

## **The Influence of Art Consumption on Theory of Mind Development**

Alinde Johanna Lammers

s4317009

Department of Psychology, University of Groningen

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Group number: 14

Supervisor: MSc. Gemma Schino

Second evaluator: dr. Islam Borinca

In collaboration with: Meike Boon, Anna Geffken, Kinga Mattern, Eva Perifanou, and Nina

Veldhuis.

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### **Abstract**

Theory of mind (ToM) is an essential skill for all humans to navigate social interactions (see Wellman, 2018). It is defined as one's understanding of other people as beings who have their own thoughts, feelings, beliefs, and intentions (Astington & Dack, 2008), which allows one to understand social contexts and navigate interpersonal interactions. Since a theory of mind is needed to understand artworks, art therapy has been used to enhance theory of mind skills in children. However, its effectiveness remains unclear (Brucker & Phillips, 2017). Therefore, the purpose of this study was to explore the impact of the amount of art consumption on the ToM-development in children. N=25 children (age 6-10) participated in pairs and were instructed to both bring a piece of art that was meaningful to them. In the experiment, the dyads took part in an audiovisually recorded semi-structured conversation, in which they reflected on both artworks and answered pre- and post-questionnaires. By use of a general linear regression analysis, a general correlation analysis, and an ANOVA analysis, no significant effect of the amount of art consumption on ToM-development was found. However, the effect was larger in age group 6-8 than in age group 9-10, which implies that there may be a stronger effect present in younger children. Future research should focus on more specific age categories as well as on younger children.

*Keywords:* theory of mind, art consumption, child development

## **The Influence of Art Consumption on Theory of Mind Development**

There is one thing that people's ability to make friends, communicate through verbal and non-verbal language, and understand abstract stimuli have in common: they all require a person to have a well-developed theory of mind (ToM, Premack & Woodruff, 1978). Plenty of information is known on the influence of the theory of mind on people's lives (for an overview see Baron-Cohen, 1999; Wellman, 2018), but less is known about how it develops. Theory of mind (ToM) is considered a crucial cognitive skill to have. However, many individuals encounter challenges in mastering it (Kinderman et al., 1998). Therefore, there is a need for extensive research to investigate the mechanisms underlying ToM and its developmental processes. Since art is used in many forms to convey emotions and messages, art understanding holds potential as an assessment tool for ToM-development. However, the reciprocal relationship between art and ToM-development remains under-explored. Hence, this study seeks to address this gap and investigates the impact of art on the ToM-development of children.

### **Introduction**

#### **Theory of Mind**

Almost 50 years ago, the term "theory of mind" was used for the very first time (Premack & Woodruff, 1978). The definition was simple: theory of mind is when "the individual imputes mental states to himself and to others" (Premack & Woodruff, 1978, p. 515). Nowadays, the concept of the theory of mind is also known as "mentalising" or "mind reading" (Franchin, 2020). Especially the latter term gives a good insight into the contemporary understanding of what it means to have a theory of mind (ToM): it is a person's understanding of other people as beings who have their own thoughts, feelings, beliefs, and intentions, and with that, it is a person's understanding that the behaviour of

others can be explained, predicted, and even manipulated by considering that they have their own mind (Astington & Dack, 2008).

Since that first mention of the ToM, extensive research has been carried out on various aspects of the concept, such as how it is defined, how it develops and how it can be measured. One of the most prominent of these aspects is the impact that the ToM has on people's lives. As it turns out, ToM is one of the most important skills needed for people to communicate with each other effectively. The ability to consider the thoughts and feelings of others allows people to create shared goals and plans, communicate their own feelings clearly, and teach other people new things. Moreover, this ability allows people to purposefully deceive and persuade others (Baron-Cohen, 1999). Taking this into account, it comes as no surprise that a person's social life and interpersonal relationships may be greatly affected by how well-developed their ToM is. Additionally, it has been shown that a well-developed ToM is a predictor for higher academic performance in both reading and mathematics as well as higher academic motivation (Wellman, 2018). These findings imply that the level of development of a person's ToM can influence their academic achievements and in turn, their future careers. Seeing that a person's interpersonal relationships and job opportunities play a major role in their lives, there is good reason to look into methods to improve people's ToM.

### ***Theory of Mind across Developmental Stages***

As with most psychological phenomena, ToM is a skill that is developed over time. The most commonly accepted theory at the moment follows the idea that the ToM develops mostly throughout childhood. This idea is supported by the 5-step ToM measurement scale (Wellman & Liu, 2004), which outlines several different theories of mind tasks and finds that with increasing age, children pass more tasks, indicating a better-developed ToM.

In general, it is believed that the ToM begins to develop shortly after birth, until a person is around ten years old (Westby & Robinson, 2014). Within two years of birth, most children have developed a sense of self and the ability to engage in pretend play. After this, until approximately six years of age, children usually develop the ability to predict the feelings and actions of others as well as to take the perspective of others. Finally, until the age of ten, children develop higher-order ToM-skills such as being able to deceive others and the ability to predict how persons feel about other people (Westby & Robinson, 2014). In older children, advanced theory of mind (AToM) refers to the ability to interpret complex social situations by inferring the mental states of others (Bialecka-Pikul et al., 2017). Many aspects of this skill are closely related to social competency and the degree to which one is able to make friends (Osterhaus & Koerber, 2021), and are necessary to develop because social contexts become more complex during adolescence (Bialecka-Pikul et al., 2017).

### **Art Consumption**

In order to understand art consumption, one must first understand what constitutes art. It can be difficult to define what makes something art, especially since historically, art has gone through many changes. One definition that still stands the test of time is Tolstoy's paragraph on the three conditions of art:

To be a work of art it must, in the first place, be a thing which has for its content something hitherto unknown but of which man has need; secondly, it must show this so intelligibly that it becomes generally accessible; and thirdly, it must result from the author's need to solve an inner doubt. (Tolstoy, 1897/1924, p. 92)

With this in mind, in this study, a wide range of art forms were accepted as art, including things such as movie excerpts, photographs, and figurines. Moreover, in the survey, all forms of interaction with art, from conceptualizing artworks to the production of art to simply

enjoying the finished product, were considered to be art consumption, as they all require interaction with the work of art.

### ***Art Consumption across Developmental Stages***

For the research on the impact of art consumption on the ToM-development, it is essential to understand how soon in life humans can enjoy art. McAdams and colleagues (2023) explored how well children can appreciate art and found that art pieces that adults stated they enjoyed were the same pieces that babies spent a long time looking at, due to a shared preference for luminance and saturation. Another study supports the idea that babies can consciously engage with art with the finding that younger infants preferred different kinds of paintings than older ones (Danko-McGhee, 2011), indicating the development of a preference for art style. The findings in support of young babies being able to appreciate art are not limited to visual art: children appear to have a preference for music style as early as 10 months old (Roulston, 2006) and newborns appear to prefer listening to music they heard prenatally (Ullal-Gupta et al., 2013), indicating that art consumption can already begin while babies are still in the womb. These findings together show that conscious art consumption can and does start very early on in life.

### **Theory of Mind and Art Consumption**

As the research on the ToM has continued, one of the more specific topics of interest has been the relationship between the ToM and art (Keskin, 2009). It has been shown that the level of development of the ToM is positively correlated to art understanding (Keskin, 2009). That is, a person with a well-developed ToM has a more profound understanding of the meaning of a piece of art, both in the sense that the meaning of the piece may be different to different people and in the sense that the symbols used in the piece may not directly correspond to reality but instead refer to something else. Studies on the reverse direction of this correlation have been carried out more recently. One of these studies found that reading

literary fiction had a short-term positive effect on the ToM (Kidd & Castano, 2013).

Additional research has shown that viewing award-winning TV shows is related to higher scores on tests of ToM (Black & Barnes, 2015). Furthermore, it has been found that viewing art films correlates to better performance on ToM tasks (Castano, 2021). Altogether, these findings imply that the consumption of different forms of art has a positive effect on the development of the ToM. This implication is supported by the advice that art encounters should be provided at primary schools in order to improve children's ToM (Keskin, 2009) as well as the fact that art therapy is already being used in an effort to help people become more empathetic (Brucker & Phillips, 2017).

While this implication provides a first insight into the relationship between art and the ToM, there is still a lot that is not yet known about this relationship. This includes features such as how art consumption improves ToM-skills; does it train facial expression recognition, or improve fundamental understanding of individual experiences? Other aspects to consider are the possibilities of the consumption of different art forms having different effects on the development of the ToM, or the methods of interaction with the art influencing the strength of ToM-skills, or the colours used in the art having different effects and so on.

### **The present study**

It has been shown that the development of the ToM has an important influence on people's lives. The ToM is understood to be a skill that can be trained, and there exist subtle implications that ToM-skills can be improved through the consumption of art during childhood. This context, in combination with the gap in the literature on the specific mechanisms at play in the correlation between amounts of art consumption and ToM-development, leads to the following research question: how does the amount of art consumption affect the development of the theory of mind in children?



The corresponding hypothesis to this research question is that there is a positive relationship between the amount of art that is consumed and the level of development of the theory of mind.

## **Method**

### **Participants**

The sample consisted of 25 participants. 12 participants were male (48%) and 13 were female (52%). Ages ranged from 6 to 10 ( $M = 8.48$ ,  $SD = 1.33$ ). 96% of participants spoke Dutch as a first language; 4% spoke English. A large portion of the participants were recruited through volunteer sampling. This was made possible by recruitment methods such as contacting schools with an invitation to participate, spreading flyers in public and the presence of a recruitment stand at the Zpanned Zernike festival. Additional participants were recruited through convenience sampling within the network of the research group. After these two initial methods, snowball sampling was used to recruit more participants. A reward for participation was given in the form of a Pimm voucher of 10 euros offered to the participant. Participants were also given the choice to donate the money to a participating school instead.

### **Materials and Procedure**

The study was approved by the Ethics Committee Behavioural and Social Sciences of the University of Groningen (PSY-2223-S-0252) and is in line with the Dutch ethical standards for scientific research. Before the experiment started, the participants—or their parents, if the child was younger than 16 years old—were asked to give their informed consent via the registration form, which was created using Qualtrics (<https://www.qualtrics.com>). This is an online software tool that is used to create surveys and convert participant responses into data files that are appropriate to use for statistical analyses. The registration form asked for basic demographic information such as the participant's

name, the name of their buddy as well as their relation to each other, and the language spoken. The participants were asked to bring an item with personal meaning to them and to share a picture of said item with the researchers before the experiment if applicable.

### *Preparation phase*

The first step in the preparation phase for the researchers was to ask all participants to invite a peer, such as a friend or a family member, to participate in the experiment with them. Each participant and their recruited peer are from here on out referred to as a dyad or as buddies. After this, the researchers asked all participants to bring one item that was important to them along with them to the experiment and to not share with their buddy what their item of choice was. Finally, the researchers obtained the informed consent of the participants or their legal guardians.

The next step in the preparation phase for the researchers was to set up all the materials needed for the experiment. The experiment could be carried out at the University Ambulatory in Groningen, at a school, or at the participants' homes. The University Ambulatory provided an experimental room where the questionnaires could be filled in and the conversation could be held, and a control room where the recording of the experiment was supervised. When experiments were conducted outside of the Ambulatory, the setup of the experimental space had to resemble the setup at the Ambulatory as closely as possible, with a separation between the conversation space and the control station. In both setup forms, at least one researcher had to be present to carry out the experiment and at least one researcher had to be present to oversee the recording and troubleshoot any technical issues. The experiment was recorded via a 2-Logitech BRIO webcam, using the computer program VideoCapture to retrieve the video stream from the webcam and the computer program AudioCapture to retrieve the audio stream from the webcam. The computer program LabRecorder was used to retrieve the audio and video stream from the webcam and time

synchronize these streams into one media file on the computer. Researchers had to ensure that these programs were working appropriately prior to the experiment. To ensure that the video and audio files were synchronized with the main computer, Lab Streaming Layer technology (LSL, <https://labstreaminglayer.readthedocs.io/>) was used. The proper working of this program also had to be checked by the researchers prior to the experiment.

The third and final step in the preparation phase was for the researchers to open the PowerPoint with the conversation prompts in the appropriate language for the dyad in question and to prepare the tablets by setting up the questionnaires for each participant. The questionnaires were held before and after the conversation. The questionnaires (see Appendix A) included questions about perceptual strategies rated on a Likert scale (from 1 to 5; 1 = “disagree”, 5 = “agree”). Personality traits of Openness to Experience and Extraversion were assessed using selected items from the Big Five Questionnaire for Children (Muris et al., 2005). Emotion elicited by artwork was measured using an adapted version of the Geneva Emotion Wheel (Scherer, 2005) for children and adolescents used in museum contexts by De Angeli and colleagues (2020). Body Sensation Maps (Nummenmaa et al., 2014, Hietanen et al., 2016) assessed where the participants felt activity getting stronger or weaker in their body.

### ***Experimental phase***

The experimental phase started after both participants in each dyad provided consent. This phase lasted anywhere between 30 minutes and two hours, depending on the age and concentration level of the participants. The experimental phase was divided into three parts.

During the first part, the participants were seated at a small distance from each other to avoid distraction and asked to spend at least 30 seconds familiarizing themselves with the object in front of them before starting the pre-conversation questionnaire. Whether the participant viewed their own or their buddy’s object first varied for each dyad to prevent

order effects (Price et al., 2015). Depending on their reading proficiency, the researcher assisted in filling out the questionnaire by reading and explaining the questions. After the participants completed the first section of the questionnaire, they were prompted to exchange their objects and move on to the next section. Once both participants finished filling out their questionnaire, they were asked to relocate to the camera's field of view for the conversation phase of the study. When the participants had settled for the conversation, the recording was started.

During the second part of the experimental phase, 11 conversation prompts, shown in Table 1, were presented to the participants in a PowerPoint and read aloud by the researcher.

**Table 1**

*Conversation prompts*

Theory of Mind	General
Why do you think your buddy brought their item?	Why did you bring this item?
What do you think your buddy thinks about your item and their item?	What do you notice about these items?
What do you think about your item?	Do you think this item is beautiful?
What do you think the artist wanted you to feel with this item?	What colour do you find most noticeable about this item and why?
	What can you do with these items?
	What would you like others to know about the item you brought?
	What can you learn from these items?

*Note.* The “General” prompts invited the participants to reflect on the items, and thus to think of the other person and their feelings and thoughts. Though similar in content, they are separated from the “Theory of Mind” prompts as the prompts in the latter category are those that are used in this study to measure the level of development of the theory of mind.

The participants were given two minutes per prompt to talk freely about what they were asked in the prompt. Throughout the conversation, if deemed necessary, the researcher invited the participants to take a break to prevent cognitive overload.

During the third and last part of the experimental phase, the participants were invited to sit and fill in the post-conversation questionnaires. The format and order of these questionnaires were the same as those of the questionnaires that were filled in before the conversation section (see Appendix A). After both participants had filled in their second questionnaire, the experiment was officially concluded.

## **Measures**

To ensure a comprehensive and detailed analysis, both qualitative and quantitative data were collected. The variables measured were the amount of art a child was exposed to in their life and how well-developed their ToM was.

### ***Art consumption***

A quantitative approach was used to measure the amount of art consumption of each participant. The questionnaires contained a section wherein participants were shown 16 different art-related activities (see Appendix A) and asked to pick the ones they enjoyed participating in. The amount of activities chosen was taken as a quantitative measure of the amount of art consumption, meaning that a higher amount of activities chosen was interpreted as a higher amount of art consumption, and a lower amount of activities chosen was interpreted as a lower amount of art consumption. The amount of answers chosen was noted and then counted per participant with the use of Microsoft Excel 2021.

After this pre-processing step, three categories were created to indicate low, medium and high amounts of art consumption. This was done by locating the median and creating as equally sized groups as possible based on this and the total possible range. Participants were sorted into their respective categories using Microsoft Excel 2021. The amount of art consumption was measured as a variable as the category each participant fell into.

### ***Theory of Mind***

A quantitative approach was used to grasp and analyse the theory of mind during the dyadic interactions (i.e.: conversations between participants). Since the conversations were conducted using both English and Dutch, all transcripts of the conversations were translated so that every conversation was available for analysis in either language to ensure the data could be easily interpreted and cited for this and future research. Transcripts and back-translations of the recordings were written and translated by one researcher, then translated back into the original language by another, to ensure that the meaning was not lost during translation and therefore the data remained reliable (Tyupa, 2011).

After these steps of pre-processing, the words and phrases related to the expression of feeling and emotion that were used during the dyadic interaction were coded as functions of the theory of mind, based on previous research by Mendonça et al. (2019) and Westby and Robinson (2014). To this end, Microsoft Excel 2021 was used as an annotation tool. The level of development of the theory of mind was measured as a variable as the category each participant fell into in the coding scheme based on their given answers during the dyadic interaction.

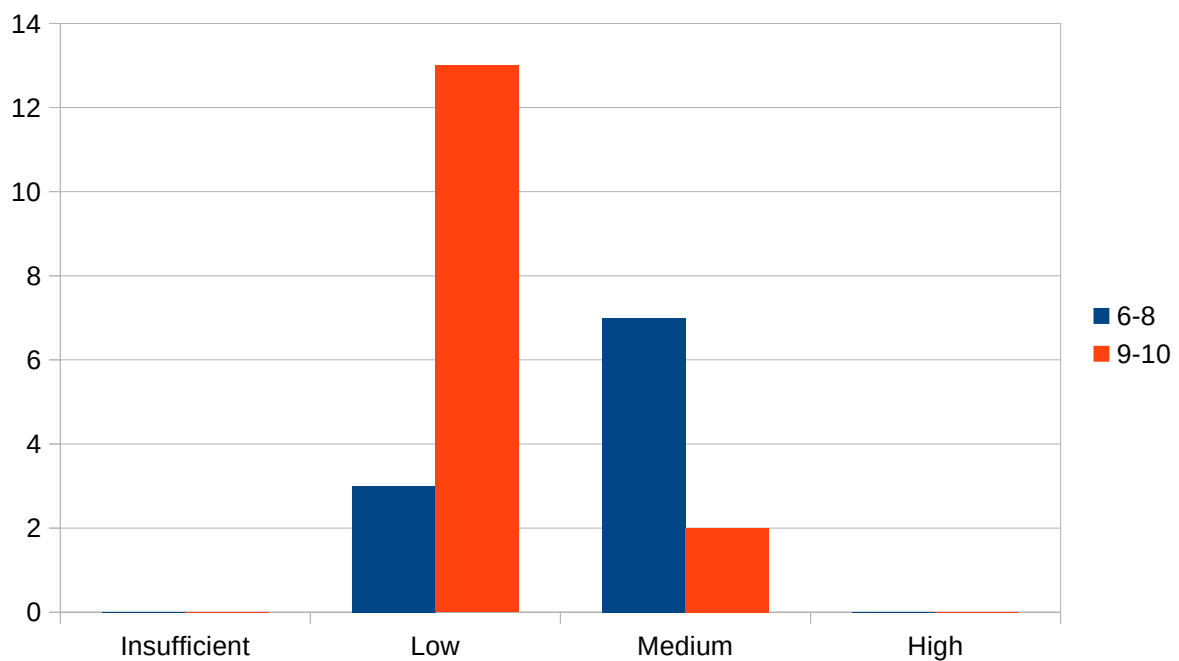
## **Results**

During the dyadic interaction within the experiment, four open-ended questions (Table 1) were aimed at measuring the level of development of the ToM in the participants. The answers to these questions were coded and transformed, using a coding scheme created

for this study (see Appendix B), into a score of observed ToM-level compared to the expected ToM-level. These scores were then separated into two age categories based on Mendonça et al. (2019) and Westby and Robinson (2014), resulting in the division elucidated in Figure 1.

### Figure 1

*Counts of participants in ToM-score categories*



*Note.* Age category 6-8 did not have a category for “insufficient”

To define the levels of amount of art consumption for the groups, the outer five values from the 16 options given in the survey to indicate activity surrounding art were taken to indicate the low and high art consumption categories, and the median six values were taken to indicate a medium level of art consumption.

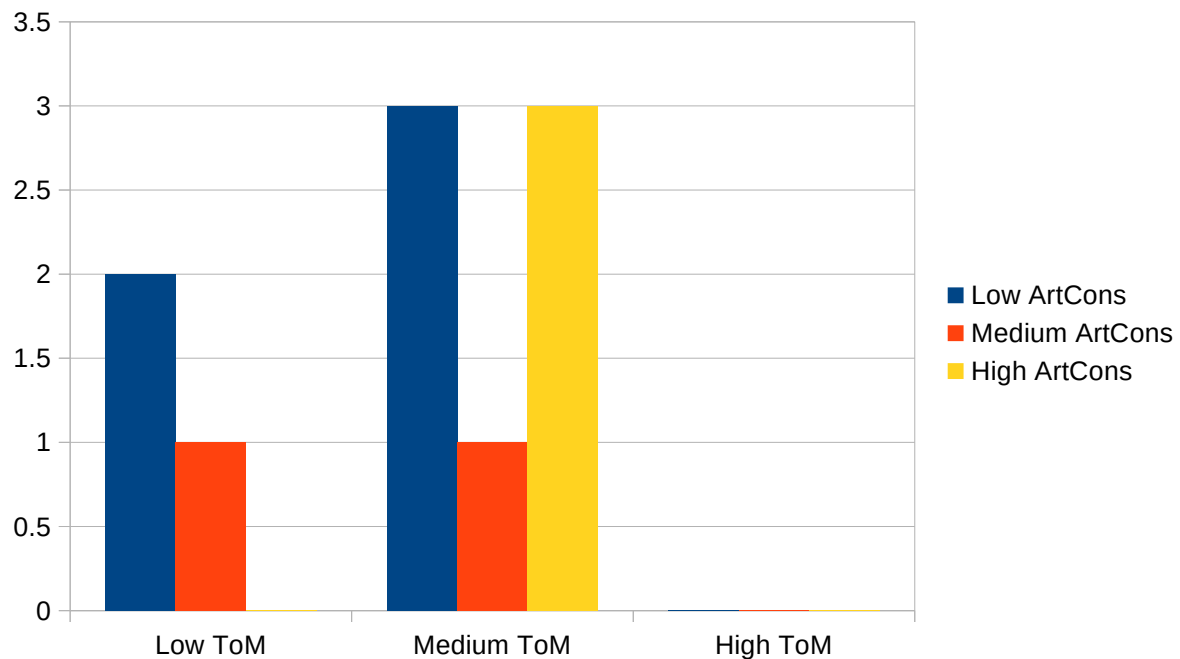
### Exploratory analysis

Within the group of participants aged 6-8, two of the three participants with low ToM-scores fell into the low art consumption category. The other participant with a low ToM-score had a medium art consumption score. In the group with medium ToM-scores, the

scores on art consumption ranged from low to high, with three participants in the group with high scores, one participant in the group with medium scores, and three participants in the group with low scores. These scores are shown in Figure 2.

**Figure 2**

*ToM-scores and ArtCons-scores for age group 6-8*

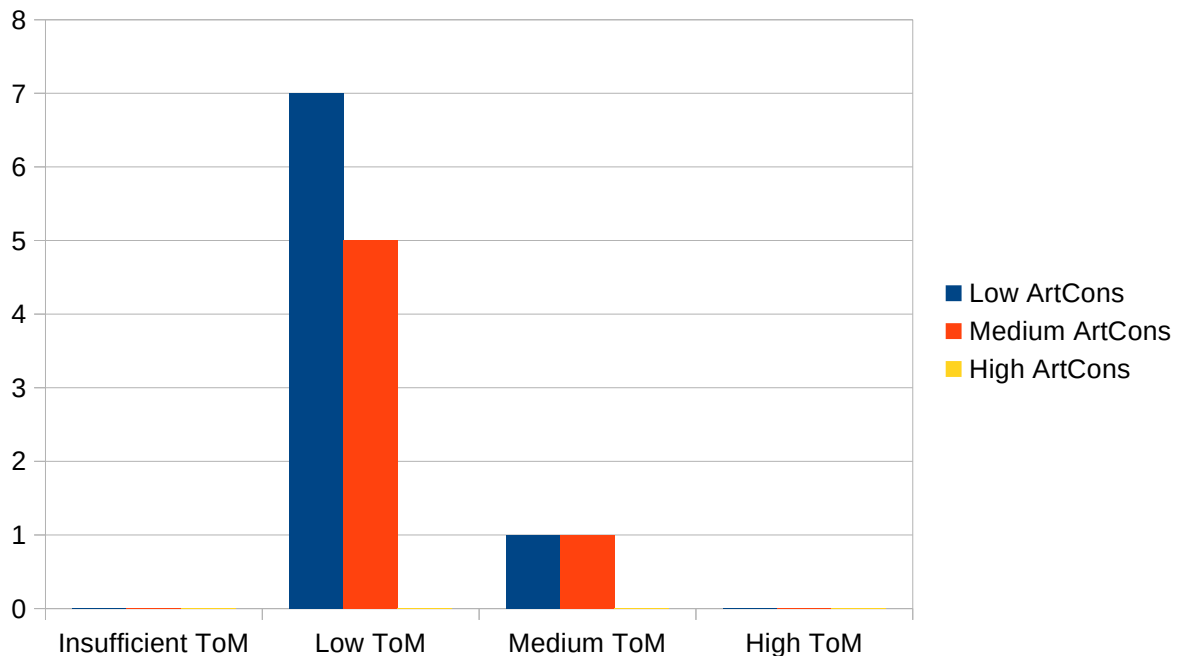


Within the group of participants aged 9-10, the two participants with medium ToM-scores had different art consumption scores, one being a low score and one being a medium score. In the group with low ToM-scores, with seven people in the low art consumption category and five people in the medium art consumption category, there was a slight lean towards low art consumption scores in the data, however no clear pattern could immediately be seen. These scores are shown in Figure 3.

**Figure 3**

*ToM-scores and ArtCons-scores for age group 9-10*





The cut-off scores for the levels of art consumption were set at 5 for the lower end and 12 for the higher end. However, for the full sample ( $M = 5.52$ ,  $SD = 3.97$ ) the 33<sup>rd</sup> percentile was measured at 2.92 and the 66<sup>th</sup> percentile was measured at 7.00. The density for total scores on art consumption was the highest in the low scores category. The art consumption scores in the group of participants aged 6-8 ( $M = 7.00$ ,  $SD = 4.57$ ) also were the densest in the category of low art consumption scores, whereas the scores in the group of participants aged 9-10 ( $M = 4.53$ ,  $SD = 3.31$ ) had almost equal densities in the low and medium art consumption scores. The only high scores on art consumption were measured in the group of participants aged 6-8.

### Statistical analysis

Statistical analyses were carried out using JASP 0.18.3 on the full sample as well as on the separate age groups to investigate the relationship between the amount of art consumption and the development of ToM. The samples were analysed by use of a general linear regression analysis, a general correlation analysis, and an ANOVA analysis.

The full sample of 25 participants found no significant effect with any of these methods, with  $F(2, 22) = 0.083, p = .921$  with the null hypothesis that the means of the different art consumption groups are the same indicating that the null hypothesis cannot be rejected, which indicates that the means of the groups are not significantly different from each other. When it comes to effect sizes,  $r(23) = 0.08, p = .712$  and  $\eta^2 = 0.007$  show a very minimal effect size, and  $F\text{-change}(1, 23) = 0.140, p = .712$  shows no significant improvement in the predictive power of the model by adding art consumption scores to the model. Finally,  $R^2 = .006$  shows that only 0.6% of the variability in ToM-scores of participants aged 6-10 can be explained by the amount of art consumption.

The analysis results for the group of participants aged 9-10 are relatively similar in interpretation. No significant effect was found with any of the methods used, with  $F(1, 13) = 0.009, p = .926$  with the null hypothesis that the means of the different art consumption groups are the same indicating that the null hypothesis cannot be rejected, which indicates that the means of the groups are not significantly different from each other. When it comes to effect sizes,  $r(13) = 0.03, p = .926$ , and  $\eta^2 = 0.000$  show a very minimal effect size, and  $F\text{-change}(1, 13) = 0.009, p = .926$  shows no significant improvement in the predictive power of the model by adding art consumption scores to the model. Finally,  $R^2 = .001$  shows that only 0.1% of the variability in ToM-scores of participants aged 9-10 can be explained by the amount of art consumption.

The analysis results for the group of participants aged 6-8 were slightly different. With  $F(2, 7) = 0.824, p = .477$ , still no significant effect was found, meaning that the null hypothesis that the means of the different art consumption groups are the same still cannot be rejected, indicating that the means of the groups are still not significantly different from each other. However, when it comes to effect sizes,  $\eta^2 = 0.190$  shows a large effect size, and while  $r(8) = 0.35, p = .321$  does not show a statistically significant effect size, it does show the

presence of a small effect size.  $F$ -change (1, 8) = 1.120,  $p = .321$  shows no significant improvement in the predictive power of the model by adding art consumption scores to the model. Finally,  $R^2 = .123$  shows that approximately 12.3% of the variability in ToM-scores of participants aged 6-8 can be explained by the amount of art consumption.

Overall, the amount of art consumption does not seem to have a significant effect on the development of theory of mind skills in children aged 6-10. However, in the younger age category a small effect size was found concerning art consumption, which was not seen in the older age category.

### **Discussion**

The main finding of this study is a lack of a statistically significant effect of the amount of art consumption on the development of ToM-skills in children aged 6-10 years old. A detail about this finding that is of note is that there was a small effect size found for children aged 6-8, indicating that there may be a relation between the development of ToM-skills in younger children and their amount of art consumption. This is somewhat in line with the existing literature. On one hand, previous literature (Keskin, 2009; Brucker & Philips, 2017) suggests that it might be beneficial to the development of ToM-skills for children to expose them to various forms of art. On the other hand, no profound results about the correlation between art consumption and ToM-skills have been found to date, so the findings in this study support the previous literature in the sense that there is no strong evidence for an effect of art consumption on the ToM-development; this goes for a positive as well as a negative effect.

The results of this study imply that overall there is no strong influence of the amount of art consumption on the ToM-development. However, for younger age groups there may be a stronger effect of amount of art consumption on ToM-development than for older age groups. It may be so that for age groups below 6 years this effect is stronger; however, this is

only a hypothesis based on the findings in this study. Based on these implications there is no immediate advice to provide more art consumption to children to improve their ToM-skills, because the effect is only minimal. However, there is no evidence in favour of harmful effects of art consumption on the ToM-skills, so there is also not a strong reason to not provide more art consumption to children.

## **Considerations**

### ***Measurement precision***

In this study, the difference in expectations of the ToM-development for children aged 6-8 may have been too large for these participants to be examined as one group. Osterhaus and Koerber (2021) found that the development of the advanced theory of mind follows a non-linear pattern, notably with a plateau phase after the age of 7, which falls in the middle of the age category used in this study. This finding gives some insight into why our category might be too broad: 8-year-olds in our category may have been in a phase of plateauing development while 6-year-olds may have been experiencing a rapid increase in development. These two states may be too different to be appropriately combined in one group.

Moreover, Westby and Robinson (2014) showed that most milestones in the ToM-development happen before the age of 6, with the first ones occurring before the 6-month mark. This means that this study may have excluded a large period of time where the effect of the amount of art consumption on the development of ToM may be seen. In doing so, it is possible that a stronger effect of art consumption on ToM-development in younger age groups has been missed, which could serve to explain the lack of statistically significant findings in this study.

The finding of this study that the effect of art consumption on ToM-development is bigger in the younger age group is in support of the theory of the ToM-development by

Westby and Robinson (2014) as well as the ToM measurement scale by Wellman and Liu (2004). The findings in this study are not in support of the theory that ToM-development continues in older children (Westby & Robinson, 2014). The findings support the advice that art encounters should be provided in elementary schools to facilitate ToM-development (Keskin, 2009), as the implication in this study and Keskin's (2009) advice is that art encounters are most beneficial at younger ages.

The advanced theory of mind (AToM, Białocka-Pikul et al., 2017) was not examined in the older age group, which may explain in part why no effect was found in the older age group. Had the AToM been measured as well, clearer differences in development levels might have been found due to higher accuracy of the measurement, which may have shown a pattern related to art consumption. It is possible that art consumption does have an effect on ToM-development in older children but that it was not captured in this study because of this.

Importantly, this study assumed linearity in regards to ToM-development. However, we have seen that this is not necessarily the truth (Osterhaus & Koerber, 2021). This means that perhaps non-linear analysis methods or a hierarchical regression analysis might have been better suited for this study. It might still be possible that art consumption affects ToM-development but that it, for example, happens at milestones that do not always occur at the same age. A linear analysis cannot show this, which is another possible explanation for the findings.

### ***Personality***

This study was partially executed as an in-person interview. This method carries risks with it that may have affected the results of the study. Speaking in front of a camera, being in an experimentation room with a researcher and being left alone with unknown adults may all be reasons why a child may be uncomfortable (Chęć, 2019). During the study it was noted several times that participants may have felt shy in the interviews. This is supported by the

fact that quite a few participants became chattier as the interview progressed. This shyness may have resulted in shorter answers to the questions, which could have reflected on the scores on the expected ToM-development. This is supported by the fact that the ToM-scores leaned towards the lower end of the scale and the fact that a “high” score on a ToM-item was only measured once during the entire study. Shyness has long been considered to be a part of personality (Hagekull & Bohlin, 1998), making up a part of the neuroticism domain in the five-factor personality model (Bratko et al., 2002). Controlling for shyness was not a viable option in this study, as only a shallow personality quiz was included at the end of the final questionnaire (see Appendix A), providing only a basic overview of personality traits of participants. However, this may have provided enough information to include personality factors in the analysis to explore a possible interaction effect between amount of art consumption and personality traits. Perhaps a more extensive personality test that would have allowed controlling for shyness or analysing personality as a third variable might have shown relationships that remain unseen now.

### **Limitations and Strengths**

The main limitation of this study was that the sample size for this study was relatively small. There exist several different ways to calculate the minimum sample size for a study, such as a sample-to-item ratio of no less than 5-to-1, a sample-to-variable ratio that is ideally around 20-to-1, or the Roscoe guidelines that advise a sample size greater than 30 but smaller than 500 for behavioural studies (Memon et al., 2020). With a sample size of 25, this study does not easily meet many commonly used criteria for minimum sample sizes. This means that the results may not reflect reality properly. Using the software G\*Power 3.1.9.6 (Faul et al., 2009), it was found that based on our  $\eta^2 = 0.007$  for the total sample, a sample size of 1846 would be necessary to reach a power of 0.95. It is recommended that in future studies a larger sample size is used.

The main strength of this study was the interview setup, which allowed participants to express their feelings and thoughts without constraints. Coding the conversational data into a measure made this approach quite similar to a naturalistic observation (Patterson, 1977). When measuring an abstract concept such as the theory of mind, it can be fruitful to provide participants with the opportunity to respond freely, as it may give a more precise indication of the development level of their ToM-skills than survey questions or similar response formats. These are generally more restricted in terms of expression of feelings of participants as they only allow expressions that were included in the survey by the researchers.

### **Future Directions**

Several recommendations for future research in this field are noted. First, similar research with more specific age groups as well as younger age groups is recommended to better capture the relationship between the amount of art consumption and the ToM-development (Westby & Robinson, 2014). This could be built upon by extending the measures to include AToM for further precision (Osterhaus & Koerber, 2021). Expanding on this, based on the fact that this study did not take into account different forms of art consumption, research into the different influences of active and passive art consumption on ToM-development may lead to a better understanding of how art consumption can influence ToM-skills (Mendonça et al., 2019). Finally, research into the role that personality plays in the ToM-development and in art consumption may provide valuable new information (Allen et al., 2017).

### **Conclusion**

This study aimed to investigate the relationship between the amount of art consumption of children aged 6-10 and the development of the theory of mind. The research question for this study was: how does the amount of art consumption affect the development of theory of mind in children? No evidence was found in support of the corresponding

hypothesis that there is a positive relationship between the amount of art that is consumed and the level of ToM-development, as the analyses did not yield significant results. Although the results were nonsignificant, a larger effect size was found for children aged 6-8 than children aged 9-10. The nonsignificant results do not mean that the finding of this study is not important: it provides us with valuable suggestions for future research, that may eventually allow us to understand the complete mechanisms of the theory of mind. Besides that, the results of this study do not show that art consumption may be harmful to the ToM-development, indicating that children are safe to enjoy all sorts of art as early on in life as they like.



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**Appendix A**  
**Questionnaire**

**Section 1: Introduction**

1. Thank you for helping us! Are you ready to start?

yes

no

**Section 2: Demographics & art engagement**

1. First, we would like to ask what your age is.

I am \_\_\_ years old

2. What is your sex assigned at birth?

male

female

3. What do you like to do the most? You can check as many boxes as you want!

dancing or playing theater

looking at dancing or theater

singing or making music

listening to singing or music

claying, knitting or sculpturing

looking at pottery, textiles or sculptures

collecting or compiling things or clothes

looking at collections or design of things

writing or telling stories, novels or poetry

reading or listening to stories, books or poetry

talking about philosophy or history

reading about philosophy or history

- taking photographs, drawing or painting
- looking at photographs, drawings or paintings
- making movies or games
- watching movies or playing games

### Section 3: Pre-trial, object 1

1. Is this object yours?

- yes, it is
- no, it is not mine and I have never seen this one before
- no, it is not mine but I have seen this one before

2. Did you like the object in front of you?

- yes
- no

3. This object invites me to observe, touch, smell, taste or listen to it.

no – a little bit – yes

4. This object invites me to feel and experience things.

no – a little bit – yes

5. This object invites me to be in a different world.

no – a little bit – yes

6. This object invites me to express myself in my own way.

no – a little bit – yes

7. This object invites me to come up with new ideas or designs.

no – a little bit – yes

8. This object invites me to share an idea or story.

no – a little bit – yes

9. This object invites me to understand what it means in the context.

no – a little bit – yes

10. This item invites me to show to which group/community I belong.

no – a little bit – yes

11. This object invites me to discover things about myself or the world.

no – a little bit – yes

12. This object invites me to explore how or why it was made.

no – a little bit – yes

13. Where did you feel more energy?

[Body Sensation Map]

14. Where did you feel less energy?

[Body Sensation Map]

15. What do you call this feeling? Click one or two emoji(s) that most represent it.

[adapted Geneva Emotion Wheel]

#### **Section 4: Pre-trial, object 2**

1. Is this object yours?

yes, it is

no, it is not mine and I have never seen this one before

no, it is not mine but I have seen this one before

2. Did you like the object in front of you?

yes

no

3. This object invites me to observe, touch, smell, taste or listen to it.

no – a little bit – yes

4. This object invites me to feel and experience things.

no – a little bit – yes



5. This object invites me to be in a different world.

no – a little bit – yes

6. This object invites me to express myself in my own way.

no – a little bit – yes

7. This object invites me to come up with new ideas or designs.

no – a little bit – yes

8. This object invites me to share an idea or story.

no – a little bit – yes

9. This object invites me to understand what it means in the context.

no – a little bit – yes

10. This item invites me to show to which group/community I belong.

no – a little bit – yes

11. This object invites me to discover things about myself or the world.

no – a little bit – yes

12. This object invites me to explore how or why it was made.

no – a little bit – yes

13. Where did you feel more energy?

[Body Sensation Map]

14. Where did you feel less energy?

[Body Sensation Map]

15. What do you call this feeling? Click one or two emoji(s) that most represent it.

[adapted Geneva Emotion Wheel]

### **Section 5: Post-trial, object 1**

1. Is this object yours?

( ) yes, it is

no, it is not mine and I have never seen this one before

no, it is not mine but I have seen this one before

2. Did you like the object in front of you?

yes

no

3. This object invites me to observe, touch, smell, taste or listen to it.

no – a little bit – yes

4. This object invites me to feel and experience things.

no – a little bit – yes

5. This object invites me to be in a different world.

no – a little bit – yes

6. This object invites me to express myself in my own way.

no – a little bit – yes

7. This object invites me to come up with new ideas or designs.

no – a little bit – yes

8. This object invites me to share an idea or story.

no – a little bit – yes

9. This object invites me to understand what it means in the context.

no – a little bit – yes

10. This item invites me to show to which group/community I belong.

no – a little bit – yes

11. This object invites me to discover things about myself or the world.

no – a little bit – yes

12. This object invites me to explore how or why it was made.

no – a little bit – yes

13. Where did you feel more energy?

[Body Sensation Map]

14. Where did you feel less energy?

[Body Sensation Map]

15. What do you call this feeling? Click one or two emoji(s) that most represent it.

[adapted Geneva Emotion Wheel]

### **Section 6: Post-trial, object 2**

1. Is this object yours?

yes, it is

no, it is not mine and I have never seen this one before

no, it is not mine but I have seen this one before

2. Did you like the object in front of you?

yes

no

3. This object invites me to observe, touch, smell, taste or listen to it.

no – a little bit – yes

4. This object invites me to feel and experience things.

no – a little bit – yes

5. This object invites me to be in a different world.

no – a little bit – yes

6. This object invites me to express myself in my own way.

no – a little bit – yes

7. This object invites me to come up with new ideas or designs.

no – a little bit – yes

8. This object invites me to share an idea or story.

no – a little bit – yes

9. This object invites me to understand what it means in the context.

no – a little bit – yes

10. This item invites me to show to which group/community I belong.

no – a little bit – yes

11. This object invites me to discover things about myself or the world.

no – a little bit – yes

12. This object invites me to explore how or why it was made.

no – a little bit – yes

13. Where did you feel more energy?

[Body Sensation Map]

14. Where did you feel less energy?

[Body Sensation Map]

15. What do you call this feeling? Click one or two emoji(s) that most represent it.

[adapted Geneva Emotion Wheel]

### **Section 7: Post-trial, personality**

Please tick the box that best describes you.

1. I know many things.

strongly disagree – disagree – neutral – agree – strongly agree

2. I have a great deal of fantasy.

strongly disagree – disagree – neutral – agree – strongly agree

3. I easily learn what I study at school.

strongly disagree – disagree – neutral – agree – strongly agree

4. When the teacher asks questions, I am able to answer correctly.

strongly disagree – disagree – neutral – agree – strongly agree

5. I like to read books.

strongly disagree – disagree – neutral – agree – strongly agree

6. When the teacher explains something, I understand immediately.

strongly disagree – disagree – neutral – agree – strongly agree

7. I like scientific TV shows.

strongly disagree – disagree – neutral – agree – strongly agree

8. I like to watch TV news, and to know what happens in the world.

strongly disagree – disagree – neutral – agree – strongly agree

9. I am able to create new games and entertainments.

strongly disagree – disagree – neutral – agree – strongly agree

10. I am able to solve mathematics problems.

strongly disagree – disagree – neutral – agree – strongly agree

11. I like to know and to learn new things.

strongly disagree – disagree – neutral – agree – strongly agree

12. I would like very much to travel and to know the habits of other countries.

strongly disagree – disagree – neutral – agree – strongly agree

13. I understand immediately.

strongly disagree – disagree – neutral – agree – strongly agree

## Appendix B

### Coding schematic for ToM-scores

<p><b>Age group 6-8 years</b></p> <p>In this age group, children can understand that an image or object can be experienced differently by separate people. Besides this, they can name basic expressions of emotion, such as happiness and sadness.</p>
<p>Groups: None (0), Low (1), Medium (2), High (3)</p>
<p><b>Age group 6-8 years: None (0)</b></p> <p>Unintelligible audio, question is not asked by researcher, question is leading or question is talked over. Question can not be answered as object has been created by the participant.</p>
<p>Keywords:</p>
<p>Examples:</p> <p>- “How do you think ... feels about your object?” “Uhm... [unintelligible]”</p>
<p><b>Age group 6-8 years: Low (1)</b></p> <p>Question is answered with “I don’t know” or “no” or not answered at all. Or question is answered with short responses or replies that do not really answer the question, but that say something about the object but not the feelings someone may have about the object.</p>
<p>Keywords:</p> <p>- No</p> <p>- I don’t know</p> <p>- No idea</p>
<p>Examples:</p> <p>- “I don’t know”</p> <p>- “You can play nice songs on it”</p>
<p><b>Age group 6-8 years: Medium (2)</b></p>

Basic expressions of emotion such as happiness and sadness are named. Besides that, there is an understanding that other people can have a different opinion about an object. Shallow answers are given.

Keywords:

- Happy
- Sad
- Pretty
- Nice

Examples:

- “You probably think it is less pretty than I do”
- “It makes you happy”

**Age group 6-8 years: High (3)**

Understanding that people can experience different emotions at the same time.

Understanding sarcasm and being able to name more intricate expressions of emotion such as pride, guilt, jealousy and disappointment.

Keywords:

- Proud
- Guilty
- You feel ... and ...

Examples:

- “I think you feel proud about that”
- “It’s disappointing that ...”
- “A bit jealous, maybe”
- “I think it makes you happy, but also sad”

**Age group 9-10 years**

In this age group, children understand that someone can experience multiple emotions at the same time. Besides that, they understand sarcasm and they can name more intricate expressions of emotion such as pride, guilt, jealousy and disappointment.

Groups: None (0), Insufficient (1), Low (2), Medium (3), High (4)

**Age group 9-10 years: None (0)**

Unintelligible audio, question is not asked by researcher, question is leading or question is talked over. Question can not be answered as object has been created by the participant.

Keywords:

Examples:

- “How do you think ... feels about your object?” “Uhm... [unintelligible]”

**Age group 9-10 years: Insufficient (1)**

Answering with phrases such as “I don’t know” or similar expressions such as remaining quiet or shrugging.

Keywords:

- I don’t know

- No

Examples:

- “I have no idea”

**Age group 9-10 years: Low (2)**

Basic expressions of emotion such as happiness and sadness are named. Besides that, there is an understanding that other people can have different opinions. Shallow answers are given.

Keywords:



- Happy
- Sad
- Pretty
- You like ...

Examples:

- “I think you think it is less pretty than I do”
- “It makes you happy”
- “You like horses”

**Age group 9-10 years: Medium (3)**

Understanding that people can experience different emotions at the same time.

Understanding sarcasm and being able to name more intricate expressions of emotion such as pride, guilt, jealousy and disappointment.

Keywords:

- Proud
- Guilty
- You feel ... and ...

Examples:

- “I think you feel proud about that”
- “I think it makes you happy, but also sad”

**Age group 9-10 years: High (4)**

Understanding symbolism.

Keywords:

- This represents ...

Examples:

- "I think the green colour represents ..."