Exploring the Spectrum of Responses to Art:

A Comparative Analysis of Sex-Based Development Across Life Stages

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Abstract

Art and the reception of art have been cornerstones of society for as long as there has been society. Despite this, there has not yet been a lot of research on how sociodemographic factors, like biological sex and age, have an impact on art reception, even though this could tell us a lot about the development of human beings. The aim of this study is to attempt to increase this amount of research, by investigating whether there are biological or age-related differences in the process of sense-making regarding art in children. Based upon the current research, the expected results are that biological males use as much or even more semiotic strategies than biological females. Moreover, age is expected to be a big predictor on the degree of engagement of sense-making in art. Finally, it is also suspected that participants that were assigned female at birth will feel and thereby report stronger emotions than participants that were assigned male at birth. In the study, a mixed method approach was used in which both qualitative and quantitative data was collected. The participants ($N = 44$), who were between the ages 6 and 17 ($M = 11.07$), were asked to join as dyads. These duos then filled out a questionnaire that assessed, among other things, their emotional state. The dyads then participated in a semi-structured interview in the form of a prompted conversation that measured their sense-making through the use of semiotic strategies.

Upon analysis of the collected data, it was found that there are no significant differences between the amount of semiotic strategies used in biological males compared to biological females. What was found, is that for the semiotic strategies Conceptualization and Analysis, age is a good predictor for the number of strategies used. There also were no statistically significant results in the reporting of emotions when comparing the assigned male participants to the assigned female participants.

Keywords: biological sex, boys, girls, children, emotional response, sense-making, receptive art, mixed methods, semiotic strategies, biological sex differences, emotions.

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Art has been a cornerstone of human expression for centuries. Our experience as humans is painted with the brushstrokes of creativity, whether it is a child scribbling on the walls with a loose crayon they have found, or a sculptor being commissioned to sculpt a statue. Art and the appreciation of art is and has been an integral part of life for a lot of people and begins very early in development (Gardner, 1990); besides this, diverse responses to art offer a fascinating lens through which to examine the individual development. Since Bourdieu et al. (1997), it has been widely assumed that there are certain sociodemographic factors, like education or profession, that have an impact on general art reception. Despite this, more basal sociodemographic factors such as biological sex and age are more scarcely discussed and studied.

Therefore, to fill this gap this paper will look at current research on art reception across different life stages compared to art responses across gender, and to further extend the amount of research done into the topic of sense-making of art in children. This will be done by giving an answer to the question how girls compared to boys make sense of their artistic expression, and how their responses evolve over time, while also looking at whether the intensity of emotions differs between the sexes.

Theoretical Background

Art across Life Stages

Art has been, for a very long time, rightfully recognised as a multifaceted process, both evoking emotional responses and stimulating cognitive processes. The perception of and reaction to different forms of art is a dynamic process that evolves alongside individuals as they grow up and develop.

In early childhood, art primarily functions as a sensory experience, wherein colors, shapes, and movement play pivotal roles in shaping the perception of artwork. This provides children with the opportunity to perceive their surroundings in diverse ways and to (re-)imagine the world around them (Terreni, 2010; van Kuyk, 2011).

As children grow up and become adolescents, their relationship and reactions to art often become more intense, as it is a way for them to search for their identity and self-expression. Finding one's sense of purpose in the world and thereby making sense of (challenging) events is an important part of development, during adolescence specifically, but also across the lifespan (Frankl, 2006; Park, 2010). The development from a child to adolescence to adulthood is an interesting and multifaceted process; studying it more closely could increase the understanding of how individuals change, grow, and adapt.

Art across Sexes

As one further delves into the developmental trajectory of the different responses to art, the question of gender emerges as a significant factor that warrants further exploration. Up until now, it is the general consensus that women compared to men are more engaged and interested in experiencing different forms of art (Tröndle et. al., 2014; Smith et. al, 2017). Combined with the fact that studies have shown that there are differences between boys and girls when it comes to social and emotional competencies (McTaggart et al., 2021), this suggests that there would be a difference in the way children that were assigned male at birth compared to children that were assigned female respond to art.

Sense-making strategies

Over the years, there have been many different studies and opinions about how perception and cognition are used to get a grasp and to make sense of the world that is around is. Karl Weick, the so-called 'father of sensemaking', suggested that the term simply means "the making of sense" (Weick, 1995, p. 4). On the other hand, Starbuck & Milliken (1988) believe

it to be the structuring stimuli into a framework that allows us to comprehend, understand, explain, attribute, extrapolate, and predict.

A more recent example of the definition of sense-making is found in the ideas of Van Heusden (2022). He boils our understanding of the world down to four semiotic strategies; Perception, Imagination, Conceptualization and Analysis.

1. The first strategy, Perception, is using one's senses to perceive the world. For example, in the case of a sheet of fabric, we perceive that it is a sheet of fabric because the external input, like the colour and the shape, is evidence of the sheet being, in fact, a sheet.
2. For the second strategy, Imagination, we wander away from the idea that it is just a sheet of fabric. It will still be recognized as fabric, but we can also start to think of different ways to use it. In doing so, we create a second, new meaning for the sheet, like for example a sail.
3. The third strategy is Conceptualization, in which we use (abstract) concepts to differentiate between different categories or events. In the example of the sheet, when one uses the word sheet, it very quickly becomes clear that you are not talking about a dress or a sheet made of metal. It is because there are previously agreed-upon definitions for concepts and things that are conveyed through language.
4. The fourth and final strategy is Analysis, the creation of new knowledge through the use of theoretical frameworks. Upon investigation of the physical attributes of the sheet of fabric, you are using the strategy of analysis to make sense of your surroundings (in this particular case, the fabric).

It is in part through these semiotic strategies that we shape and understand the world around us.

Emotions across gender

Emotions are some of the most important neurophysiological effects, since they are one of the main drivers for adaptation (Izard, 1977). They are what alerts and prepares us to act in order to maintain conditions that support our goals and change the conditions that may threaten our goals for well-being (Barrett & Campos, 1987).

As was researched by Chaplin and Aldao (2013), girls show more positive emotion expressions than boys. Girls also express more of the internalizing emotions, such as sadness, sympathy, and shame. In contrast, boys show more externalizing emotion expressions, in particular for anger. However, by adolescence, this changes as girls show more externalizing emotions than boys. Therefore, it is very interesting to look at the difference between girls and boys when it comes to intensity and reporting these emotions.

The Present Study

In the following study, a mixed-method approach will be used to both look at the different types and the degree to which the participants use sense-making strategies and to see if there is a difference between males and females when it comes to the number of semiotic strategies they use and if this differs across different age groups. Besides this, the intensity of the reported emotions in both the female and male participants will be measured and weighed against each other.

To answer the question of how girls compared to boys navigate their artistic expression, and whether their responses over time evolve, multiple hypotheses will be tested. As researched previously by Ter Keurst et al. (2023), the hypothesis that females use more semiotic strategies than males is not significantly supported. This would make sense, seeing as Bem (1981) has previously inferred masculinity with more instrumental traits and feminity with more expressive traits. The first hypothesis that will be tested is built on these ideas.

The first hypothesis is that people assigned male at birth will use more semiotic strategies than people that are assigned female at birth (from hereon also called Hypothesis 1).

Additionally, the number of semiotic strategies that children of different age groups used will be compared to each other, in order to determine if it is true that age is a good predictor of the number of semiotic strategies used (from hereon also called Hypothesis 2).

Previously, it has been stated that younger girls report more positive emotion expressions than boys of the same age. This raises the question, do girls over-report their feelings, or do they actually feel the emotions more strongly? Therefore, the last hypothesis is that people assigned female at birth will feel and report stronger emotions than people assigned male at birth (from hereon also called Hypothesis 3).

Through this approach, the aim is to provide a nuanced perspective on the responses to art across life stages, with a particular focus on gender differences between girls and boys and the difference in the development of these artistic responses. Finding a satisfying conclusion about gender-related differences in development can provide us with insight into the complex interaction between identity and reactions to art, and more information about the difference in development between girls and boys.

Methods

Participants

The final sample consisted of 44 voluntary participants (22 dyads). Originally, the sample of participants was larger, but since it proved not possible to transcribe all dyadic interactions, some of these were cut. 19 participants were assigned male at birth (36.5%) and 33 were assigned female at birth (63.5%). Ages ranged from 6 to 17 (M_{age} = 11.07, SD_{age} = 3.39, see Table 1).

Table 1

Descriptive Statistics

	Age
Valid	44
Missing	0
Mean	11.07
Std. Deviation	3.39
Minimum	6.00
Maximum	17.00

Of these participants, 42 spoke Dutch as a first language (95.5%); 2 spoke English (4.5%). All participants were recruited through convenience sampling within the network of the research group. The requirements for participation were being able to speak either Dutch or English and being between the ages of 6 and 17. Recruitment methods included advertisement through the Zpannend Zernike festival, as well as directly contacting parents and collaborating with both primary and secondary schools in the northern Netherlands, particularly in Groningen. An incentive to participate was given in the form of a Pimm voucher of 10 euros offered to the participant. Alternatively, participants were also given the choice to donate the money to a participating school.

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). The

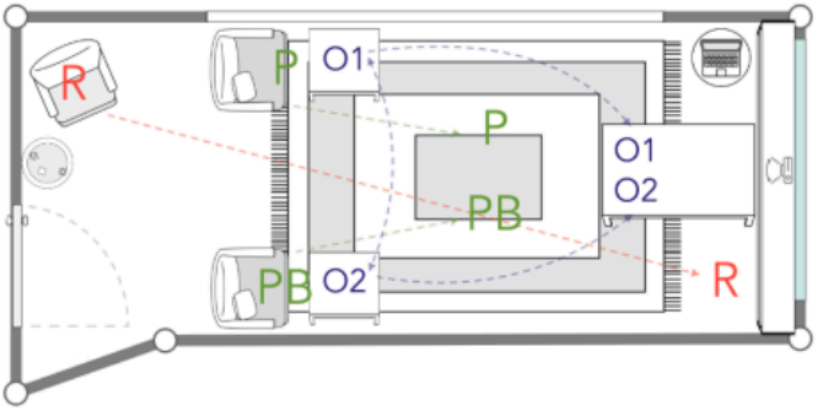
registration form asked for basic demographic information such as the participant's name, the name of their buddy as well as their relation to each other, and the language spoken. Besides this, the participants were able to read relevant information about the study, and were able to choose a date and time for taking part in the experiment. Data collection was possible both in a room in the University's lab, or in a setup at the participants' home, school, or other community institution. The location was chosen by the participants.

All participants were asked to do the experiment with a peer, either a friend, acquaintance, or sibling. This was done to ensure the participants felt save and to provide them with somebody they trusted to make the conversation part of the data collection more comfortable. The participants were asked to bring an item with personal meaning to them and to share a picture of said item (if applicable) with the researchers prior to the experiment.

The experiment began with the researchers welcoming the two participants into the experimental room in the University lab, or the experimental setup at the participants' home, school, or community institution. The laboratory at the University was divided into two rooms: the experimental room, where the conversations were carried out, supervised by at least one researcher, and the control room, in which another researcher would oversee the recording, as well as troubleshoot any possibly recurring technical problems. When conducting the experiment off-site, the setup of the room mirrored that of the laboratory as closely as possible, providing distance between the conversation space and the control station. The participants were seated some distance apart from each other in order to avoid distraction, and asked to first spend at least 30 seconds familiarizing themselves with and experiencing the object in front of them.

Figure 1

Experimental setting in the University's lab or recreated at the chosen location



Note. Depicted is a schematic representation of the laboratory setting. Indicated by "P" is the position of participant 1, and "PB" is the location of participant number 2. The position of the researcher(s) is coded as "R". The positions of the objects brought by the participants are coded as "O1" and "O2". The arrows demonstrate the different directions of movement.

After familiarizing themselves with the object, participants were then asked to fill in the survey on the tablet in front of them. The survey 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 (BFQ-C, Muris et al., 2005). Emotion elicited by artwork was measured using an adapted version of the Geneva Emotion Wheel (Scherer, 2013) for children and adolescents used in museum contexts by De Angeli, Kelly & O'Neill (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. Depending on their reading proficiency, the researcher provided assistance in filling out the questionnaire.

After they completed the first section of the questionnaire, they were prompted to exchange their objects and move on to the next section. Whether the participant viewed their own or their buddy's object first varies for each dyad of participants in order to prevent order effects (Schuman et al., 1981). 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, as shown in Figure 1. Once the participants had settled for the conversation, the recording was started. The experiment was recorded via a 2-Logitech BRIO webcam. Video and audio file were synchronized with the main computer via Lab Streaming Layer technology (GitHub, https://labstreaminglayer.readthedocs.io/). 11 conversation prompts were presented, which allowed them to discuss their objects and the feelings they had about them. The researcher in the experimental room read each prompt out loud to the participants and gave them two minutes to discuss each prompt. Throughout the conversation, if deemed necessary, the researcher invited the participants to take a break to prevent cognitive overload.

After all prompts had been discussed, the researcher in the control room stopped the recording and saved the encoded files, which were later turned into transcripts. The participants were invited to sit back down at the tables with the tablets on them and to 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. After both participants had filled in their second questionnaire, the experiment was officially concluded. The researcher in the experimental room thanked the participants for their participation and walked them out of the experiment room. Each experiment took around 30-60 minutes for each set of dyads, but this depended heavily on the individual participants. Since the dyadic interactions were conducted using both English and Dutch, all transcripts were translated so that every dyadic interaction was available for analysis in either language.

Measures

Age

The ages of the participants in this study varied from 6 to 17 years old. In order to make a distinction between different age groups, they were divided into 6 to 11 years old and 12 to 17 years old. The reason these specific age ranges were chosen is based upon the expected developmental stage the children are in. The chosen developmental stages are 2 of the 4 developmental stages of Piaget (1971). According to Piaget (1971), there are 4 stages of development that all children go through. The sensorimotor stage (from 0 to 2 years old), which is the first phase of the cognitive development in children where they learn about their environment though their senses and motor activities; the preoperational stage (from 2 to 7 years old), in which children learn to use mental representations rather than the physical appearance of objects and learn to use the beginnings of abstract thought; the concrete operational stage (from 7 to 11 years old), where children learn things like conversation (the idea that things can stay the same, even when they look different) and categorization abilities improve; lastly, the formal operational stage (from 11 years old onwards) is characterized by abstract thinking, being able to perform hypothetical-deductive reasoning and logical reasoning skills. The age range of the dataset is 6 to 17 years old; therefore, the participants between 6 and 11 are expected to be in the concrete operational stage, and are therefore put together into one group and the participants older than 12 years old are expected to be in the formal operational stage, and are therefore grouped together.

Sex

In the questionnaire, the participants were asked to give their sex assigned at birth; they could choose either Male or Female.

Sense-Making

The sense-making of the engagement with the art was measured through the number of times a participant used one of the four semiotic strategies of Van Heusden (2022). These strategies are: Perception, Imagination, Conceptualization, and Analysis. The data was provided through the use of the semi-structured interviews in the form of prompted conversations, in which the participants were given prompts that encouraged them to hold a discussion between themselves. These prompts were given both verbally and were shown on a PowerPoint. All prompts fit into one of six categories, of which there were four that directly assessed the four semiotic strategies (see Table 2).

The answers that the participants gave to the prompts were recorded and later turned into transcripts. The semiotic strategies were measured through analysis of the conversation; the transcripts that were made of the conversations the participants had with the researcher were encoded and the frequency of answer in each category were counted.

Table 2

Overview of Conversation Prompts

Examples of prompts	Categories
Why did you bring these objects?*	General
Why do you think your buddy brought that object?*	General
(V1) What do you notice about this object?* (color, shape, texture, material, sound etc.)	Perception
(V2) What do you notice about this object?*	Perception

(color, shape, texture, material, sound etc.)	
What color strikes you most about this object and why?*	Perception
What can you do with this object?*	Imagination
What would you tell others they need to know about your object?*	Conceptualization
What do you think the artist wanted you to feel with when they made the object?*	Conceptualization
What can you learn from this object?*	Analysis
How do you think your buddy thinks about their art object?	Theory of Mind
What do you think your buddy thinks about your art object?	Theory of Mind
What do you think about your art object?	Theory of Mind

Note. The questions marked with a star (*) were used in the analysis.

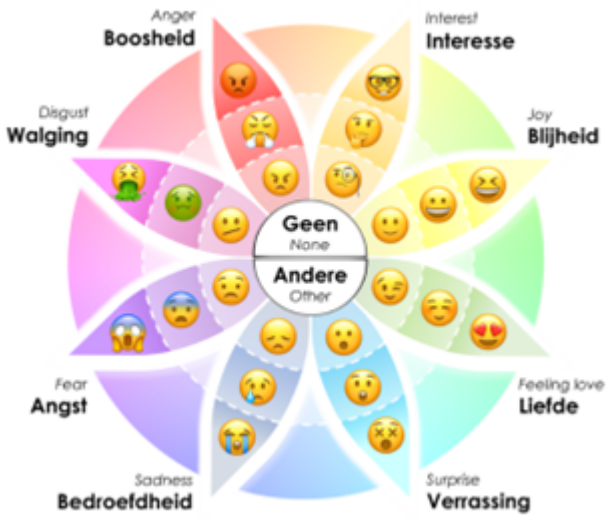
Intensity of Emotions

To measure and assess the emotional dimensions of the participant about their object, an adapted version by De Angeli, Kelly & O'Neill, 2020 of the Geneva Emotion Wheel (Scherer et al., 2013) was used. The GEW showcases 8 emotions (rather than 20) with verbal labels as well as emojis to discern the amount of intensity. The negative emotions that the participants were able to choose from were *Anger, Fear, Disgust,* and *Sadness.* The positive

emotions included *Surprise, Interest, Joy,* and *Feeling Love*. Participants were also able to choose the options *None* and *Other*.

Figure 2

The version of the Geneva Emotion Wheel that was used in the questionnaire.



Note. As can be seen in the above figure, there were no emoji's attached to the *None* and *Other* options.

Results

In this study, both qualitative and quantitative data are collected and analysed. The quantitative data that was gathered through a questionnaire developed through Qualtrics (https://www.qualtrics.com) and analysed in JASP (Version 0.18.1). In the light of a mixed-method approach audio recordings of the dyadic interactions have been coded using Cognitive Discourse Analysis (CODA, Tenbrink, 2014) according to the use of semiotic strategies (perception, imagination, conceptualization, analysis). To test Hypotheses 1 and 2, the collected data from the dyadic interactions that was encoded and analysed with a

Cognitive Discourse Analysis (CODA) was used, and for Hypothesis 3, the quantitative data of the Geneva Emotion Wheel (GEW) in the questionnaire was used.

Mixed-method analysis

Cognitive Discourse Analysis (CODA)

In order to transcribe the semi-structured interviews that were held with the participants, the following steps were used: transcription, segmentation, and then annotation. To help convey meaning and the intent of the written down versions of the dyadic interaction, things like mispronunciations, pauses, and the rephrasing of sentences were included in the transcriptions since they often contain relevant information about both communicative and cognitive processes (Widodo, 2014). This context is incredibly important, since there are no things like tone of voice and non-verbal communication to deduct meaning from in transcripted data. By looking at the spoken-aloud thought-processes of the participants, it is still possible to grasp what the participants were actually thinking and meaning to say. Besides this, punctuation markers were added and if the conversation asked for it, context was included in the form of comments on the transcription. Examples of what these transcriptions look like can be found in Figure 3.

Figure 3

Examples of a Transcribed Conversation

Speaker1: [00:04:20] “Cool, and what can you do with your piece of art? With your object?”

Speaker3: [00:04:24] “Uhm, play the guitar.”

Speaker1: [00:04:26] “And anything else?”

Speaker3: [00:04:27] “Uhm, and in an uhm, what’s it called again, put it in a display cabinet? No, in one of those uhm photo frames.”

Speaker1: [00:04:37] “Oh yeah, is it in a photo frame?”

Speaker3: [00:04:39] “No.”

Speaker1: [00:04:40] “And have you used it with a guitar before?”

Speaker3: [00:04:42] “No.”

Speaker2: [00:04:43] “He also doesn’t have a guitar, he has a drum kit, [inaudible] that plays guitar.”

Note. Here, speaker 3 is talking about the object that he has brought; a guitar pick that he got from a guitarist when he went to their concert.

The transcript is divided into smaller segments, which were in turn annotated and allocated to a category in Excel (Microsoft Corporation, 2018). In this case, the four semiotic strategies were used as coding categories (as seen in Appendix B). Wherever possible, a segment was, based upon linguistic indicators, put into the most relevant semiotic strategy. The Perception category contains descriptive linguistic indicators, the Imagination category involved words centered around the imagination, the Conceptualization category was built around words relating to classification and organization, while the Analysis category used words relating to discovering new things and making connections. By doing this, the participants use of a certain words and thereby a certain strategy could be measured and quantified.

Hypothesis 1.

To test Hypothesis 1 (children who were assigned boy at birth use more semiotic strategies than children that are assigned girls at birth), an independent samples t-test was used (see Tables 4 and 5). The participants that were assigned girl at birth were coded with 1, the participants who were assigned boy at birth were coded with 2 (see Table 3).

Table 3

Descriptive Statistics Sex

	Group	N	Mean	SD	SE	Coefficient of variation
Perception	1	15	5.667	2.870	0.741	0.507
	2	29	4.793	2.541	0.472	0.530
Imagination	1	15	4.000	2.619	0.676	0.655
	2	29	3.897	2.526	0.469	0.648
Conceptualization	1	15	9.067	4.334	1.119	0.478
	2	29	10.138	4.198	0.780	0.414
Analysis	1	15	4.333	2.820	0.728	0.651
	2	29	5.310	3.557	0.660	0.670

Note. Group 1 is participants assigned female at birth, group 2 is participants assigned male at birth.

Before the independent samples t-test was ran, Levene's Test of Equality of Variances was run, to assess whether the variances of the four groups (Perception, Imagination, Conceptualization, Analysis) are equal, and evaluate whether the assumption of homogeneity of variances that are required for the independent sample t-test are met. None of the subsequent p-values were significant (see Table 4). This means that equal variances across the groups can be assumed, and that therefore an independent samples t-test can be conducted.

Table 4

Test of Equality of Variances (Levene's)

	F	df_1	df_2	p
Perception	0.060	1	42	0.808
Imagination	0.055	1	42	0.815
Conceptualisation	0.012	1	42	0.912
Analysis	2.177	1	42	0.148

In the conducted independent samples t-test, although there were t-values that pointed in the direction of there being a difference between the number of semiotic strategies used in boys compared to girls, these results were not significant ($p = 0.307$, $p = 0.899$, $p = 0.432$, and $p = 0.361$ respectively, see Table 5).

Table 5

Independent Samples T-Test Sex

	Test	Statistic	df	p
Perception	Student	1.034	42	0.847
Imagination	Student	0.127	42	0.550
Conceptualization	Student	-0.794	42	0.216
Analysis	Student	-0.923	42	0.181

Note.

Hypothesis 2.

In order to test the Hypothesis that age is a good predictor of number of semiotic strategies used, another Levene's Test of Equality of Variances and an independent sample t-test were ran, this time dividing samples by age instead of assigned biological sex. One group consisted of all the participants between the ages of 6 and 11 (numbered 1), the other 12 to 17 (numbered 2) (see Table 6).

Table 6

Descriptive Statistics Age

	Group	N	Mean	SD	SE	Coefficient of variation
Perception	1	27	5.185	2.760	0.531	0.532
	2	17	4.941	2.561	0.621	0.518
Imagination	1	27	3.519	2.592	0.499	0.737
	2	17	4.588	2.347	0.569	0.511
Conceptualization	1	27	8.704	4.121	0.793	0.474
	2	17	11.471	3.923	0.951	0.342
Analysis	1	27	3.926	3.245	0.625	0.827
	2	17	6.647	2.783	0.675	0.419

Note. Group 1 is participants aged 6 to 11, group 2 is participants aged 12 to 17.

Once again, there were no significant p-values upon analysis of Levene's Test of Equality of Variances (see Table 7); this means that there are equal variances between the four groups of semiotic strategies.

Table 7

Test of Equality of Variances (Levene's)

	F	df_1	df_2	p
Perception	0.173	1	42	0.680
Imagination	0.131	1	42	0.720
Conceptualisation	0.010	1	42	0.922
Analysis	0.267	1	42	0.608

For the results of the independent samples t-test, there were no significant results for the semiotic strategies Perception and Imagination ($p = 0.771$ and $p = 0.175$ respectively, see Table 7). Conceptualization and Analysis both had a statistically significant p-value ($p = 0.033$ and $p = 0.007$ respectively, see Table 8).

Table 8

Independent Samples T-Test Age

	Test	Statistic	df	p
Perception	Student	0.293	42	0.771
Imagination	Student	-1.381	42	0.175
Conceptualization	Student	-2.208	42	0.033
Analysis	Student	-2.856	42	0.007

Quantitative analysis

Geneva Emotion Wheel (GEW)

In order to get insight in the emotions that the participants were experiencing, an adapted version of the Geneva Emotion Wheel (Scherer et al., 2013) by De Angeli, Kelly & O'Neill (2020) was used. To transform the raw data that was collected into data that can be used in statistical models and analyses, the arousal, intensity, and valence of the eight emotions were quantified using the protocol by Coyne et al. (2020) in Excel (Microsoft Corporation, 2018).

Hypothesis 3.

The final Hypothesis, which questions whether girls will feel and report stronger emotions than boys, was tested through use of the adapted version of the Geneva Emotion Wheel (Scherer et al., 2013) by De Angeli et al. (2020). With this quantified data, an independent sample t-test was conducted. In this test the sample was divided into a sample consisting of boys and one consisting of girls (see Table 9).

Upon inspection of the data (see Table 10), it can be noted that there are no significant differences between the two groups for both the intensity, as well as arousal and valence of the emotions.

Table 9

Group Descriptives Emotion

	Group	N	Mean	SD	SE	Coefficient of variation
GEW_XX_intensity_normalised_Emoji1	1	15	0.431	0.277	0.072	0.644
	2	27	0.446	0.222	0.043	0.498
GEW_XX_intensity_normalised_Emoji1b	1	11	0.445	0.270	0.081	0.607
	2	22	0.435	0.337	0.072	0.775
GEW_XX_intensity_normalised_Emoji2	1	15	0.465	0.276	0.071	0.593
	2	27	0.472	0.264	0.051	0.559
GEW_XX_intensity_normalised_Emoji2b	1	12	0.434	0.210	0.061	0.484
	2	18	0.503	0.309	0.073	0.614
GEW_XX_intensity_normalised_Emoji3	1	15	0.399	0.292	0.075	0.731
	2	27	0.467	0.352	0.068	0.754
GEW_XX_intensity_normalised_Emoji3b	1	13	0.390	0.249	0.069	0.639
	2	22	0.574	0.331	0.071	0.577
GEW_XX_intensity_normalised_Emoji4	1	15	0.570	0.209	0.054	0.366
	2	27	0.526	0.303	0.058	0.576
GEW_XX_intensity_normalised_Emoji4b	1	14	0.425	0.224	0.060	0.527

	2	22	0.475	0.307	0.065	0.646
GEW_XX_arousal_centered&normalised_Emoji1	1	15	0.206	0.209	0.054	1.015
	2	27	0.155	0.330	0.063	2.133
GEW_XX_arousal_centered&normalised_Emoji1b	1	11	0.297	0.208	0.063	0.700
	2	22	0.114	0.415	0.088	3.643
GEW_XX_arousal_centered&normalised_Emoji2	1	15	0.160	0.284	0.073	1.778
	2	27	0.289	0.297	0.057	1.025
GEW_XX_arousal_centered&normalised_Emoji2b	1	12	0.239	0.308	0.089	1.286
	2	18	0.086	0.363	0.086	4.246
GEW_XX_arousal_centered&normalised_Emoji3	1	15	0.225	0.202	0.052	0.895
	2	27	0.039	0.412	0.079	10.441
GEW_XX_arousal_centered&normalised_Emoji3b	1	13	0.106	0.334	0.093	3.153
	2	22	0.192	0.263	0.056	1.366
GEW_XX_arousal_centered&normalised_Emoji4	1	15	0.213	0.276	0.071	1.299
	2	27	0.041	0.428	0.082	10.404
GEW_XX_arousal_centered&normalised_Emoji4b	1	14	0.134	0.337	0.090	2.509

	2	22	0.093	0.341	0.073	3.671
GEW_XX_valence_centered&normalised_Emoji1	1	15	0.486	0.230	0.059	0.472
	2	27	0.375	0.321	0.062	0.857
GEW_XX_valence_centered&normalised_Emoji1b	1	11	0.434	0.260	0.078	0.599
	2	22	0.346	0.317	0.068	0.917
GEW_XX_valence_centered&normalised_Emoji2	1	15	0.381	0.405	0.105	1.062
	2	27	0.433	0.219	0.042	0.505
GEW_XX_valence_centered&normalised_Emoji2b	1	12	0.318	0.344	0.099	1.082
	2	18	0.486	0.283	0.067	0.583
GEW_XX_valence_centered&normalised_Emoji3	1	15	0.454	0.236	0.061	0.520
	2	27	0.412	0.310	0.060	0.753
GEW_XX_valence_centered&normalised_Emoji3b	1	13	0.417	0.203	0.056	0.486
	2	22	0.575	0.306	0.065	0.533
GEW_XX_valence_centered&normalised_Emoji4	1	15	0.464	0.401	0.103	0.863
	2	27	0.493	0.215	0.041	0.436
GEW_XX_valence_centered&normalised_Emoji4b	1	14	0.392	0.280	0.075	0.715

2	2 2	0.471	0.285	0.061	0.606

Table 10

Independent Samples T-Test Emotion

	Test	Statistic	df	p
GEW_XX_intensity_normalised_Emoji1	Student	-0.202	40	0.841
GEW_XX_intensity_normalised_Emoji1b	Student	0.085	31	0.933
GEW_XX_intensity_normalised_Emoji2	Student	-0.077	40	0.939
GEW_XX_intensity_normalised_Emoji2b	Student	-0.679	28	0.503
GEW_XX_intensity_normalised_Emoji3	Student	-0.631	40	0.532
GEW_XX_intensity_normalised_Emoji3b	Student	-1.738	33	0.092
GEW_XX_intensity_normalised_Emoji4	Student	0.500	40	0.620
GEW_XX_intensity_normalised_Emoji4b	Student	-0.529	34	0.600
GEW_XX_arousal_centered&normalised_Emoji1	Student	0.542	40	0.591
GEW_XX_arousal_centered&normalised_Emoji1b	Student	1.375	31	0.179
GEW_XX_arousal_centered&normalised_Emoji2	Student	-1.380	40	0.175
GEW_XX_arousal_centered&normalised_Emoji2b	Student	1.205	28	0.238

GEW_XX_arousal_centered&normalised_Emoji3	Student	1.636	40	0.110
GEW_XX_arousal_centered&normalised_Emoji3b	Student	-0.850	33	0.402
GEW_XX_arousal_centered&normalised_Emoji4	Student	1.396	40	0.171
GEW_XX_arousal_centered&normalised_Emoji4b	Student	0.359	34	0.722
GEW_XX_valence_centered&normalised_Emoji1	Student	1.180	40	0.245
GEW_XX_valence_centered&normalised_Emoji1b	Student	0.795	31	0.433
GEW_XX_valence_centered&normalised_Emoji2	Student	-0.546	40	0.588
GEW_XX_valence_centered&normalised_Emoji2b	Student	-1.463	28	0.155
GEW_XX_valence_centered&normalised_Emoji3	Student	0.454	40	0.652
GEW_XX_valence_centered&normalised_Emoji3b	Student	-1.646	33	0.109
GEW_XX_valence_centered&normalised_Emoji4	Student	-0.301	40	0.765
GEW_XX_valence_centered&normalised_Emoji4b	Student	-0.814	34	0.421

Discussion

The present study provided a way to look at sense-making in art from a developmental perspective and seeing if this development differed in girls compared to boys. Besides this, differences in the emotions in responses across sexes was also studied. Although only some significant results were found, this study shows great potential for future further research.

Hypothesis 1: Sense-Making across Sex Differences

For the first hypothesis that was tested, participants that were assigned male at birth will use more semiotic strategies than the participants who were assigned female at birth, there was no statistically significant evidence found. An interesting thing to note however, despite it not being significant because of the p-value of 0.847, the t-value of the amount of Perception strategies used is 1.034; this would mean that had it been statistically significant, it would show that girls use more Perceptive semiotic strategies than boys. For Imagination, they are pretty much equal, and for Conceptualization and Analysis there is a negative t-test (-0.794 and -0.923 respectively), which would point in the direction of participants assigned male at birth as using more Conceptualization and Analysis strategies, if the p-values had been statistically significant.

This phenomenon could be explained by the fact the biological females live in a society where instead of allowing them to speak freely, it is often expected of them that they step down and make room for others. For example, as studied by Lee and McCabe (2021), female students have been proven to allow their male student counterparts to talk more in class discussions. It is not just that, boys are more likely to speak up during class discussions, even when they are not called upon or if they do not know as much about the topic as others (Sadker, 2002). Besides this, when working on project in a (small) group, boys tend to ignore the contributions and comments of girls; this parallels to many parts of society, where men

have a tendency to ignore the comments and contributions of women (Tannen, 2001). This effect can also be seen in the data collection; of the 44 participants, there were only 15 female participants, while there were 29 male participants. These unbalanced sample sizes could have had an impact on the generalizability of the found results, and could not be an accurate reflection of the target population (Keppel & Wickens, 2004).

Hypothesis 2: Sense-Making across Age

The second hypothesis, age is a good predictor of the number of semiotic strategies used, found some significant results. For both Conceptualization and Analysis evidence was found of Group 1, the participants aged 6 to 11, using less strategies than Group 2, the participants who were 12 to 17 years old. In the case of Conceptualization there was a t-value of -2.208 and a p-value of 0.033, and for Analysis there was a t-value of -2.856 and a p-value of 0.007. This would suggest that for Conceptualization, Group 1 (6-11) has a mean that is lower by a magnitude of 2.208 standard deviations than Group 2 (12-17), because of the fact that the t-value is negative. This would also go for the variable of Analysis, where Group 1 (6-11) has a mean that is lower than the mean of Group 2 (12-17) by a magnitude of 2.856 standard deviations.

According to Piaget's theory of cognitive development (1971), children go through 4 stages of learning. For this study, only the last two are relevant; the Concrete Operational Stage and the Formal Operational Stage. The concrete operational stage, which entails children from around 6 to 11 years of age, marks the beginning of children switching from being concrete and literal in their thinking to getting more adept at using logic. Children in this stage of development tend to struggle with more abstract concepts.

This can be seen, for example, in the way that younger participants answer the question what they think their buddy thinks about their object. Participant P003, who is 9 years old, answered: "I think you really like your colouring book because you love colouring".

The next stage, generally for ages 12 and up, is the Formal Operational Stage wherein children learn to use deductive reasoning and begin to understand abstract concepts and hypothetical problems and situations. An example is that when asked the same question, what do you think your buddy thinks about their object, Participant P019, who is 17 years old, answered: “Uhm, I think when you first saw mine you weren't sure what you were looking at. Which I understand, because you obviously missed a whole part of the film before it. Ehh, I think you found what you were seeing interesting, because even if you don't have the whole plot, you can still see that it is presented beautifully. (...) You first have a, what am I looking at? That turned into ohh, this is interesting”.

Comparing these stages to the found results, it would make sense for there to not be a statistically supported difference between the two age groups (6 to 11 and 12 to 17) when it comes to more practical strategies like Perception and Imagination, but there being a difference when it comes to more logical and abstract strategies like Conceptualization and Analysis.

Likewise, it has been proven many times that language is not static, and the development of language is not the same for everybody. For example, as researched by Hoff (2006), different environments provide different bases for the language acquisition mechanism, which thereby produce differences in the improvement of language on the individual and on the group level in terms of rate and type of language development.

Hypothesis 3: Emotions across Sex

For the third hypothesis, people assigned female at birth will feel and report stronger emotions than people assigned male at birth, there were no statistically significant results found. This would suggest that there is no difference in reported intensity, arousal, or valence when it comes to the difference in girls compared to boys.

Historically, women have always been painted as more emotional than men - this even went as far as to exclude women from research based upon the idea that their ovarian hormone fluctuations would lead to variation in emotion, even though this is not the case (Weigard et al., 2021). Weigard et al. (2021) also found that a lot of feelings, such as enthusiasm, nervousness, or strength are very often interpreted differently between the two sexes. While a man whose emotions fluctuate during a sporting event would be labelled as "passionate", a woman would in the same or a similar event be considered "irrational". It would appear that the idea that women are more emotionally sensitive than men is mostly a cultural ingrained stereotype and that men experience the same number of emotions – they are often just labelled differently.

Another reason for the fact that women are generally seen as more emotional than males is the fact that males often exhibit so-called restrictive emotionality; this refers to the tendency to inhibit and limit the expression of certain emotions, and an seemingly unwillingness to self-disclose feelings (Jansz, 2000). However, these effects are not observed commonly until after preschool; this suggests that there is a possibility that it is a consequence of certain socialization processes. In that case, it would make sense that there is not a statistically significant difference between boys and girls, as they have not yet encountered these processes a lot.

Limitations, Strengths, and Future Directions

As was stated previously, this study had a sample that consisted of 44 participants; of these 44, 15 were assigned female at birth, and 29 were assigned male at birth. This makes that there is a slight deviation in balance of the sample. This imbalance in the sample could have an impact on the generalizability of the found results (Keppel & Wickens, 2004). However, since there has been more research done on topics that are similar to the topic of

this study, that have found results similar to the ones that were found here, this effect could be regarded as relatively small.

Another limitation of this study that observably had an influence on the participants was whoever answered the prompt first, oftentimes had the longest answer. The second participant would often either add a couple of words, or just simply state “Yeah, I agree with that”. This made it more difficult to measure their sense-making, as nothing basically was said. This process of interviewing multiple people at the same time, and the risks that come with it was studied by Zarhin (2018), who found that it is often the case that joint interviews become a site where one participant will silence the other, with the interviewer becoming an (unwilling) accomplice. The other option is also true, where the interviewer may facilitate passivity of one of the participants. Joint interviews therefore may prevent the researchers from giving equal voice to both participants, which will result in partial data collection. A solution for this problem could be to have the participants sign up together, but conduct the interviews separately, or researchers should consider how they should react to more one-sided conversations beforehand.

Beside the second participant not giving as much insight into their sense-making as the first participant, another problem lied in the selected age group for this study. For the study, the selected age range was 6 to 17 years old. For future studies, it would be wise to have either a different method to measure the data, or to exclude participants under about eight years, as the participants of 6 and 7 years old often struggled to maintain their attention and did not understand the prompts as often as the older participants. Besides this, they were not able to fill in the questionnaire independently, as they are not yet able to read well. This led to the researchers having to read to questions out loud and fill in the answers for them, leading to both the study taking longer and to possibly less reliable answers (De Leeuw & Otter, 1995).

A strength of this research is the fact that both qualitative and quantitative data was collected and used; this leads to a better understanding of the sample that is being studied, as both quantitative and qualitative research contain weaknesses that are to some extent compensated for by the strength of the other. While quantitative research is good for testing hypotheses and determining attitudes and practices of a larger population, qualitative research is very good for developing hypotheses that have more emphasis on depth, context and participants perspectives (Verhoef & Casebeer, 1997).

For future research, it could be very interesting to study possible cross-cultural differences or conduct longitudinal research on the development of semiotic strategies over a prolonged period of time. With cross-cultural research, the development of children could be compared across different cultures; this way, it can be studied whether cultural differences in for example values, norms, beliefs, and traditions have an influence on the development of the number of semiotic strategies used (Amir & McAuliffe, 2020). Longitudinal research could lead to insights in the developmental trajectories, the continuity, and change over time of the number of semiotic strategies as children grow up (Magnusson & Cairns, 1996). Longitudinal research could also help with the identification of factors that influence the development of the use of semiotic strategies.

Conclusions

The data in this present study show that there is no significant difference in the number of semiotic strategies used in the sense-making process when comparing biological males to biological females. This could however be explained by the possibly too small sample and the subsequent low power of the study.

Besides this, it was found that age is a good predictor for the number of semiotic strategies used, especially the Conceptualization and Analysis strategies. Presumably this is the case due to the older participants having more experience with more cognitive thinking, and thereby with the cognitive-based semiotic strategies.

Finally, the data in this study do not support the idea that females experience and report stronger emotions than males, contrary to the common believe. Likely, this is because it is mostly culturally ingrained ideas that lead us to believe that females experience more emotions than males.

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Tables and Figures

Table 1

Desciptive Statistics

	Age
Valid	44
Missing	0
Mean	11.07
Std. Deviation	3.39
Minimum	6.00
Maximum	17.00

Table 2

Examples of Conversation Prompts

Example of question	Type of Question
Why did you bring these objects?	General
Why do you think your buddy brought that object?	General
(V1) What do you notice about this object? (color, shape, texture, material, sound etc.)	Perception
(V2) What do you notice about this object? (color, shape, texture, material, sound etc.)	Perception
What color strikes you most about this object and why?	Perception
What can you do with this object?	Imagination
What would you tell others they need to know about your object?	Conceptualization
What do you think the artist wanted you to feel with when they made the object?	Conceptualization
What can you learn from this object?	Analysis
How do you think your buddy thinks about their art object?	Theory of Mind
What do you think your buddy thinks about your art object?	Theory of Mind
What do you think about your art object?	Theory of Mind

Note. The questions marked with a star (*) were used in the analysis.

Table 3

Descriptive Statistics Sex

	Group	N	Mean	SD	SE	Coefficient of variation
Perception	1	15	5.667	2.870	0.741	0.507
	2	29	4.793	2.541	0.472	0.530
Imagination	1	15	4.000	2.619	0.676	0.655
	2	29	3.897	2.526	0.469	0.648
Conceptualization	1	15	9.067	4.334	1.119	0.478
	2	29	10.138	4.198	0.780	0.414
Analysis	1	15	4.333	2.820	0.728	0.651
	2	29	5.310	3.557	0.660	0.670

Note. Group 1 is participants assigned female at birth, group 2 is participants assigned male at birth.

Table 4

Test of Equality of Variances (Levene's)

	F	df_1	df_2	p
Perception	0.060	1	42	0.808
Imagination	0.055	1	42	0.815
Conceptualisation	0.012	1	42	0.912
Analysis	2.177	1	42	0.148

Table 5

Independent Samples T-Test Sex

	Test	Statistic	df	p
Perception	Student	1.034	42	0.847
Imagination	Student	0.127	42	0.550
Conceptualization	Student	-0.794	42	0.216
Analysis	Student	-0.923	42	0.181

Note.

Table 6

Descriptive Statistics Age

	Group	**N**	**Mean**	**SD**	**SE**	**Coefficient of variation**
Perception	1	27	5.185	2.760	0.531	0.532
	2	17	4.941	2.561	0.621	0.518
Imagination	1	27	3.519	2.592	0.499	0.737
	2	17	4.588	2.347	0.569	0.511
Conceptualization	1	27	8.704	4.121	0.793	0.474
	2	17	11.471	3.923	0.951	0.342
Analysis	1	27	3.926	3.245	0.625	0.827
	2	17	6.647	2.783	0.675	0.419

Note. Group 1 is participants aged 6 to 11, group 2 is participants aged 12 to 17.

Table 7

Test of Equality of Variances (Levene's)

	F	df_1	df_2	p
Perception	0.173	1	42	0.680
Imagination	0.131	1	42	0.720
Conceptualisation	0.010	1	42	0.922
Analysis	0.267	1	42	0.608

Table 8

Indipendent Samples T-Test Age

	Test	Statistic	df	p
Perception	Student	0.293	42	0.771
Imagination	Student	-1.381	42	0.175
Conceptualization	Student	-2.208	42	0.033
Analysis	Student	-2.856	42	0.007

Table 9

Group Descriptives Emotion

	Group	N	Mean	SD	SE	Coefficient of variation
GEW_XX_intensity_normalised_Emoji1	1	15	0.431	0.277	0.072	0.644
	2	27	0.446	0.222	0.043	0.498
GEW_XX_intensity_normalised_Emoji1b	1	11	0.445	0.270	0.081	0.607
	2	22	0.435	0.337	0.072	0.775
GEW_XX_intensity_normalised_Emoji2	1	15	0.465	0.276	0.071	0.593
	2	27	0.472	0.264	0.051	0.559
GEW_XX_intensity_normalised_Emoji2b	1	12	0.434	0.210	0.061	0.484
	2	18	0.503	0.309	0.073	0.614
GEW_XX_intensity_normalised_Emoji3	1	15	0.399	0.292	0.075	0.731
	2	27	0.467	0.352	0.068	0.754
GEW_XX_intensity_normalised_Emoji3b	1	13	0.390	0.249	0.069	0.639
	2	22	0.574	0.331	0.071	0.577
GEW_XX_intensity_normalised_Emoji4	1	15	0.570	0.209	0.054	0.366
	2	27	0.526	0.303	0.058	0.576

GEW_XX_intensity_normalised_Emoji4b	1	14	0.425	0.224	0.060	0.527
	2	22	0.475	0.307	0.065	0.646
GEW_XX_arousal_centered&normalised_Emoji1	1	15	0.206	0.209	0.054	1.015
	2	27	0.155	0.330	0.063	2.133
GEW_XX_arousal_centered&normalised_Emoji1b	1	11	0.297	0.208	0.063	0.700
	2	22	0.114	0.415	0.088	3.643
GEW_XX_arousal_centered&normalised_Emoji2	1	15	0.160	0.284	0.073	1.778
	2	27	0.289	0.297	0.057	1.025
GEW_XX_arousal_centered&normalised_Emoji2b	1	12	0.239	0.308	0.089	1.286
	2	18	0.086	0.363	0.086	4.246
GEW_XX_arousal_centered&normalised_Emoji3	1	15	0.225	0.202	0.052	0.895
	2	27	0.039	0.412	0.079	10.441
GEW_XX_arousal_centered&normalised_Emoji3b	1	13	0.106	0.334	0.093	3.153
	2	22	0.192	0.263	0.056	1.366
GEW_XX_arousal_centered&normalised_Emoji4	1	15	0.213	0.276	0.071	1.299
	2	27	0.041	0.428	0.082	10.404

GEW_XX_arousal_centered&normalised_Emoji4b	1	14	0.134	0.337	0.090	2.509
	2	22	0.093	0.341	0.073	3.671
GEW_XX_valence_centered&normalised_Emoji1	1	15	0.486	0.230	0.059	0.472
	2	27	0.375	0.321	0.062	0.857
GEW_XX_valence_centered&normalised_Emoji1b	1	11	0.434	0.260	0.078	0.599
	2	22	0.346	0.317	0.068	0.917
GEW_XX_valence_centered&normalised_Emoji2	1	15	0.381	0.405	0.105	1.062
	2	27	0.433	0.219	0.042	0.505
GEW_XX_valence_centered&normalised_Emoji2b	1	12	0.318	0.344	0.099	1.082
	2	18	0.486	0.283	0.067	0.583
GEW_XX_valence_centered&normalised_Emoji3	1	15	0.454	0.236	0.061	0.520
	2	27	0.412	0.310	0.060	0.753
GEW_XX_valence_centered&normalised_Emoji3b	1	13	0.417	0.203	0.056	0.486
	2	22	0.575	0.306	0.065	0.533
GEW_XX_valence_centered&normalised_Emoji4	1	15	0.464	0.401	0.103	0.863
	2	27	0.493	0.215	0.041	0.436

GEW_XX_valence_centered&normalised_Emoji4b	1	14	0.392	0.280	0.075	0.715
	2	22	0.471	0.285	0.061	0.606

Table 10

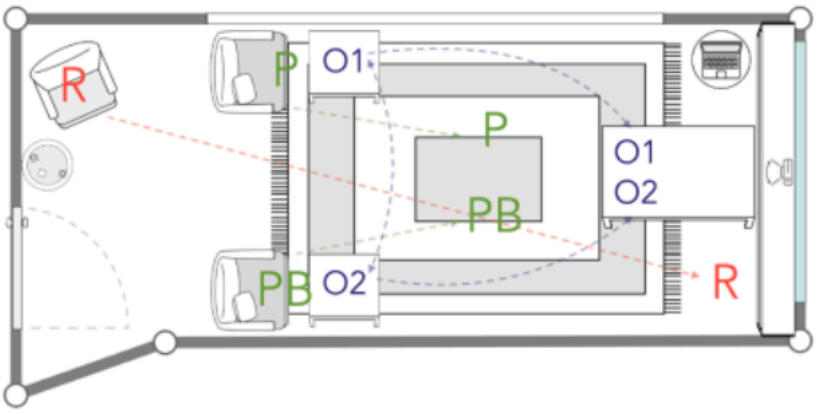
Independent Samples T-Test Emotion

	Test	Statistic	df	p
GEW_XX_intensity_normalised_Emoji1	Student	-0.202	40	0.841
GEW_XX_intensity_normalised_Emoji1b	Student	0.085	31	0.933
GEW_XX_intensity_normalised_Emoji2	Student	-0.077	40	0.939
GEW_XX_intensity_normalised_Emoji2b	Student	-0.679	28	0.503
GEW_XX_intensity_normalised_Emoji3	Student	-0.631	40	0.532
GEW_XX_intensity_normalised_Emoji3b	Student	-1.738	33	0.092
GEW_XX_intensity_normalised_Emoji4	Student	0.500	40	0.620
GEW_XX_intensity_normalised_Emoji4b	Student	-0.529	34	0.600
GEW_XX_arousal_centered&normalised_Emoji1	Student	0.542	40	0.591
GEW_XX_arousal_centered&normalised_Emoji1b	Student	1.375	31	0.179
GEW_XX_arousal_centered&normalised_Emoji2	Student	-1.380	40	0.175
GEW_XX_arousal_centered&normalised_Emoji2b	Student	1.205	28	0.238

GEW_XX_arousal_centered&normalised_Emoji3	Student	1.636	40	0.110
GEW_XX_arousal_centered&normalised_Emoji3b	Student	-0.850	33	0.402
GEW_XX_arousal_centered&normalised_Emoji4	Student	1.396	40	0.171
GEW_XX_arousal_centered&normalised_Emoji4b	Student	0.359	34	0.722
GEW_XX_valence_centered&normalised_Emoji1	Student	1.180	40	0.245
GEW_XX_valence_centered&normalised_Emoji1b	Student	0.795	31	0.433
GEW_XX_valence_centered&normalised_Emoji2	Student	-0.546	40	0.588
GEW_XX_valence_centered&normalised_Emoji2b	Student	-1.463	28	0.155
GEW_XX_valence_centered&normalised_Emoji3	Student	0.454	40	0.652
GEW_XX_valence_centered&normalised_Emoji3b	Student	-1.646	33	0.109
GEW_XX_valence_centered&normalised_Emoji4	Student	-0.301	40	0.765
GEW_XX_valence_centered&normalised_Emoji4b	Student	-0.814	34	0.421

Figure 1

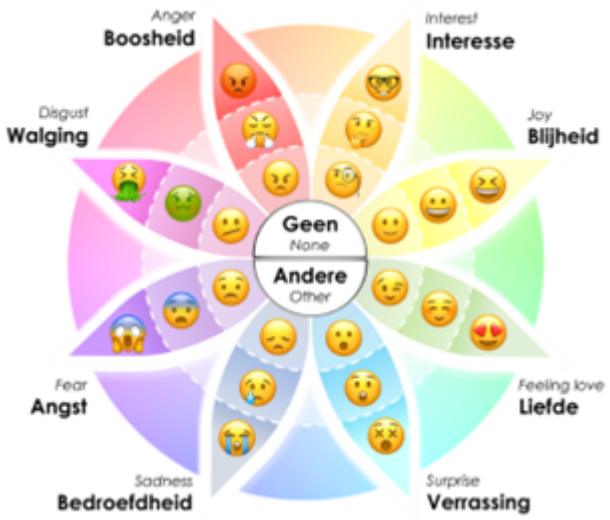
Experimental setting in the University's lab or recreated at the chosen location



Note. Depicted is a schematic representation of the laboratory setting. Indicated by "P" is the position of participant 1, and "PB" is the location of participant number 2. The position of the researcher(s) is coded as "R". The positions of the objects brought by the participants are coded as "O1" and "O2". The arrows demonstrate the different directions of movement.

Figure 2

The version of the Geneva Emotion Wheel that was used in the questionnaire



Note. As can be seen in the above figure, there were no emoji's attached to the *None* and *Other* options.

Figure 3

Examples of a Transcribed Conversation

Speaker1: [00:04:20] "Cool, and what can you do with your piece of art? With your object?"

Speaker3: [00:04:24] "Uhm, play the guitar."

Speaker1: [00:04:26] "And anything else?"

Speaker3: [00:04:27] "Uhm, and in an uhm, what's it called again, put it in a display cabinet? No, in one of those uhm photo frames."

Speaker1: [00:04:37] "Oh yeah, is it in a photo frame?"

Speaker3: [00:04:39] "No."

Speaker1: [00:04:40] “And have you used it with a guitar before?”

Speaker3: [00:04:42] “No.”

Speaker2: [00:04:43] “He also doesn’t have a guitar, he has a drum kit, [inaudible] that plays guitar.”

Note. Here, speaker 3 is talking about the object that he has brought; a guitar pick that he got from a guitarist when he went to their concert.

Appendix B

Coding Schemes for Semiotic Strategies

Coding Scheme Perception

Perception	
Description	Statements corresponding to the semiotic strategy of perception are those who explain a perceptual engagement with an object. The strategy of Perception are the concrete expressions of seeing, smelling, hearing or touching something, but also utterances that explain the experience of a feeling that stimulus can give someone. The perceptual strategy is used when participants focus on the sensory qualities of an object. This helps to appreciate the impact of the object and how it brings out emotional and sensory responses.
Examples of Keywords	Seeing Smelling Hearing Touching Feeling Recognizing Experience Observe Notice Consider
Examples of Sentences	- Um, that it smells nice. (P011) - The size and the colour really stand out to me. (P012) - And mine has, 1, 2, 3, 4, 5, 6, 7, 8, mine has eight colours! (P015) - And umm, how that, what do you call it, that handle thing isn't very beautiful. (P035) - That it's very soft. (P041)

Coding Scheme Imagination

Imagination	
Description	The semiotic strategy of imagination is about active and concrete manipulations of perceptions, both those before us and in memory. For instance, thinking about a future condition, using an object in a different matter than presented, theorizing about how the world must have looked in the past or will look in the future, or, coming up with different endings to a music piece. This strategy enables us to engage with our imagination and connect with objects (of art) on a more profound and subjective level. It also relates to empathy. If something looks like something else (without comparing), this is done by employing a imagination strategy.
Examples of Keywords	Design Fantasize Play Pretend Shape Would Wonder + Idea Make Create Construct Invent Imagine If
Examples of Sentences	- With that we could make a Minecraft account together and with that just play Pokémon cards. (P014) - Maybe play with the chicken, but I don't know if that would be very fun. Maybe it'll break or something. (P018) - He probably thought, I'll make a nice little lucky angel. (P027) - Yeah, there are a lot of those holes, so you can make many things with it. So, you can easily make a car out of it. (P053) - And if the guitar is out of tune, you can tune it with that. (P055)

Coding Scheme Conceptualization

Conceptualization	
Description	Employing a conceptual semiotic strategy involves combining multiple concrete memories into abstract categories and their underlying meaning. Judging, naming, classifying and labelling are all part of Conceptualization. Conceptualization also involves the extraction of the underlying meaning of a stimulus. Many objects and especially artworks are created with specific concepts, ideas, or cultural contexts in mind. The Conceptualization strategy allows one to understand underlying concepts, ideologies, and cultural references involved in an artwork, as well as the maker's intentions. Agreeing to something is always conceptual. Observations of abstract feelings like nostalgia and awe are also considered to be part of conceptual strategies.
Examples of Keywords	Judging Naming Classifying Labelling Represent Belonging Categorizing (e.g.: "I think XXXX" belongs in this category) To debate To pronounce To tell Symbolize To relate Nostalgic
Examples of Sentences	- Well it's a bit sunny and that makes me kind of happy. (P007) - I actually really like the fact that it is a combination of a lot of colors, but I think I really like the blue, but it is truly the combination that I like. (P009) - I thought it was very cool, throughout the film they are very active with the camera, and where the camera is placed and the music is very well chosen. (P019) - Yes, you can see that, it's a really nice photo. (P021) - And umm, how that, what do you call it, that handle thing isn't very beautiful. (P035)

Coding Scheme Analysis

Analysis	
Description	The Analytical semiotic strategy involves abstract perception. What are the underlying structures of what we experience? What are the rules that govern these structures? And what do the different parts of objects tell us about the world? The Analytical strategy helps us to deconstruct and analyse the formal and structural element of objects or artworks. It involves exploring the composition, visual elements, artistic techniques, and relationships between different elements within the work. We can extract artistic choices and the overall organization of an object. When using arguments to support why something is made the way it was made is Analytical as well.
Examples of Keywords	Exploring Comparing Making connections Testing Made Discover Meaning in the world… / to other people… Express Explains
Examples of Sentences	- I think you really like your colouring book because you love colouring. (P003) - I think you think your own artwork object is very special because your grandmother made it. (P004) - If you hadn’t heard what this all means to me, it may just seem like a regular poster that you made as a child. (P009) - I just have very fond memories because I was there with my mother, and it was just overall very nice to be in Shakespeare's Globe and all. (P012) - I think it's a nice photo because everyone is really in it in a way like they usually behave, the attitudes are really so specific to everyone. And everyone isn't posed so stiffly and so on, so it was just captured in the moment and everyone was just acting like themselves. (P022)