice' package in R (Buuren & Groothuis-Oudshoorn, 2010). After imputation, mean CSUS long- and short-forms scores were computed by averaging over items. The resulting pooled estimates from the 12 imputed datasets were then obtained according to Rubin's rules through the 'mice' package and are denoted by the subscript *pooled* in the remaining sections of the manuscript.

CSUS reliability for mothers and fathers

As shown in Table 1, the reliability (internal consistency) of the CSUS long- and short-forms was high for both mothers and fathers (as $>.79$), as were the average corrected item-total correlations ($r_s >.39$). Although the majority of items had moderate to high corrected item-total correlations, several items in both the long- and short-forms did not (see range on Table 1). However, separate analysis that excluded items with low ($r <.2$)

Table 1. Internal consistency of the CSUS and its relation to children's ToM performance.

	Alpha	Average Corrected item-total <i>r</i>	Range Corrected item- total <i>r</i>	<i>r</i> with ToM	Partial <i>r</i> with ToM	N
Long Form (42 items)						
Mothers	.91	.44	[−.03,.73]	.36**	.23*	97
Fathers	.88	.39	[.04,.71]	.33**	.21*	81
Composite	.90	.41	[.01,.72]	.40**	.24*	102
Short Form (18 items)						
Mothers	.85	.48	[.09,.71]	.35**	.20*	97
Fathers	.79	.39	[.02,.64]	.29**	.16	81
Composite	.83	.43	[.07,.68]	.35**	.18	102

Composites were formed by averaging over mothers' and fathers' responses, and substituting one parent's data where the other parent's data was missing. Partial correlations control for age and verbal ability.

* $p < .05$. ** $p < .01$ (2-tailed).

corrected item-total correlations did not change the general pattern of results. Hence, we report analyses with the full set of items here.

Are mothers' and fathers' CSUS reports related?

Table 2 shows descriptive statistics for mothers' and fathers' reports for the long and short forms as well as the subscales. Interestingly, on the long-form CSUS, mothers attributed significantly greater overall social understanding to their children than did fathers, although the effect was small, $d_{unb} = .21$. The same was true for some of the subscales. Mean scores for the short form were not significantly different.

Table 2. Descriptive statistics for mothers' and fathers' CSUS reports along with paired samples t-tests.

Variable	Mothers		Fathers		<i>t</i> (81)	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Belief	3.11	0.56	3.01	0.53	1.80	.072
Knowledge	3.30	0.43	3.15	0.45	3.41	.001**
Perception	3.01	0.42	3.05	0.38	−0.93	.351
Desire	3.23	0.38	3.12	0.42	2.29	.022*
Intention	3.23	0.44	3.17	0.45	0.92	.360
Emotion	3.42	0.36	3.13	0.36	2.22	.027*
Long Form (42 items)	3.19	0.36	3.11	0.33	2.16	.031*
Short Form (18 items)	3.06	0.42	2.98	0.39	1.63	.102

M = mean, *SD* = standard deviation. Mean subscale and scale scores were computed by averaging over items.

* $p < .05$. ** $p < .01$ (2-tailed).

Of the 112 children in the sample, 82 had CSUS reports from both the mother and the father while 22 only had reports from mother and eight children only from father. Maternal and paternal CSUS scores were moderately-highly correlated for both the long- and short-forms, r_{pooled} (80) = .51 and .49 respectively, both $ps < .001$ and these correlations remained significant after controlling for child age and verbal ability (both partial $r_{pooled} > .47$, $ps < .001$). As a result, we additionally formed a parental composite ($N = 112$) by averaging over mothers' and fathers' responses and substituting one parent's score if the other parent's score was missing. We did so because such a composite maximizes sample size and, if reliable and valid, it would have practical utility in many research scenarios especially those with small sample sizes. Similar to the individual parent reports, internal consistency was moderately high for the composite scores, as were the average corrected item-total correlations (as $> .83$, $rs > .39$; Table 1).

Are mothers' and fathers' CSUS reports associated with children's ToM?

Children's ToM task scores were moderately intercorrelated (r_{pooled} ranging from .11 to .42, Cronbach's $\alpha = .57$), with the exception of the Explicit False Belief task. Nonetheless, in the analyses that follow, we aggregated across all five ToM tasks to form a ToM composite because the pattern of results did not change when the Explicit False Belief task was excluded. As shown in Table 1, mothers' and fathers' long- and short-form CSUS responses were each significantly correlated with children's behavioural ToM ($r_{pooled} > .29$, $ps < .001$). These relations remained significant with age and verbal ability held constant (partial $r_{pooled} > .20$, $ps < .05$), with the exception of the fathers' short-form (partial r_{pooled} (77) = .16, $p = .13$). The same general pattern was found for the parental composite long- and short-form ($r_{pooled} > .24$, $ps < .05$), with the exception of the composite short-form when controlling for age and verbal ability (partial r_{pooled} (98) = .18, $p = .06$).

Are mothers' CSUS reports more strongly associated with children's ToM than fathers' reports (or vice versa?)

To determine whether mothers' CSUS reports were more strongly associated with children's ToM than fathers' reports (or vice versa), we tested whether the zero-order correlations just described were significantly different in the subset of 76 children with complete behavioural ToM

Table 3. Hierarchical regression predicting theory of mind performance.

Predictors of word learning at each step: predictors of word learning at each step										
		At step				Final model				
Step	Predictor	R^2 total	ΔR^2	F	p	B	SE	β	t	p
Long Form (42 items)										
1	Age	.29	.29	12.85	<.001	0.01	0.01	0.35	2.55	.014
	Receptive vocabulary					<.01	<.01	0.17	1.24	.221
2	Mothers CSUS	.31	.02	2.33	.131	0.09	0.11	0.12	0.89	.379
3	Fathers CSUS	.33	.02	1.36	.247	0.13	0.11	0.15	1.17	.247
Short Form (18 items)										
1	Age	.29	.29	12.85	<.001	0.01	0.01	0.35	2.53	.014
	Receptive vocabulary					<.01	<.01	0.18	1.26	.215
2	Mothers CSUS	.31	.02	2.39	.127	0.1	0.09	0.15	1.09	.279
3	Fathers CSUS	.32	.01	0.43	.513	0.06	0.1	0.09	0.66	.513

Regression was conducted using the subset ($n = 76$) of children with complete behavioural Theory of Mind and data from both parents. ΔR^2 = change in R^2 , B = unstandardized coefficient, SE = standard error of B , β = standardized coefficient.

and parental data. For both the long and short forms of the CSUS, mother's and fathers' CSUS scores were not significantly different in the strength of their relations to ToM, Hotelling's $t(73) = -0.60$, and -0.09 , $ps = .55$ and $.93$ for the long and short forms respectively.

Do mothers' CSUS reports uniquely predict ToM over and above fathers' reports (and vice versa)?

A final hierarchical regression analysis examined whether each parent's reports uniquely predicted ToM over and above the other parent's reports while controlling for age and verbal ability. Age and verbal ability were entered as a first step, followed by mothers' CSUS at the next step, and then fathers' CSUS at the final step. Table 3 shows the results at each step along with the final model. As is clear from Table 3, for both long- and short- forms, fathers' reports did not contribute significantly over and above mothers' reports, both $Fs(1, 71) < 1.36$, $ps > .247$. In an analogous regression analysis, mothers' reports did not contribute significantly over and above fathers' reports, both $Fs(1, 71) < 1.19$, $ps > .279$. Note, however, that in these analysis lack of power may be a contributing factor because of the necessarily smaller subset of children ($n = 76$) with complete data from both parents. Indeed, in this subset of data, neither mothers' nor fathers' reports significantly predicted ToM controlling for the other parent's report (and age and verbal ability).

Discussion

The current study further examined the reliability and validity of the Children's Social Understanding Scale, by incorporating fathers' as well as mothers' reports along with behavioural measures of children's ToM. Extending findings from prior studies, which relied heavily on mothers' reports (e.g. Tahiroglu et al., 2014), both mothers and fathers in the current study provided reliable and valid information on their children's ToM. Specifically: (a) internal consistency was high for both parents, (b) mothers and fathers ascribed broadly similar mean levels of social understanding to children, (c) mothers' and fathers' reports were moderately related, and (d) both parents' reports were significantly associated with behavioural ToM, even with age and verbal ability controlled. This pattern of findings was true for the long-form CSUS (42 items), as well as generally true for the short-form (18 items).

Two other interesting findings emerged. First, neither parent's CSUS report was a stronger associate of children's behavioural ToM than that of the other parent: Both parents appeared to have roughly equally strong insights into their children's ToM. Second, not only were their insights about equally associated with ToM, but each parent's insight did not appear to add novel information about ToM over and above that of the other parent. What these two findings suggest is that mothers' and fathers' reports are more or less substitutable as they relate to children's ToM. Researchers can safely use either one or the other as a complement to behavioural performance in studying ToM. Alternatively, if the data are available, a composite of both parents' reports would be equally as valid and would maximize the sample size (by adding in data from just one parent if the other parent's data are unavailable). In this regard, the relations between the parental composite and ToM were in fact a shade higher than those for the individual parents.

One limitation of the current study is that the sample was largely white and generally middle class. It is possible that differences between mothers' and fathers' reports might emerge in different cultures or more diverse samples. Relatedly, it seems likely that the amount of time each parent spends with their child, along with the context in which that time is spent, would be an important moderator of the validity of the CSUS as an index of ToM. Future work is also needed to determine whether other caregivers close to the child such as grandparents, relatives, or teachers can provide additional insight into the child's theory of mind. In addition, although the CSUS sent to

parents indicated which form each parent was to complete, parents were not *explicitly* informed to complete the questionnaires separately. Thus, we cannot rule out the possibility that some parents may have consulted with one another when completing the CSUS. That said, although the correlation between mothers' and fathers' report was moderately-high ($r = .51$) it was not so large as to suggest wholesale collaboration. Nonetheless, in future work it will be important to ensure that parents complete the CSUS separately from one another to entirely rule out the possibility of any collaboration. Finally, from an analytic perspective, while it would have been optimal to apply measurement invariance and structural equation modelling techniques to our data, our sample size was too small for those techniques to be appropriate.

In sum, the findings for mothers replicate those from previous studies (Tahiroglu et al., 2014) while those for fathers represent an important extension. Taken together, the findings suggest that, for both mothers and fathers, the CSUS is a reliable and valid measure of children's ToM that provides an important, additional tool in the assessment of children's theories of mind.

Data availability statement:

The authors confirm that the data supporting the findings of this study are available as supplementary materials at <http://osf.io/w69qm>.

Disclosure statement

No potential conflict of interest was reported by the authors.

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