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# Spanish adaptation and validation of the Social Attribution Task-Multiple choice (SAT-MC) versions I and II for children and adolescents

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## ABSTRACT

**Introduction.** Social cognition is progressively acquired from childhood to early adulthood. Nevertheless there is a shortage of social cognition scales with normative data for Spanish children and adolescents. Social Attribution Task-Multiple Choice (SAT-MC) and its alternate version SAT-MC-II are social cognition instruments that measure mentalization skills in adults with psychosis. This study aimed to report psychometric characteristics and normative data of the Spanish version of SAT-MC and SAT-MC-II in a sample of minors.

**Methods.** The sample included 511 children and adolescents, from 8 to 15 years old, that volunteered to participate in the study. SAT-MC and SAT-MC-II were translated into Spanish versions, resulting in Tarea de Atribución Social-Elección Múltiple I and II (TAS-EM-I and TAS-EM-II). Participants completed both scales in two different sessions in a two-week longitudinal study. The order of scales was counterbalanced across visits.

**Results.** The internal consistency obtained was acceptable for TAS-EM (Cronbach's  $\alpha=0.75$ ) and good for TAS-EM-II (Cronbach's  $\alpha=0.80$ ). Test-retest reliability showed a moderate correlation ( $r=0.49$ ;  $p<.001$ ). Age positively correlated with TAS-EM-I ( $r=0.40$ ;  $p<.001$ ) and TAS-EM-II ( $r=0.54$ ;  $p<.001$ ). Percentiles are reported for each age group from 8 to 15 years old.

**Discussion.** The current normative data allow the study of social cognition development in Spanish children and adolescents. In accordance with previous literature, our results showed that social cognition performance improved from childhood to adolescence. Moreover, psychometric properties of SAT-MC resulted similar to the previous studies published in adults with schizophrenia and undergraduate students.

**Key words.** Social cognition, ToM, mentalization, children, adolescents

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## Adaptación y validación de la Social Attribution Task-Multiple choice (SAT-MC) versiones I y II en niños y adolescentes

### RESUMEN

**Introducción.** La cognición social (CS) se adquiere progresivamente desde la infancia. Sin embargo, hay escasas medidas de CS con datos normativos para niños y adolescentes en España. La escala Social Attribution Task-Multiple Choice (SAT-MC) y su versión paralela SAT-MC-II son instrumentos de CS que miden mentalización en adultos con psicosis. El propósito de este estudio es mostrar las características psicométricas y datos normativos de la versión española del SAT-MC y SAT-MC-II en una muestra de menores.

**Metodología.** Un total de 511 estudiantes de 8 a 15 años participaron voluntariamente en el estudio. Las escalas SAT-MC y SAT-MC-II fueron traducidas al castellano, resultando en la Tarea de Atribución Social-Elección Múltiple I y II (TAS-EM-I y TAS-EM-II). Los participantes realizaron la tarea en dos sesiones con dos semanas de diferencia. El orden de las escalas se contrabalanceó entre las sesiones.

**Resultados.** La consistencia interna obtenida fue aceptable para TAS-EM (Alfa de Cronbach=0,75) y buena para TAS-EM-II (Alfa de Cronbach =0,80). La fiabilidad test-retest mostró una correlación moderada ( $r=0,49$ ;  $p<,001$ ). La edad correlacionó positivamente con TAS-EM-I ( $r=0,40$ ;  $p<,001$ ) y TAS-EM-II ( $r=0,54$ ;  $p<,001$ ). Se reportan percentiles para cada grupo de edad desde los 8 a los 15 años.

**Discusión.** Estos datos normativos permiten el estudio del desarrollo de la CS en niños y adolescentes españoles. Acorde con la literatura previa, nuestros resultados mostraron que el desempeño en CS mejora desde la infancia a la adolescencia. Además, las propiedades psicométricas de las TAS-EM son similares a las obtenidas en estudios previos en estudiantes universitarios.

**Palabras clave.** Cognición social, ToM, mentalización, niños, adolescentes

Social cognition is an umbrella term that alludes to cognitive processes and types of behavior aimed at managing and responding to social issues<sup>1</sup>. This multidimensional concept includes theory of mind, mentalization, emotional processing, attributional style, and social processing<sup>2,3</sup>. Its alteration is a core symptom in illnesses such as schizophrenia or autism<sup>4</sup>. However, a diversity of diagnoses in children, such as obsessive compulsive disorder<sup>5</sup>, epilepsy<sup>6</sup> or traumatic brain injury<sup>7</sup> among others, are also related to a lower performance in social cognition.

The relevance of social cognition relays on its consistent relation to real life functioning<sup>8</sup>, risk behaviors such as suicide attempt<sup>9</sup>, or specifically in children and adolescents, quality of life<sup>10</sup>, social communication<sup>6</sup>, behavioral problems<sup>11</sup> or drug intake<sup>12</sup>. Knowing the performance in a child's social cognition can inform us about their resilience in stress situations<sup>13,14</sup>. Additionally, neuroanatomical structures underlying social cognition continue to develop beyond childhood and adolescence<sup>15</sup>. Brain development of this areas until adulthood is accompanied by a progressive acquisition of social cognitive skills<sup>15,16</sup>. For example, facial emotion recognition is present from an early age<sup>17</sup> but it is not until adolescence that face processing improves for the successful detection and comprehension of face expression from others<sup>18</sup>. On the other hand, first and second-order false beliefs are already acquired at the age of 6<sup>19</sup>. It has been hypothesized that there is an increase in the mentalizing competence during adolescence<sup>20</sup>. The progressive mastering in mentalizing is intensified with the beginning of the adolescence, coinciding with the change of the social cognition network used from adolescence to adulthood<sup>15</sup>. This progressive acquisition and maturation of social cognition explains the crucial role of peers and the social context during adolescence, showing an impact on the adolescent brain development<sup>21</sup>. Trauma experiences or social problems such as social rejection and exclusion in these ages can interrupt the regular maturation of social cognition brain structures and can produce, among others, anxiety or depression in future<sup>22-24</sup>.

Due to the impact of social cognition on people's functioning and quality of life<sup>8</sup>, professionals are doing large efforts to improve this competence through specifically-designed interventions. In order to properly test reliability and effectiveness of social cognition interventions, it is necessary to count with tools that accurately identify and characterize social cognition. There are a few well-validated social cognition rating scales for adults, but there is a shortage of child-direct tools<sup>25</sup>, specially in other languages such as Spanish. Consequently, researchers are using adult-validated tools for the assessment of social cognition in minors. Proper tools could show accurate information about prodromal symptoms such as in psychotic disorder.

Moreover most of the available social cognition tools are pen-and-paper instruments<sup>26</sup>. Although useful, they are limited due to their excessive reliance on memory, verbal or language skills, and their low ecological validity. In an attempt to balance some of the mentioned limitations, pictures, videos or brief stories of people expressing emotions<sup>27-32</sup> are more recommended as stimuli in social cognition assessment. In exchange, the weight of culture on these tools makes difficult to compare among countries or even within the same country with large cultural differences<sup>33-35</sup>. Consequently, some studies have tried to minimize the cultural effect on some scales by designing instruments that use geometric figures instead of human actors<sup>36</sup>. The ecological validity of these scales may be limited, although they pursue equal assessment in cross-cultural studies. In addition, studies are also limited by the small number of social cognition measures that include an alternate version, which can be used in longitudinal studies with pre- post assessments. Clinicians could benefit from an alternate version as well, since follow-ups are essentials in developing populations such as children and adolescents.

Social Cognition Task- Multiple Choice (SAT-MC) is a mentalizing task based on a silent cartoon animation that shows moving geometric figures, developed by Heider and Simmel in 1944. People watching the cartoon interpreted it as a social drama, in 2000 a scoring procedure for adult people with Autism Spectrum disorder was implemented. The lower dependence in verbal abilities or intelligence quotient among other benefits led Bell *et al.* (2010) to apply and validate the scale in people with schizophrenia. Johannesen *et al.* (2013) designed an alternate form, the validity of which was tested in an undergraduate student sample first, and then in a clinical sample<sup>37</sup>. Score distributions and patterns of association with external measures were found to be similar in both cases.

SAT-MC is not available in Spanish; it has been developed and validated in English as many others social cognition measures for adults<sup>2</sup>. Due to the limitation of adapting audiovisual stimuli to a different country, pen-and-paper scales are the most translated tools into other languages, although electronic versions are desirable for the current minors population that are get used to use new technologies. Currently there are a few social cognition scales validated for adults in Spanish. None of them was validated in minors and all present cultural issues. In addition, the specific characteristics of the existing scales in Spanish require a high cognitive demand in verbal and memory skills, what is a limitation in some populations. Furthermore, none of them includes alternate versions, which is of particular interest for longitudinal studies and clinical follow-up.

Therefore, there is an urge to study social cognition development in Spanish children and adolescents. For that reason, it is necessary to obtain normative data in social cognition measures in Spanish children and adolescents with alternative forms that allow longitudinal reliable assessments. Consequently, this study's primary purpose was to translate SAT-MC into Spanish. We hypothesize that Spanish versions of both SAT-MC and SAT-MC-II will evidence similar psychometric properties to the original English versions among Spanish children and adolescents.

**METHOD**

**Participants**

The study took place at 4 primary and secondary schools of a regional area in Spain, where 511 students (239 male and 272 female) volunteered to participate in the study. All participants were aged between 8 and 15 years old. The Ethics Committee of the University of Deusto approved this study (Ref: ETK-6/18-19). Because there were no student names included on the surveys, it was chosen to collect passive consent from parents. Thus, parents were informed and given the option of refusing to allow their child's participation. No parent refused to allow their child's participation. Participants or their legal guardian did not receive any benefit (nor financial neither academic) from their participation.

**Measures**

*The Social Attribution Task- Multiple Choice (SAT-MC)*

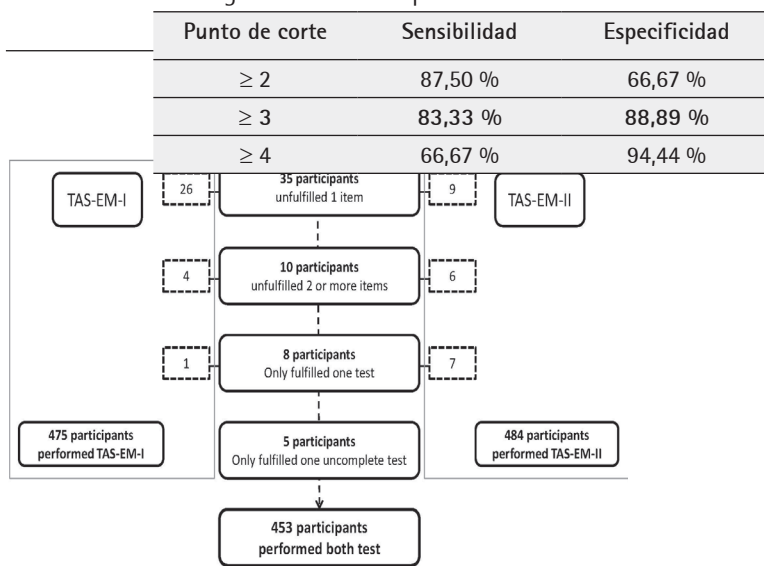
This scale uses a 64-second animation created in 1950 by Heider and Simmel in which geometric shapes enact a social drama (the original movie is available on www.youtube.com under "Heider and Simmel Movie"). The animation is shown twice and is then divided into short segments to be presented with their related questions. The 19 questions are embedded one by one, supported by a voiceover that reads them aloud, while the participant reads along on the response form. Each question has 4 options where the participant must choose the correct one. Bell et al. (2010) found a good internal consistency (Cronbach's alpha = 0.83).

*The Social Attribution Task- Multiple Choice-Alternate Version (SAT-MC-II)*

Johannesen et al. (2013) created an alternate form of SAT-MC for repeated testing. The same timing, number of questions and similar geometric figures as the original were used, but the objects' motion was altered to create new social content. Internal consistency among healthy adult population was good (Cronbach's alpha = 0.81)<sup>38</sup>.

**Procedure**

The original authors of SAT-MC and SAT-MC-II allowed the translation of both instruments from their original English versions into a new Spanish version. A panel of experts in neuropsychology and mental health analyzed the translation and modified it as needed. The final version was sent to the original authors for approval. Audios were recorded with the test questions that appeared embedded in the final video. Lastly, it was edited in accordance with the same model as the original English one. The result was two videos of 13 and 12 minutes' duration for SAT-MC and SAT-MC-II, respectively. Spanish versions were created and named "Tarea de Atribución Social-Elección Múltiple (TAS-EM-I)" and "Tarea de Atribución Social-Elección Múltiple-version II (TAS-EM-II)". Participants completed TAS-EM-I and TAS-EM-II in two different sessions in a two-weeks longitudinal study. The order of scales presentation was counterbalanced across visits. Administering was carried out in groups in participants' regular school, videos were presented on a 2 by 2 meter screen and the audio was played through the classroom speaker system. In the first visit, 370 participants fulfilled TAS-EM-I and 141 TAS-EM-II. Psychometric characteristics of each test were calculated taking into account data collected in both visits. When both visits (visit 1 and 2) are taken into account, a total of 475 participants correctly fulfilled TAS-EM-I and 484 TAS-EM-II. There were eight participants that did not fulfill one of the two versions, and 50 participants with missed items in TAS-EM-I or TAS-EM-II, either in visit 1 or 2. Consequently 58 participants were eliminated, resulting in 453 participants that completed both TAS-EM-I and TAS-EM-II forms. Figure 1 shows the flow diagram with the drop out detail.



**Figure 1** Drop Out Diagram

### Data Analysis

Data according to test version were analyzed for normal distribution using the Kolmogorov-Smirnov Test, while internal consistency was tested via Cronbach's alpha coefficient and Spearman-Brown coefficients using the split-half method. Test-retest reliability was computed using Spearman's *r* correlation coefficients. Utility as a repeated measure was evaluated by assessing evidence for practice effects (paired-samples *t*-tests) and floor/ceiling effects (number of participants scoring at/below chance levels or scoring 100%). Percentile scores per age were calculated. The significance level was set at 0.05 and all two-tailed. IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA) was used to analyze data.

### RESULTS

There were no statistical gender differences in the performance of TAS-EM-I ( $t(482) = -1.075; p = .283$ ) or TAS-EM-II ( $t(473) = -.024; p = .981$ ). Age positively correlated with TAS-EM-I ( $r = 0.40; p < .001$ ) and TAS-EM-II ( $r = 0.54; p < .001$ ). Distribution data is shown in detail in table 1. Scrutiny of normality of the whole sample showed a negative skew distribution in TAS-EM-I and TAS-EM-II, but shorter in the last. In figure 2, scatter plots represent TAS-EM-I and II results versus age.

Table 1	Score Distribution of TAS-EM and TAS-EM-II.	
	TAS-EM N= 475	TAS-EM-II N= 484
Range	18	18
Minimum	1	1
Maximum	19	19
Mean	14.53	13.26
SD	3.27	3.82
Skew	-1.16	-0.66
Kurtosis	1.93	1.08

Note. TAS-EM-I=Tarea de Atribución Social-Elección Múltiple I; TAS-EM-II= Tarea de Atribución Social-Elección Múltiple II

Internal consistency was acceptable for TAS-EM-I (Cronbach's alpha = 0.75) and good for TAS-EM-II (Cronbach's alpha = 0.80). Split-half reliability using the Spearman-Brown coefficient was 0.63 and 0.75 for TAS-EM-I and TAS-EM-II, respectively. Item analysis was tested by the removal of items individually, internal consistencies and means (up to 18) were recalculated (Table 2). Results show an increase in reliability if item 1 (TAS-EM-I), item 4 or 15 (TAS-EM-II) are removed. But, only when item 4 is removed from TAS-EM-II there is a significant increase in the reliability statistic ( $\chi^2 = 22.1935(df = 1); p < .001$ )<sup>39</sup>. Parallel reliability and

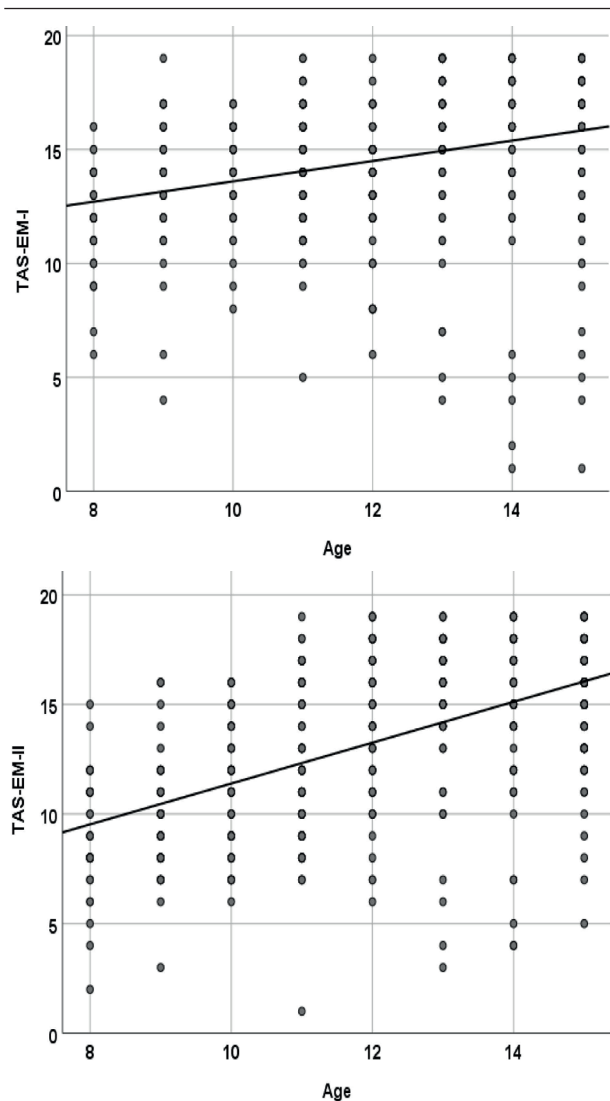


Figure 2 | Distribution of TAS-EM-I and TAS-EM-II scores per age

test-retest reliability in terms of the longitudinal application of TAS-EM and TAS-EM-II showed a moderate correlation ( $r = 0.49; p < .001$ ).

Performances at ceiling level reached 8.2% and 4.5% of the sample for TAS-EM-I and TAS-EM-II respectively. Percentage equivalences per age are provided in table 3 and 4.

### DISCUSSION

This study provides normative data of Spanish children and adolescents in a mentalizing task with an alternate version: TAS-EM-I and TAS-EM-II. This task was initially

	TAS-EM		TAS-EM-II	
	Mean	Cronbach's $\alpha$	Mean	Cronbach's $\alpha$
Item 1	13.68	.749	12.43	.792
Item 2	13.65	.739	12.77	.792
Item 3	13.71	.737	12.56	.786
Item 4	13.80	.741	12.39	.807
Item 5	14.04	.747	12.52	.790
Item 6	13.69	.745	12.65	.780
Item 7	13.71	.733	12.90	.789
Item 8	13.70	.731	12.93	.789
Item 9	13.66	.734	12.61	.782
Item 10	13.69	.740	12.50	.788
Item 11	13.73	.740	12.45	.788
Item 12	13.82	.729	12.55	.787
Item 13	13.84	.738	12.40	.794
Item 14	13.67	.725	12.41	.791
Item 15	13.75	.730	12.41	.801
Item 16	13.64	.731	12.46	.788
Item 17	14.05	.738	12.69	.785
Item 18	14.00	.737	12.59	.789
Item 19	13.68	.738	12.55	.784

Note. TAS-EM-I=Tarea de Atribución Social-Elección Múltiple I; TAS-EM-II= Tarea de Atribución Social-Elección Múltiple II

designed to offer free of cultural influence tools in order to improve cross-cultural studies in adult's social cognition.

Previous studies have shown the progressive acquisition of social cognition and its subsequently process of mastering<sup>15</sup>. Our results support this idea, since they show a better performance in TAS-EM-I and TAS-EM-II trough age. With the present scales, it is possible to compare the performance of children at different moments over time taking into account their developmental stage.

The existence of a social cognition scale with normative data for Spanish children and adolescents offers a reliable tool to measure social cognition, specifically mentalization. Moreover, the possibility of using an alternate version allows clinicians to measure changes over time, what could be crucial in neurodevelopmental disorders and conditions. However, TAS-EM-I and TAS-EM-II showed a moderate test-retest reliability. Pinkham et al (2014) tested psychometric characteristics in several social cognition scales for adults with schizophrenia and concluded that SAT-MC and SAT-MC-II parallelism was partial. Our normative data offer a

CR	Age (N)								
	8 (32)	9 (39)	10 (46)	11 (84)	12 (56)	13 (68)	14 (64)	15 (86)	
1							1-2	1	
2							3		
3		<1				<1	4	2	
4		1-3		<1		1-2	5		
5	<1	4		1	<1	3	6	3-4	
6	1-4	5			1-2	4	7	5	
7	5-6	6	<1		3	5-6	8	6	
8	7-8	7	1-3	2	4-9				
9	9-16	8	4-5		10	7		7	
10	17-25	9-11	6-7	3-5	11-14		9	8-9	
11	26-37	12-18	8-11	6-12	15-16	8-10	10	10	
12	38-62	19-28	12-22	13-25	17-27	11-13	11-14	11-16	
13	63-71	29-41	23-35	26-35	28-44	14-18	15-19	17-18	
14	72-86	42-61	36-54	36-48	45-58	19-23	20-28	19-23	
15	87-92	62-71	55-71	49-68	59-81	24-38	29-34	24-28	
16	93-96	72-83	72-92	69-82	82-86	39-52	35-50	29-43	
17		84-95	93-97	83-93	87-95	53-71	51-62	44-67	
18		96	>98	94-97	96-97	72-84	63-80	68-84	
19		>97		>98	>98	>85	>81	>85	

Note. CR= Number of correct responses in TAS-EM-I

CR	Edad (N)								
	8 (32)	9 (42)	10 (52)	11 (82)	12 (61)	13 (69)	14 (62)	15 (84)	
	32	39	46	84	56	68	64	86	
1	<1			1					
2	1-3	<1				<1			
3	4-5	1-2				1-2	<1		
4	6-7	3				3	1-3	<1	
5	8-10	4	<1	2	<1		4-5	1	
6	11-16	5	1-2		1-2	4-5		2	
7	17-22	6-15	3-10	3-5	3-5		6-8		
8	23-50	16-29	11-17	6-13	6-7	6		3-4	
9	51-59	30-43	18-33	14-23	8		9	5	
10	60-65	44-63	34-40	24-35	9-15	7-10	10	6	
11	66-80	64-75	41-53	36-48	16-23	11-14	11-15	7-8	
12	81-91	76-87	54-66	49-57	24-31	15	16-23	9-13	
13	92-93	88-89	67-74	58-64	32-37	16-19	24	14-24	
14	94-95	90-91	75-82	65-68	38-47	20-29	25-34	25-28	
15	>96	92-94	83-91	69-74	48-57	30-42	35-50	29-42	
16		95-97	92-98	75-84	58-66	43-55	51-57	43-66	
17				85-95	67-78	56-73	58-70	67-77	
18				96-98	79-92	74-93	71-89	78-91	
19					93-98	94-98	90-98	92-98	

Note. CR= Number of correct responses in TAS-EM-II

solution to that limitation since percentile scores could be used instead of raw data. Since percentiles locate each person compared with the population of reference, they can be compared if TAS-MC-I and TAS-MC-II are alternated in longitudinal assessments. It is true that the nature of the two stories represented in TAS-EM-I and TAS-EM-II slightly differ. TAS-EM-I figures scene can be understood as a harassment situation. However, in TAS-EM-II figures scene seems to represent a dispute that is positively solved. The plot in TAS-EM-I could be experienced as being more stressful compared with TAS-EM-II. Positive versus negative situations can be processed in a different way, and it can have an impact in the cognitive processing of stimuli. This idea is supported by previous studies that found different processing style in children depending on the valence of the situation presented<sup>40</sup>. Therefore, the different nature of stories might partially explain why these two scales seem not totally equivalent.

One limitation of the present study regards the lack of exclusion criteria, there is no psychiatric and/or neurologic screening; so all students had the chance to participate in this study. However, the present study aimed to show normative data in general population of children and adolescents. This implies that maybe the present results support the use of this scale in educational contexts were the real situation includes variety of performance among kids. Another methodological issue of this study is the group assessment, so it is not possible to know if there would be differences in the performance if scales were individually applied. The fact that data were collected in groups, as usual in this population age, implies that the better use of the present normative data should be in-group assessments, such as educational contexts. Schools could be interested in measuring mentalization in their students in order to design new educational methodologies or test the existing ones. However, the individual use is possible interpreting data with caution.

Despite the mentioned above limitations, this study offers normative data for a population that barely had data that allowed comparisons between individual children or adolescents performance and their general population of reference. Data of two different tasks are offered allowing longitudinal monitoring of social cognition. This decreases the effect of learning in the performance due to repetition. These longitudinal follow-ups are of special relevance in the child and youth population due to the social cognition changes according to these ages.

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