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## WHAT'S FUNNY?: DEVELOPING HUMOR AND THEORY OF MIND<sup>1</sup>

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**ABSTRACT.** The main goal of the present study was to investigate the relationship between theory of mind development and humor appreciation. Forty-one children between 4 and 11 years of age participated ( $M_{age} = 7$  years and 11 months,  $SD = 23.8$  months) and they were grouped according to their performance in four false belief tasks. Children listened to three jokes and read three comic strips, all directed to children, and were asked to rate how funny each joke/comic strip was. Analyses revealed a significant correlation between performance in the false belief tasks and joke ratings. Children who had a more sophisticated theory of mind (G2 and G3) attributed better ratings of selected jokes than children who failed in first order false belief tasks. No significant differences were found among theory of mind groups regarding the comic strips' ratings. Results corroborate the proposal that humor is a good indicator of social cognitive development and they point to a promising line of investigation in Developmental Psychology.

**Keywords:** Humor; theory of mind; social cognition.

## QUAL É A GRAÇA?: HUMOR E TEORIA DA MENTE EM DESENVOLVIMENTO

**RESUMO.** O presente estudo teve como objetivo principal investigar a relação entre o desenvolvimento da teoria da mente e a apreciação de humor. Participaram 41 crianças de quatro a 11 anos ( $M_{idade} = 7$  anos e 11 meses,  $DP = 23,8$  meses), que foram agrupadas segundo o seu desempenho em quatro tarefas de crença falsa. As crianças ouviram três piadas e acompanharam três quadrinhos, todos direcionados ao público infantil, e foram solicitadas a indicar quão engraçada/o era cada piada/quadrinho. As análises revelaram correlação significativa entre o desempenho nas tarefas de crença falsa e a avaliação das piadas. As crianças com uma teoria da mente mais avançada (G2 e G3) apreciaram mais as piadas do que as crianças do grupo que não obteve sucesso nas tarefas de crença falsa de primeira ordem. Não foram encontradas diferenças significativas entre os grupos de teoria da mente em relação à apreciação dos quadrinhos. Os resultados corroboram a proposta de que o humor é um bom indicador de desenvolvimento sociocognitivo e apontam para uma linha de investigação promissora na psicologia do desenvolvimento.

**Palavras-chave:** Humor; teoria da mente; cognição social.

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## ¿DÓNDE ESTÁ LA GRACIA?: HUMOR Y TEORÍA DE LA MENTE EN DESARROLLO

**RESUMEN.** En el presente estudio se tuvo como objetivo principal investigar la relación entre el desarrollo de la Teoría de la Mente y la apreciación del humor. Participaron 41 niños de 4 a 11 años ( $M_{edad} = 7$  años y 11 meses,  $DP = 23,8$  meses) que fueron agrupados según su desempeño en cuatro tareas de creencia falsa. Los niños oyeron tres chistes y vieron tres tiras cómicas, todos dirigidos al público infantil, y se les pidió que indicasen cuán gracioso/a era cada chiste o tira cómica. Los análisis revelaron una correlación significativa entre el desempeño en las tareas de creencia falsa y la evaluación de los chistes. Los niños con la teoría de la mente más avanzada (G2 y G3), apreciaron más los chistes que los niños del grupo que no tuvieron éxito en las tareas de creencia falsa de primer orden. No se encontraron diferencias significativas entre los grupos de teoría de la mente en relación con la apreciación de las viñetas. Los resultados corroboran la propuesta de que el humor es un buen indicador de desarrollo socio-cognitivo e indican una línea de investigación prometedora en Psicología del Desarrollo.

**Palabras-clave:** Humor; teoría de la mente; cognición social.

### Introduction

In different social situations, an individual is invited to make inferences about the mental states (i.e., beliefs, desires, intentions, emotions) of others so that communication can be established in an efficient manner. When making these attributions (e.g., what is the other person thinking, feeling, wanting?), this individual is able to grasp possible differences between his/her own perspective and that of the other person, and as a result, explain and predict the behavior of this other person. If someone, for example, wants to talk to a friend about an unpleasant subject, but when meeting him, the friend says that he has just been robbed, he/she will probably avoid talking about the unpleasant subject, predicting that the friend will not react well to another piece of bad news.

This set of skills, which is necessary for the success of social interactions, is conventionally called Theory of Mind (Wimmer & Perner, 1983; Wellman, 2014). Although recent evidence suggests the presence of theory of mind precursors in the early years of life (e.g., Baillargeon, Scott, & Baian, 2016; for a review, see Souza & Velludo, 2016), we are not born with a fully developed theory of mind. Studies conducted in different cultures over the last 30 years have shown that the period from 3 to 6 years of age, however, is a period of great advances in theory of mind development (Roazzi & Sperb, 2013; Wellman, 2014).

As children show important gains in theory of mind (and more broadly, in social cognition), they also begin to demonstrate an increasingly sophisticated understanding and appreciation of humor (Hoicka, 2014). Humor, in turn, seems to play a facilitating role in social interactions and it represents an important coping mechanism for individuals in adverse situations (e.g., Martin, 2007; McGhee, 1989; Ruch, 2008).

Defining humor is in fact a difficult task. According to Martin (2007, p.5), one possible and sufficient definition should include “anything that people say or do that is perceived as funny and tends to make others laugh, as well as the mental processes that go into both creating and perceiving such an amusing stimulus, and also the affective response involved

in the enjoyment of it". Throughout its history, the field of studies on humor has attracted researchers from different areas, but especially from Linguistics and Psychology. In Brazil, linguistic research seems to have advanced a little further than psychological research (for a review of the Brazilian linguistic research, see Carmelino & Ramos, 2015).

When considering the contributions of psychology, theories have been grouped into three categories: theories about the perceptual and cognitive aspects of humor (i.e., the issue of incongruity); social and behavioral aspects (i.e., the issue of superiority vs. depreciation), and finally, those that emphasize the psychological aspects (i.e., the issue of catharsis) (Carrell, 2008; Martin, 2007). In the last decades, however, studies on the development of humor understanding and appreciation have become increasingly frequent (Bosacki, 2013; Hoicka, 2016; Hoicka & Akhtar, 2011, 2012; Hoicka & Gattis, 2008; Loizou, 2005; Loizou & Kyriakou, 2016; McGhee, 1989; Mireault, et al., 2015; Mireault, et al., 2014).

Although humor has been studied for centuries (Carrell, 2008), McGhee (1989) was probably the first developmental psychologist to propose a theory on the different stages of humor in childhood, which was inspired by Piaget's cognitive development theory. According to this author, both the understanding and appreciation of humor depend directly on the individual's cognitive development level: "[...] as progressive underlying cognitive development enables the child to understand new forms of humor, those new forms are preferred over forms the child has been able to understand for some time" (p. 115). Therefore, McGhee's research was pioneering and opened the path for new and important lines of inquiry on humor from a developmental perspective.

Many studies, for example, have shown that humor is already present in the early years of life. In one observational study, Loizou (2005) recorded infants from 15 to 22 months of age producing humor by means of facial expressions, gestures, actions, or playing with words or sounds. For example, in one observation session, the youngest child in the study, Akiko (15-month-old), threw her cooking toys (plates, cups and cutlery) on the floor, sat on top of them and looked at the mother with a smile. Hoicka and Gattis (2008) demonstrated that 19 to 36-month-old infants imitated ambiguous behaviors which were followed by laughter (i.e., play or a joke), but corrected the ambiguous actions that were followed by the experimenter saying "Woops!", indicating an accidental error. In a more recent study (Hoicka & Akhtar, 2011), infants aged 2 ½ to 3 years were able to distinguish between "doing the wrong thing" intentionally and "doing the wrong thing" to produce humor.

There is also evidence of an association between mood understanding and the development of social cognition in preschool and school aged children. For example, Kielar-Turska and Bialecka-Pikul (2009) asked 60 children from two age groups (5- and 9-year-old) to draw something funny. Two months later, they were asked to choose the funniest drawings and explain why they were funny. A significantly higher number of 9-year-old children, compared to those from the 5-year-old group, correctly understood the intentions of the artist when asked to interpret the drawings. The authors suggest that this difference is related to theory of mind development. Following the same direction, Bosacki (2013) assessed a group of 10-year-old children on two different occasions, with a time difference of two years between the two assessments. Results revealed significant correlations between measures of theory of mind, self-perception and mood perception.

Samson and Hegenloh (2010), in turn, tested individuals diagnosed with Asperger Syndrome, and compared them to a control group (typically developing children) in two humor processing tasks: one involving a visual pun and another involving strips that led the participant to make a false belief attribution. Although no significant difference was found between the two groups in their appreciation of visual puns, participants with Asperger Syndrome had a lot more difficulty to understand and appreciate the strips that required a more developed theory of mind. These data were collected from adolescents and adults but they suggest the possibility that theory of mind may be associated with (or is a prerequisite for) the appreciation of certain types of humor.

Considering the evidence of a relationship between humor and theory of mind, it is surprising that the number of studies investigating this topic is still limited. As Hoicka and Akhtar (2012, p.586) argue:

*Humor is both cognitive and social in its nature. Producing it involves creating incongruity (e.g., McGhee, 1979; Shultz, 1976), which requires a cognitive understanding of norms and how those norms can be violated (e.g., putting a cup on one's head, and calling a cup a "dog", violate action and language norms, respectively). Humor is also social in nature. Jokes are intended for an audience (e.g., Hoicka & Gattis, 2008; Leekam, 1991) and need to be shared. Thus humor may be a good index of socio-cognitive development, as a successful joker must use their understanding of incongruity in social interaction. (e.g., Hoicka & Gattis, 2008)*

Finally, it is important to note that a more elaborate understanding of the relationship between theory of mind and humor can be very useful in planning interventions directed to individuals with difficulties or impairments in the social domain, especially because there is evidence in the literature that humor contributes to the development of social competence (McGhee, 1989).

Considering, therefore, the yet limited number of studies with a developmental perspective on the topic, as well as the scientific and social relevance of this line of research, the present study intends to contribute in this direction by investigating whether children who already have a more developed theory of mind present a better understanding of humor than those who have not yet developed this skill. Additionally, we investigated possible differences in the preference for different types of humor, that is, we asked whether children who are already succeeding in more elaborate theory of mind tasks show preferences for different types of humor when compared to younger children, who do not have this skill yet.

## Method

### Participants

Forty-one children aged 4 to 11 years ( $M_{age} = 7$  years and 11 months,  $SD = 23.8$  months) participated, 23 girls and 18 boys. Participants were recruited from a private school in a town located in the state of São Paulo. Parents received a letter containing a description of the study and the consent form. Children's participation in the research was conditioned to the return of the Informed Consent Form, signed by the parents. The project was approved by the Human Research Ethics Committee of Universidade Federal de São Carlos (Review # 149/2011, Approval Certificate #: 6677.0.000.135-10).

## Location and materials

Data was collected at the school where participants were recruited, in a room previously prepared for this purpose. The materials used were a box of chocolates, cut pieces of copy paper, a small cardboard box, a small bag, a wristwatch, a paper card, pieces of cloth and printed colored pictures representing the characters and places mentioned in the stories.

## Instruments

For theory of mind assessment, two first-order false belief tasks and two second-order tasks were used. To succeed in the first-order false belief task, the child had to attribute a false belief to one of the characters (e.g., “he thinks that ...”) (Wimmer & Perner, 1983). In the second-order false belief tasks, the child had to attribute a false belief to a person about the belief of a third person (e.g., “he thinks she thinks ...”) (Coull, Leekman, & Bennet, 2006). For the assessment of humor understanding, we used comic strips and jokes directed to children.

## Theory of Mind Tasks

*First-order false belief tasks.* The first task is an adaptation of the original false-belief task created by Perner, Leekman and Wimmer (1987). First, the experimenter presented a closed box of chocolates to the child and asked, “What do you think I have in here?”. The experimenter then opened the box and showed that the box contained pieces of cut paper, not chocolates. The box was closed again and the researcher asked the child: “What did you think I had in here before I opened the box?” Next, the experimenter asked a few control questions: “What is really inside the box?” and “What did you think was in the box when you first looked inside?” After the control questions were answered, the experimenter showed the printed picture of one of the characters and said: “This is Henry. He did not see what was inside the box. If I ask him what’s inside, what is he going to say?”. Finally, the experimenter asked: “Why do you think Henry thinks that?”. To succeed in the task, the participating child should be able to attribute a false belief to the character, that is, she needed to say that the character, just like herself, would say that the box contained chocolates.

The second task was an adaptation of the Maxi task (Wimmer & Perner, 1983), involving the displacement of an object. The experimenter showed the colored picture of a girl to the child and said: “This is Ana. She was at home when she decided to play ball with her friends. She was wearing her new watch. To prevent it from breaking during the game, Ana put it in her bag”. Next, the experimenter told the child that Ana left the house to play, and that she had left her purse in the bedroom. She added: “When Ana’s mother cleaned the house, she found her watch inside her bag and she thought: ‘I’ll keep Ana’s watch in this box so she will not forget it tomorrow.’” The experimenter asked next: “Where did Ana keep her watch?”. After providing the answer to this control question (correct answer was the bag), the experimenter proceeded with the story. The participant watched Ana returning home and was asked the following question: “What will be the first place where Ana goes to look for her



watch? Why?”. To succeed in this task, the child should answer that Ana would look for her watch where she placed it when she left home, that is, in her bag.

**Second-order false belief tasks.** The first task is an adaptation of the original task created by Perner and Wimmer (1985). The following story was told (with the help of colored printed pictures):

*This is the story of Clara and Marcos, who live in the same neighborhood. This morning, they went to a nearby park together. In the park, there is an ice cream truck. Clara is in the mood for some ice cream, but she left her money at home. She is very sad. ‘Don’t be sad,’ says the ice-cream man, ‘You can fetch your money and buy the ice cream later; I’ll be here in the park all afternoon’. ‘Oh, good,’ says Clara. ‘I’ll be back in the afternoon to buy ice cream. I’m going home to get my money then’. So Clara goes home. She lives in this house. (the experimenter points to the picture showing Clara’s house)*

*Now Marcos was alone in the park. To his surprise, he sees the ice cream man leaving the park with his truck. ‘Where are you going?’, asks Marcos. The ice cream man says, ‘I’m taking my truck to the church. There’s no one here in the park to buy my ice cream. I think I’ll have more customers there, near the church.’ The ice cream man then goes to the church. On his way, he passes in front of Clara’s house. Clara is looking out of the window and sees the ice cream man. ‘Where are you going?’, she asks. ‘I’m going to church. I’ll sell more ice cream there’, the man replies. ‘I’m glad I saw you passing,’ says Clara.*

*Marcos does not know that Clara talked to the ice cream man. He does not know that. Now Marcos has to go home. After lunch, he is doing his homework. He is not doing well in one of his assignments. So, he goes to Clara’s house to ask for help. Clara’s mother opens the door and Marcos asks: ‘Is Clara there?’. ‘Wow, she just left,’ says Clara’s mother. ‘She said she was going to buy some ice cream’. Then, Mark runs to try to reach Clara’.*

The experimenter then asks participants: “Where does Mark think Clara went?” Then she asked the following question: “Why does he think she went to...?”. In addition, three control questions were asked: 1. “Does Clara know that the ice cream truck is near the church?”; 2. “Does Mark know that the ice-cream man spoke to Clara?”; 3. “Where does Clara go to get her ice cream?”. To succeed in the task, the participant had to answer that Marcos would think Clara went to the park to look for the ice cream man, thus assigning a second-order false belief to the character.

In the second task, the following story, based on the original task created by Astington, Pelletier and Homer (2002), was told:

*This is Junior and this is Lisa. They are playing in the living room. Junior got a letter from a classmate. Lisa wants to know what the letter says, but Junior does not want Lisa to read it. Junior’s mother calls him, and Junior puts the letter under the blanket and leaves the room. While Junior is talking to his mother, Lisa picks up the letter, reads it and places it in a box, but in the meantime, Junior finishes talking to his mother and returns to the room. He sees Lisa putting the letter in the box. Junior sees Lisa, but Lisa does not see Junior. Then Junior approaches Lisa and says, ‘Okay, I’ll read the letter to you.’ And he will get the letter”.*

Next, the experimenter asked: “Where does Lisa think Junior will look for his letter? Why does Lisa think that?” To succeed in the task, the participant should correctly attribute a false belief to the character. The criterion for success at each level (first and second order) was to provide correct answers to the target questions in both stories.

**Humor comprehension task.** For the assessment of humor comprehension, three comic strips of *Turma da Mônica* (Monica's Gang) (Sousa, 1996) and three jokes from the book *Rá, ré, ri, ró ... ria - Novas piadas para crianças* (New jokes for children) (Tadeu, 2009) were used. In both comic strips and jokes, there were female and male characters. The jokes and comic strips were divided by the authors into three categories according to their content: a) *incongruity* (e.g., "What do lazy dogs do for fun? They chase parked cars!"); b) *intentional deception* (e.g., Monica uses deceptive arguments to convince Smudge that she (Monica) is not using a fake camera) and c) *unintentional deception* (e.g., Johnny says he lost his little ball, leaving the impression that he is talking about a toy and not his nasal mucus). A comic strip and a joke from each category were used. Comic strip 1 and joke 1 are from the "contradiction" category; comic strip 2 and joke 2 belong to the "intentional deception" category and comic strip 3 and joke 3 belong to the "unintentional deception category". The experimenter recorded the narration of each joke, using similar intonation in all of them to avoid a possible bias, which would be the case if each child heard a story narrated by a different speaker.

## Procedures

The experimenter took participants one by one to the data collection room. Each session lasted approximately 30 minutes and the procedure was the same for all children. The instruments were always used in the following order: first-order false belief tasks, second-order false belief tasks, humor task with jokes and with comic strips.

After the presentation of each comic strip and each joke, the experimenter asked questions to ascertain that children understood them. Next, the experimenter presented the recorded jokes again, and at the end of each one, she asked the child to tell whether they had found the joke "funny" (2 points), "more or less funny" (1 point) or "not at all funny" (0 point). The same procedure was used to evaluate the comic strips. The total appreciation scores for the comic strips and jokes ranged from 0 to 6 each.

## Data analysis

The following analyses were conducted: a) a frequency distribution analysis of responses indicating children's appreciation of jokes and comic strips; b) Kolmogorov-Smirnov tests to determine whether the distribution of scores for the Theory of Mind (ToM) and Humor tasks were normal; b) Spearman correlation tests to investigate possible associations between the variables of interest (i.e., ToM scores, evaluation of jokes, evaluation of comic strips); and c) the Kruskal-Wallis test to test possible effects of theory of mind on the appreciation of jokes and comic strips.

## Results

Initially, a chi-square analysis was conducted to verify the frequency distribution of responses provided by participants in their evaluation of jokes and comic strips (i.e., "How



funny is this joke/comic strip?”). Scores 0 and 1 were classified as “not at all/a little bit funny” and score 2 was categorized as “funny”. No significant difference in frequency distribution of evaluation responses to the comic strips was found,  $\chi^2(2) = 0.84$ , ( $p = 0.96$ ), that is, no comic strip, in particular, was rejected by participants. However, a significant difference was found in the frequency distribution of responses to jokes,  $\chi^2(2) = 11.38$ , ( $p = 0.003$ ). As can be seen in Table 1, joke 2 (*intentional deception* category) seems to have been rejected by the majority of participants, with 65.9% of them considering it not at all or a little bit funny.

**Table 1.** Frequency distribution of children's evaluation responses to jokes and comic strips

		Not/a little bit funny	Funny
Jokes	P1	53.7%	46.3%
	P2	65.9%	34.1%
	P3	29.3%	70.7%
Comic strips	Q1	24.4%	75.6%
	Q2	26.8%	73.2%
	Q3	26.8%	73.2%

To test the normality of the scores distribution for each of the three measures of interest (Theory of Mind, jokes appreciation and comic strip appreciation), Kolmogorov-Smirnov tests were performed. KS revealed, however, that none of the distributions were normal ( $p_s < 0.05$ ). Thus, subsequent analyses were also non-parametric. A Wilcoxon test revealed a significant difference between the appreciation of jokes and comic strips,  $Z = -3.079$ ,  $p = 0.002$ . More specifically, children appreciated significantly more the comic strips ( $M = 4.90$ ) than the jokes ( $M = 3.92$ ); scores ranged from 0 to 6 points.

Next, participants were grouped according to their performance in the false belief tasks: a) one group of children (G1) that did not succeed in the first- and second-order false belief tasks ( $n = 14$ ); b) one group (G2) that succeeded in the first-order tasks, but not in the second-order tasks ( $n = 18$ ); and c) one group (G3) that succeeded at both levels ( $n = 9$ ). Chi-square analyses were performed to investigate possible differences in the preference pattern of each group for jokes, but the only significant difference found was in relation to joke 3 (unintentional deception). Whereas most children in G2 and G3 considered the joke “funny” (88.3% and 88.9%, respectively), only 42.9% of the children in G1 (who did not succeed on the first-order tasks) found it “funny”. Finally, the analysis of the comic strips appreciation responses revealed no significant difference between the three theory of mind groups.

Spearman correlation tests were conducted to test possible associations between performance on ToM tasks and appreciation scores for jokes and comic strips. A significant association was found between ToM and joke appreciation,  $r_s = 0.378$ ,  $p = 0.015$ , and a trend toward a significant association was found between ToM and the total appreciation score for the comic strips,  $r_s = 0.301$ ,  $p = 0.056$ . Finally, the Kruskal-Wallis test revealed a

significant difference between the three groups in their appreciation of jokes,  $H(2) = 9.04$ ,  $p = 0.01$ , but not in their appreciation of comic strips,  $H(2) = 4.37$ ,  $p = 0.11$ . As can be seen in Table 2, whereas most children in G1 indicated that the jokes were “a little bit” or “not at all funny” (71.3%), only 22.2% of children in G3 disliked the jokes. G2 showed a preference pattern divided between considering jokes “a little bit/not at all funny” (55.6%) and finding them funny (44.4%).

**Table 2.** Frequency distribution of appreciation scores for jokes across Theory of Mind groups (G1- failed first- and second-order tasks; G2- failed first-order tasks, but not second-order tasks; G3 – succeeded in first- and second-order tasks).

		Not/a little funny (scores 0-4)	Funny (scores 5 and 6)
Jokes	G1	71.3%	28.5%
	G2	55.6%	44.4%
	G3	22.2%	77.7%

## Discussion

The present study aimed to contribute to the field of socio-cognitive development by investigating the relationship between humor and theory of mind development in a sample of Brazilian children. Thus, we investigated possible differences in the appreciation of jokes and comic strips (all directed to children) between three groups of children who were at different stages in their development of theory of mind. Results suggest a significant association between theory of mind and humor appreciation, which is consistent with findings from previous studies conducted in other countries (Bosacki, 2013; Kielar-Turska & Bialecka-Pikul, 2009; Samson & Hegenloh, 2010). More specifically, the pattern of participants' preference for jokes seems to have been influenced by their ability to attribute first- and second-order false beliefs to other individuals. Children with a more advanced theory of mind (G2 and G3) showed greater appreciation of jokes than children who did not succeed in first-order false belief tasks. One possible explanation is that G1 children's limited theory of mind made it difficult for them to understand and, consequently, to appreciate jokes. Jokes 2 and 3 (*intentional deception* and *unintentional deception* categories) minimally require the ability to differentiate mental states (i.e., thoughts, beliefs and emotions) of each of the characters, that is, a minimal repertoire in theory of mind seems necessary to understand these jokes.

An analysis of G1 children's justifications for joke 3 ratings (unintentional deception), for example, may illustrate this point. In sum, the joke is about how Johnny began to disturb a movie session, claiming that he was looking for his “little ball”. The session was interrupted so that he could look for his little ball, but as it was not found, Johnny said: “It doesn't matter. I'll make another one!”, shrugging his shoulders and sticking his finger in his nose. Thus, in order to appreciate the joke, a person had to understand that all people thought he was looking for a toy ball when, in fact, he was looking for his booger ball. When asked “Why did you find the joke (not at all/a little bit funny or funny)?”, some G1 children provided answers

that revealed a lack of understanding: “Because when he puts his finger in his nose, it makes me want to laugh”; “Because he says he’s going to make another little ball in the nose”; “Because he lost his ball and did not find it”; “Because he shrugged his shoulders and stuck his finger in his nose”. In contrast, G2 and G3 children offered explanations that indicated an understanding of the difference between what Johnny wanted and what other people in the movie theater thought he wanted: “Because everyone thought it was a toy ball, and in the end, it was a booger ball”; “Because the ball was the booger ball from his nose”; “Because he lost the little ball and everyone stopped to look for it because they thought it was a paper ball”.

In contrast to the data on joke appreciation, no significant differences were found between the three ToM groups with regard to their evaluation of the comic strips. The Spearman correlation test also indicated only a trend toward a significant association between theory of mind and comic strip appreciation. In fact, as indicated by the Wilcoxon test results, children liked comic strips much more than jokes, regardless of their theory of mind repertoire. This difference can be explained by the type of resource used for jokes and comic strips. Participants had only access to the audio recorded jokes, whereas the comic strips were shown in printed and colored sheets of paper. According to Ramos (2005), comic strips are not limited to verbal strategies to elicit humor because they carry visual information. The image can act as a source of comedy and can help the move from a “serious” type of reading to a “not serious” one. Future studies should consider the type of humor technique or resource used as a variable to be controlled or to be further investigated.

Although these findings corroborate the foreign studies which have evidenced the relationship between theory of mind development and humor understanding/appreciation, this study presents some limitations that need to be noted. First, it is important to remember that there are several forms of humor and several techniques to produce humor (Martin, 2007; Ruch, 2008; Stein & Carmelino, 2013) and our small sample of three jokes and three comic strips does not reflect this diversity. The criteria used for the selection of the material were: they had to be manifestations of humor directed to children and they had to include a narrative that invited the reader to make attributions of mental states to the characters. Future studies, however, should include a more diverse sample of children jokes in order to test how generalizable the effect is. Another suggestion is that future studies should make comparisons to adolescent and adult participants. One important question that the present work raises is whether individuals who already possess an advanced theory of mind (e.g., those who are already able to attribute second-order false belief) will present similar preference patterns or whether individual variables (such as predisposition to engage in humor or participants’ mood), as well as contextual variables (e.g., a family context that encourages the use of humor) may explain differences in the appreciation of humor material.

Finally, it is important to note that the present work represents an important but yet initial step in understanding the exact relationship between humor and social cognition. The data presented here are in line with the proposal that humor is a good index of socio-cognitive development (Hoicka & Akhtar, 2012), but the association can be bidirectional. On the one hand, it seems plausible to assume that a well-developed theory of mind contributes to the understanding and appreciation of humor, and that humor, in turn, can become an

important resource in social interactions (Martin, 2007; McGhee, 1989; Ruch, 2008). On the other hand, it is also possible to argue that the use (or encouragement) of humor may have positive effects on socio-cognitive development. If, in fact, there is one (uni- or bi-directional) relationship between theory of mind and understanding/appreciation of humor, understanding the nature of this relationship can be very useful for the planning of interventions that use humor resources with specific populations (e.g., typically and atypically developing children who present delays in social cognition or children who are in situations of adversity or psychological suffering).

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