Sense-Making in Art: The Influence of Gender Identity and Biological Sex

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Abstract

Current research on sense-making in art in children is scarce. Research on adults shows that women are more likely to be more engaged in the art experience than men are, but this research only looks at biological sex. Studies that include gender identity in their design have shown that gender identity could be a better predictor than biological sex. The present study investigates if there are gender differences in the sense-making experience of children. This will be done by comparing the effects biological sex and gender identity have on the sense-making experience. Based on the current literature I propose that gender identity will be as effective as or more effective than biological sex in explaining gender differences in the sense-making experience in art in children. Moreover, I suspect individuals with a feminine gender identity to be more engaged in the sense-making experience in art. We used a mixed methods study where participants (N = 10) partook in dyads. Participants were between the ages of 6 to 17 (M = 12, SD = 4.08) and were asked to fill in a questionnaire that assessed gender identity and biological sex among other things. Dyads also participated in a semi-structured conversation that assessed their sense-making experience by looking at the use of semiotic strategies. Because of the small sample size results were not significant. However, results do suggest that biological males were more engaged in the sense-making experience in art than biological females. On the other hand, individuals with a higher feminity score were found to be more engaged in the sense-making experience in art as well. This supports the notion that gender identity is able to predict the sense-making experience in addition to biological sex but it does not tell us if it is a better predictor.

Keywords: gender identity, biological sex, sense-making, receptive art, children, mixed methods

Sense-Making in Art: The Influence of Gender Identity and Biological Sex

In recent years, topics surrounding gender and gender expression have become more talked about than ever. This can be seen on social media and the news, but also in places like schools, on the streets and at home. The word "gender" sparks a lot of debate in our current social and political climate, regardless of what your opinion on it is. Critiques of the concept of gender often involve how children are too young to make decisions about their gender and how exploring one's gender could lead to negative consequences. However, research provides enough evidence to suggest that children can and will express their *gender identity* in ways that go beyond traditional gender roles (Diamond, 2020; Twist & de Graaf, 2019). Even though this is the case, current research often still defines the variable "gender" in the biological sense, as male and female. This could limit the interpretations of results in research, as *biological sex* can only say so much about a person. By defining gender as gender identity, so looking at masculine and feminine expressions, you much more accurately take into account the person's experiences and sense of self (Clemens, et al., 2020; Compère, et al., 2018; Thomson & Zand, 2007). This makes the interpretations of your results have much more complexity and depth.

Research on experiencing receptive art also defines the variable "gender" in the biological sense, with the consensus being that women are generally more engaged and interested in experiencing different forms of art than men are (Tröndle et. al., 2014; Smith et. al, 2017). Current research has not yet looked at the experience in receptive art while defining gender as gender identity. In this paper, I will look at the current research on biological sex versus gender identity and discuss which one explains variation in results better. Furthermore, I will aim to extend this to *sense-making* in receptive art in children.

Theoretical Background

Biological Sex Versus Gender Identity

Currently, the most common way that researchers use the variable "gender" in their research is by asking the participants what their biological sex is. So what research refers to as "gender" is actually biological sex. In this paper, I will use the term "biological sex" when referring to what you were assigned at birth (i.e. male or female, or a boy or a girl). When I talk about gender identity I refer to how scientific research defines gender identity as opposed to how laymen define gender identity. In scientific research, gender identity is defined as where someone falls on the masculinity and femininity scales (Neale & Robbie, 2016). This could be compared to how researchers measure and look at personality traits.

The term "gender identity" is used differently when we look at media, online discourse or casual conversations about this topic. A modern tool used by a lot of laymen is Wikipedia and the webpage about gender identities (Wikipedia, 2023) cites a source that defines gender identity as a way people describe, present and feel about themselves (Understanding Gender Identity, 2022). It then goes on to present a very long list of different gender identities. For example agender, bigender, genderqueer, transgender and xenogender. It does not mention masculinity or femininity anywhere. This difference in definition is important to keep in mind while reading the rest of this paper.

Research on gender identity has changed quite significantly in the past 50 years. In the past, researchers measured gender identity by measuring where you lay on the femininity/masculinity scale, they viewed gender identity as unidimensional. Nowadays, gender identity has been widely recognized by researchers to be *bi-* or *multidimensional*. Bidimensionality looks at gender identity by using femininity and masculinity as separate measures (Bem, 1981) while multi-dimensionality looks at gender identity through additional

factors (e.g. pressure to conform, gender typicality, etc.) to masculinity and femininity (Spence, 1984).

The ongoing debate about gender identity focuses on the bidimensional model, the relationship of femininity and masculinity with gender identity. Can femininity and masculinity accurately define gender identity or are these concepts merely related to gender identity, without defining it? The multidimensional model argues that these concepts are insufficient in capturing someone's gender identity. However, a lot of research uses the bidimensional approach and measures gender identity by looking at both femininity and masculinity as independent and different dimensions (Hall & Halberstadt, 1980; Martin et. al., 2016; Stets & Burke, 2000) while some use the multidimensional approach and look at additional variables like gender typicality and pressure to conform among other things (Egan & Perry, 2001). The debate about which approach is better to use in research is still ongoing, but it does show that gender identity is quite complex and can capture a lot of different aspects of someone's sense of self.

Moreover, research suggests that instead of looking at (only) biological sex, gender identity could be a better variable to use in research. For example, a study found that gender identity influences today's societies concerning income levels, leadership, participation, health and academic status (Clemens et al., 2020). Thomson & Zand (2007) found that rather than biological sex, gender identity better predicts self-evaluations in the areas of friendship and romantic appeal. Another study found that gender identity was a more effective dimension for customer segmentation than biological sex (Neale & Robbie, 2016) and the same was found in another study but for autobiographical memory and future thinking (Compère et al., 2018). In addition to that, Strath et. al. (2020) found data suggesting that gender identity may play a more significant role in pain sensation than genetic sex. All this literature suggests that when investigating gender differences, it might be a good idea to

consider gender identity in the form of masculinity and femininity, in addition to biological sex.

Sense-Making Strategies

The idea that we use perception and cognition to make sense of the world around us has a long and varied history. For example, Gestalt psychology talks about certain "laws" or "principles" that the mind uses to make sense of the chaotic world around us by constructing global wholes (Koffka, 2013/1935). Chater & Loewenstein (2016) define sense-making as an innate drive to construe the world around us in a way that makes sense.

Another way to define sense-making is how Van Dorsten (2015) does this, she talks about four *semiotic strategies* that we use to make sense of the world. Semiotic strategies refer to the strategies used in symbolic communication, interpretation and meaning-making processes like signs and symbols (Campbell et. al., 2019). These four strategies are perception, imagination, conceptualization and analysis and are based on a model where van Heusden (2015) distinguishes between four basic cultural strategies. *Perception* is quite literally using our senses to perceive the world around us. Take for example a simple object like a (wooden) stick, we perceive it as a stick because external input (colour, shape, etc.) points towards it being a stick. The second strategy is *imagination*, this is where we slowly start to get away from the perception that it is a simple stick. We still recognize it as a stick, but we also start imagining other ways to use it. We create a second, new meaning (e.g. bat). Thirdly there is *conceptualization*, which is enabled by language. We use concepts to quickly differentiate between different categories or events. For example, when using the word 'stick', it becomes clear very quickly that you are not talking about a bat or fishing rod. Instead, previously agreed-upon definitions for certain concepts are used by conveying them through language. The final strategy is *analysis*. This skill refers to the creation of new

knowledge with the help of theoretical frameworks. If you decide to investigate the physical attributes of a stick, you are using the skill analysis to make sense of your surroundings (in this example a stick). These semiotic strategies play a vital role in how we shape and experience the world around us.

Biological Sex and Sense-Making in Art

The bidimensional perspective on gender does recognize that certain behaviours are more easily associated with femininity and others more with masculinity. Bem (1981) infers masculinity with more instrumental traits and feminity with more expressive traits. This is also why women (biological females) are more often associated with having an interest in art. A common belief about men and women is that women like to spend their free time going to art museums, the theatre, reading literature, etc. and men like to spend their free time watching or doing sports, going to bars, etc. However, these ideas are based on stereotypes and biases, but what if there is some truth to them? What if this perceived relation between women and receptive art is not just some illusory correlation? When looking at current research on this topic, it quickly becomes apparent that women partake in cultural activities significantly more than men do (Christin, 2012; Katz-Gerro & Jaeger, 2015; Lagaert & Roose, 2018; Purhonen et. al., 2011). I suspect that these differences in cultural participation between men and women could mean that their experience in the reception of different art could also be different.

There is not a lot of research to be found on this exact topic, as this is quite a new research direction on gender and art. I found one article investigating art reception between men and women that looked at the difference in expectation, experience, physiological aspects and post-memory of the artworks between men and women (Tröndle et. al., 2014). Their research found that women rated the artworks more positively than men and this result

was stable even when education level was accounted for. They also assessed aesthetic-emotional involvement and found that men often felt sad looking at the artworks and they were also significantly more frightened by the artworks. Women were more often emotionally moved and experienced the artworks as stronger than men. This association did lose significance when education level was taken into account. These subjective assessments were also supported by objective assessments. For example, female visitors read almost twice as many text panels as male visitors did, suggesting a higher level of interest and engagement with the art. They also were affected more while reading these panels. All these data suggest that there are quite a few differences in art reception between men and women (Tröndle et. al., 2014).

There are two studies that investigate time spent viewing art and reading labels (Smith et. al, 2017; Smith & Smith, 2001) that also investigate the effect biological sex has but both studies find no association between biological sex and time spent viewing artworks and reading labels. These studies do not look at the sense-making experience, however. Do note that the 2017 study was a replica of the original study from 2001 including the same researchers. This difference in results could be because Tröndle et al. (2014) study used a sample with participants knowing they were partaking in an experiment while the other two studies were conducted by unobtrusively observing participants. This is referred to as *reactivity* and this is a phenomenon that occurs when individuals alter their performance or behaviour due to the awareness that they are being observed (Heppner et. al, 2008). This shows that more research is needed on this topic to investigate if biological sex matters in the art experience.

Other than these three studies, with two of them not investigating the subjective art experience at all, no other research has been conducted on the relationship between art

experience and biological sex at this point to my knowledge and none of these studies investigated gender identity at all.

The Present Study

In this study I will use a mixed-method approach to look at the type and amount of sense-making strategies children use in art and if this differs across biological sex and gender identity. I hypothesize that individuals with higher femininity scores will use more semiotic strategies (Hypothesis 1) and, on the other hand, that individuals with higher masculinity scores will use fewer semiotic strategies (Hypothesis 2). These hypotheses are constructed this way because research points out that femininity is traditionally associated with more expressive traits, potentially making their engagement in art higher (Bem, 1981).

Furthermore, I hypothesize that females will use more semiotic strategies compared to males (Hypothesis 3). This is because studies have found that women are more likely to engage in cultural activities, making it apparent they have a higher interest in art and this could lead to a higher engagement in art compared to men (Lagaert & Roose, 2018; Purhonen et. al., 2011).

Additionally, I will look at whether biological sex or gender identity is a better predictor for the number of semiotic strategies used. As multiple studies have found gender identity predicts various variables at least as well or better than biological sex (Clemens et al., 2020; Compère et al., 2018; Thomson & Zand, 2007) I hypothesize that gender identity will predict the number of semiotic strategies used as well or better than biological sex will (Hypothesis 4).

As there is no previous research on the type of semiotic strategies used between males and females as well as between different gender identities I will not state a hypothesis. I will simply investigate whether there are any (if at all) apparent differences between what type of

semiotic strategies the biological sexes and different gender identities use and if the type of semiotic strategy can predict biological sex and gender identity.

Method

Participants

Participants were recruited from two locations in the Netherlands: Groningen and Rijssen. They were recruited through voluntary response sampling by spreading flyers in the aforementioned locations and via word-of-mouth. These flyers were both spread in Dutch and English. The only requirements to participate were that participants had to be able to speak either Dutch or English and had to be between 6-17 years old. Twelve people participated in the experiment from which two participants were excluded from the data analysis as their data file was damaged due to technical problems. The final sample consisted of ten participants between the ages of 6 and 17 years old (M = 12, SD = 4.08, see Table 1). Four participants were minors under the age of 12, four participants were minors between 12 and 15 years of age (40%) and two participants were minors of 16 or 17 years of age (20%). Five participants were biologically male (50%, M = 13, SD = 1.87, see Table 2), three were biologically female (30%, M = 14.3, SD = 4.61, see Table 2) and two did not want to answer this question (20%, M = 6, SD = 0, see Table 2). The missing data on biological sex was inferred by the researchers based on imputation techniques (Kennedy et al., 2020). This was done based on information provided by a parent of one of the participants. This resulted in five participants identifying as biologically female (50%, M = 11, SD = 5,61, see Table 3). The experiment was conducted twice in English and seven times in Dutch, with one participant filling in the questionnaire in English but partaking in the conversation in Dutch.

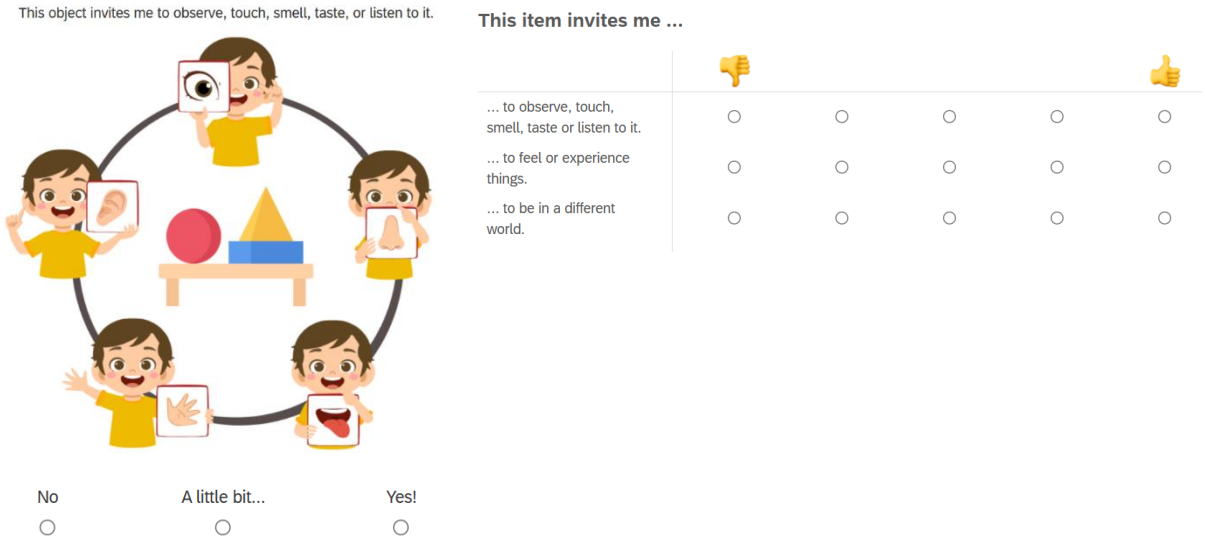
Materials

All the materials (from recruitment materials to questionnaires and conversational prompts) used were in English to Dutch. The materials were translated by two Dutch students partaking as researchers in this experiment and to ensure the reliability of the translations, back-translation or reverse-translation methodology was used (Tyupa, 2011). We can distinguish three types of materials used in the present study:

1. First, a registration form was developed in the form of a Qualtrics survey. This Qualtrics survey (https://www.qualtrics.com) was shared with potential participants to (1) read relevant information about the study, (2) give their informed consent for participation and (3) choose a date and time for taking part in the experiment and leave their contact details. This consent procedure allowed us to register their consent electronically. Data collection took place at participants' homes. The exact location of the experiment was chosen by the participants (and their parents).
2. Next, a questionnaire was made in the form of another Qualtrics survey. This survey was used to conduct the first and final part of the study (see Procedure). Two different versions of the Qualtrics questionnaire were developed, one was adapted for participants under the age of 12 (children) and one for participants between 12 and 17 years of age (adolecents). More pictures were used in the children's questionnaire in addition to the questions (see Figure 1).

Figure 1

Example item in children's versus adolescent's version



Note. The picture on the left depicts the question "This object invites me to observe, touch, smell, taste or listen to it." as formulated in the questionnaire for children. The picture on the right depicts the same question as formulated in the questionnaire for adolescents.

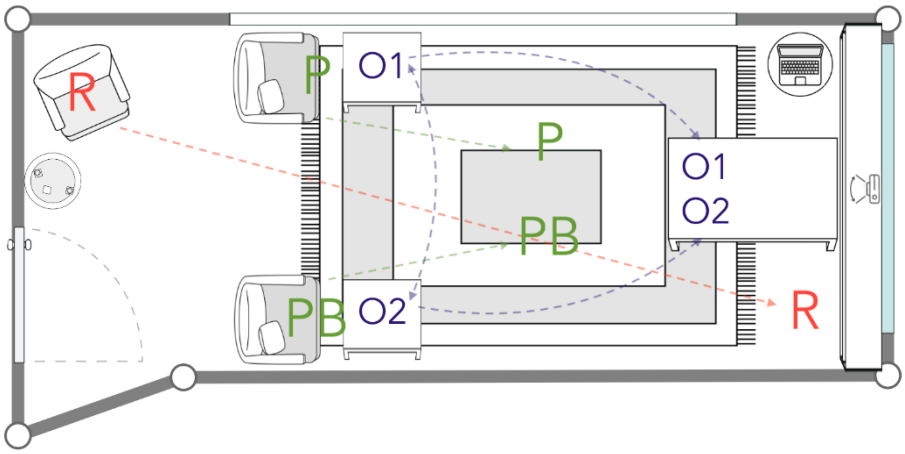
We also modified some questions to make them easier to understand for children (see Gender Identity in Materials section). Each of the measurement tools used in the questionnaire will be explained in further detail in the following section.

3. Lastly, some technical equipment was used to conduct the experiment. One laptop from the University of Groningen was used to run all the recording programmes we needed to record the conversational part of the experiment. Camera 2- Logitech BRIO was used to capture the audio (via AudioCapture) and video (via SyncVideo) and the software LabRecorder.cfg was used to record the video and audio onto the laptop. The audio files were converted from XDF files to WAV files using Matlab (Version 9.13.0). Data from the video file was not used in the data analysis as audio data was sufficient for this exploratory study.

The questionnaires were completed on either two iPads or two experimental laptops. Headphone sets were provided if needed. Researchers conducting the experiment used a project manual and script to ensure similar instructions were given to all participants. This way the experiment was conducted the same every time and variance in results would be due to variance between participants and not due to variance in experimental setting. The experimental setting can be seen in Figure 2.

Figure 2

Experimental setting in the lab or recreated at the participants' homes



Note. Depicted is a schematic representation of the laboratory setting. "P" indicates the positions of participant 1 and "PB" indicates the positions of participant 2. The position of the researcher(s) is coded as "R". The positions of the objects/artworks are coded as "O1" and "O2". The arrows demonstrate the different directions of movement.

Gender Identity

To measure gender identity in adolescents, we used an adapted version of the personal attribution questionnaire (PAQ-8; Tibubos et. al., 2022). 8 items were used in total with 4 assessing femininity/expressivity and 4 assessing masculinity/positive instrumentality. Some

examples of items are “Not at all emotional – very emotional” to measure femininity and “Feels superior – feels very inferior” to measure masculinity. The scale runs from 1-6, exactly like the PAQ-8 study Tibubos et. al. (2022) conducted with 1 meaning “Strongly disagree” and 6 meaning “Strongly agree”. In the original PAQ study (Spence et. al., 1973) they use a 5-point scale which is the only big difference between the two studies.

To measure gender identity in children, we used the Children’s Personal Attributes Questionnaire (CPAQ; Hall & Halberstadt, 1980). There were 8 items used, 4 to assess femininity/expressivity and 4 to assess masculinity/positive instrumentality. Some items included were “I am not as friendly to other people as I should be” for measuring femininity and “I give up easily” for measuring masculinity. The items were reduced to correspond to the personal attribution questionnaire we used for the adolescent’s version. The original 4-point scale from Hall and Halberstadt’s study on CPAQ was slightly adjusted to a 4-point Likert scale. This scale included: strongly disagree (1), disagree (2), agree (3) and strongly agree (4). Appendix A contains the complete gender identity questionnaire.

Since the adolescent’s version used a 6-point Likert scale and the children’s version a 4-point Likert scale, the final scores had to be standardized (Adolescent Stand. Score = $(\frac{Unstand.score - 4)}{2}$ and Child Stand. Score = $\frac{Unstand.Score - 4}{12}$*10). This results in the final scores ranging from a minimum of 0 to a maximum of 10.

Sense-Making in Receptive Art

Sense-making in receptive art was measured by looking at the number of times participants used the four semiotic strategies described by van Dorsten (2015). These strategies are perception, imagination, conceptualization and analysis. We did this through a semi-structured discussion between the participants. Participants were given prompts that encouraged them to discuss the objects/artworks they brought to the study. We used five

different categories of prompts and four of these categories directly assessed the four semiotic strategies. The fifth category was a general category in which we gave the participants the freedom to answer using any of the semiotic strategies. Prompts were given verbally but were also shown on a monitor or laptop. Some examples of conversation prompts are shown in Table 5.

Table 4

Examples of Conversation Prompts Measuring Semiotic Strategies

What do you notice about these objects/artworks?	Perception
What colours or shapes do you see?	Perception
What can you do with these objects/artworks?	Imagination
Would you be able to discover things with this object/artwork?	Imagination
What would you tell others they need to know about your object/artwork?	Conceptualization
What makes this a [insert object/artwork type]?	Conceptualization
What can you learn from this object/artwork?	Analysis
What do you learn about the world/yourself when you experience this object/artwork?	Analysis
Why did you bring these objects/artworks?	General
What do you think about the object your partner brought with them?	General

Note. An example of the prompt "What makes this a [insert object/artwork type]?" could be "What makes this a painting [and not a drawing]?"

This conversation measured which semiotic strategies the participants used in practice. We measured this by counting the frequency count of answers that fell into each category (see Appendix B for the coding scheme used).

Other Measurements

Other variables we measured but that I not personally used to answer my research questions were: a questionnaire for assessing the participant's preference of engagement with art (productive/receptive, e.g. singing/making music), Bodily Sensation Maps (BSMs, Nummenmaa et. al., 2013), Geneva Emotion Wheel (Scherer et. al., 2013) to assess the emotional dimensions of the experience of the objects/artworks brought to the study and items from the Big-Five Personality Traits Questionnaire for Children and Adolescents focusing on the trait Openness (Muris et. al, 2005).

Procedure

Before the start of the data collection, Ethical Approval was granted by the author's institutional Ethics Committee of the Faculty of Behavioural and Social Sciences at the University of Groningen (PSY-2223-S0252) before the start of data collection. The study was conducted according to the Dutch ethical standards for scientific research. Informed consent was obtained by filling in the registration form. Participants who were 16 years and older were able to give consent on their own, but the younger participants needed their parents' consent in addition to their own to complete the registration form. Participants were given a 10 euro Pimm voucher upon completion of the study and they could indicate in the registration form what they wanted to do with it. Options were to either keep the 10 euro Pimm voucher for themselves or donate it to their school to spend on cultural activities. This last option was mainly for participants that had been recruited via schools.

All participants were asked to do the experiment with a peer. This was done to promote a sense of intimacy and safety during the conversation. Children and adolescents were asked to bring an object or artwork that was meaningful to them (e.g. stuffed animal, bracelet, book, painting, etc.). We also gave them the option to bring an object/artwork that

they made themselves. The experiment was expected to take around 45-60 minutes for each dyad, but this depended heavily on the participants themselves.

The experiment looked as follows: (1) First, participants answered a question about age and a question assessing the participant's preference of engagement with art (productive/receptive). (2) We then gave them a maximum of 2 minutes to appreciate and experience the object/artwork in front of them. We counterbalanced whether they first experienced their own object/artwork or that of their partner. (3) After finishing the appreciation of object/artwork participants completed the pre-measurement of their own object/artwork or their partner's object/artwork. (4) Participants appreciated the other object not yet experienced and filled in the questionnaire about that object/artwork. (5) We then moved on to the second part of the experiment. Participants were asked to discuss their objects/artworks based on prompts that were shown on a monitor or laptop. These prompts assessed how participants made sense of their experience of the object/artwork they brought. Every category lasted a maximum of 4 minutes with a maximum of 2 minutes to discuss each object/artwork. In total this part lasted a maximum of 20 minutes. (5) Thereafter, participants did steps 2-4 again, this time as a post-measurement. (6) The final part of the experiment consisted of answering the Openness questionnaire and answering the Gender Identity questionnaire.

Analysis

This study used quantitative and qualitative data analysis. Data gathered from the Qualtrics survey and the conversation were analysed in JASP (Version 0.17.1.0). Power analyses were performed for every test in GPower (version 3.1.9.7).

I used linear and logistic regression analyses, an independent samples t-test as well as qualitative analyses to investigate the hypotheses about sense-making and gender identity.

The data collected from the conversations between participants was analysed using similar techniques to Cognitive Discourse Analysis (CODA, Tenbrink, 2015).

CODA

Based on CODA, I used the following relevant steps: *transcription, segmentation* and *annotation*. Transcription involved completely transcribing the semi-structured conversation between the two participants only leaving out information not relevant to the question, etc. Mispronunciations, false starts and markers of hesitation were transcribed since they usually contain relevant information about communicative and cognitive processes. Punctuation markers were also added in the transcript, as they help signify the intonation and meaning of the spoken sentence. Segmentation was used to divide the full transcript into smaller units to better quantify the data. Examples of segments are “Nou, ik heb het eigenlijk als aandenken, dus ja, wat ik ermee persoonlijk kan doen” and “Gewoon omdat deze... Ik vind het de leukste vakantie waar ik ooit ben geweest. En dat vind ik gewoon leuk”. Annotation of these segments is done by creating relevant categories based on your research question. Annotation was done with the help of Excel (Version 2016).

In this study, I used the four semiotic strategies as coding categories (see Appendix B). Every relevant segment was allocated to the most fitting category based on linguistic indicators. For example, the perception category involved descriptive linguistic indicators, the imagination category involved words about the imagination, the conceptualization category used words relating to classification and organizing principles and the analytical category involved words concerning discovering new things and making connections. This way the participant’s usage of words of a certain category could be counted and thus quantified.

Results

Refer to Table 5 for the definitions of all the variable names.

First, Hypotheses 1 and 2 were tested. Linear regression was used with *SemStr_F* as Dependent Variable (DV) and *FemScore_stand* and *MascScore_stand* as Independent Variables (IVs) and all the assumptions were met. The regression coefficients were -0.30 and -1.64 for *FemScore_stand* and *MascScore_stand* respectively but these were not significant ($p = 0.93$ and $p = 0.52$ respectively, see Table 6). A post-hoc power analysis was done that resulted in a power of 0.10.

To test Hypothesis 3 an independent samples t-test was used comparing the means of *SemStr_F* between the groups male and female. The assumptions were met for the male group but not for the female group. Because of this, I decided to run both a Student test and a Mann-Whitney test. When testing alternative hypothesis 1: group 1 (female) > group 0 (male), the p-values for both the Student and Mann-Whitney test were not significant ($p = 0.970$ and $p = 0.982$ respectively, see Table 7). However, Table 8 shows that there is a difference of 11.6 between group 0 and group 1 for *SemStr_F*, but this difference supports the opposite alternative hypothesis from what I tested. When testing alternative hypothesis 2: group 0 (male) > group 1 (female), the p-values for both the Student and Mann-Whitney test were significant ($p = 0.030$ and $p = 0.029$ respectively, see Table 9).

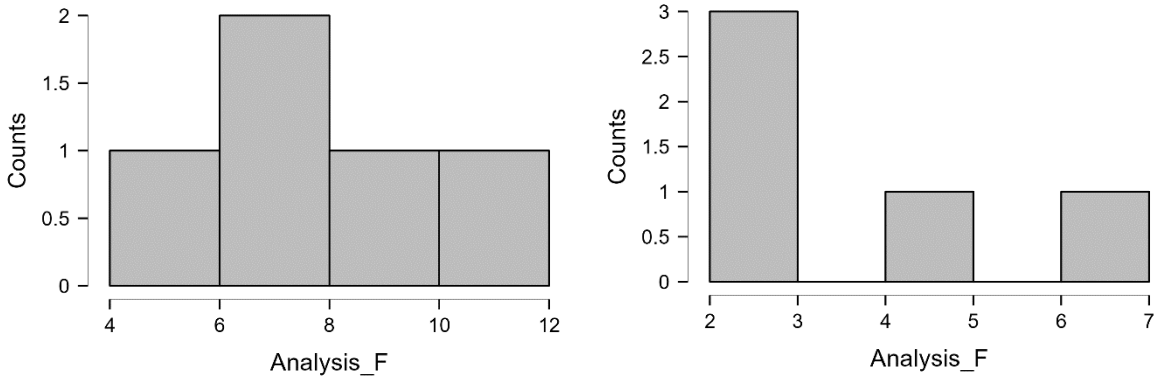
To test Hypothesis 4 I used linear regression with *SemStr_F* as DV and *FemScore_stand*, *MascScore_stand* and *Sex_C* as IVs. The analysis yielded regression coefficients 2.14, -1.15 and -12.87 for *FemScore_stand*, *MascScore_stand* and *Sex_C* respectively (see Table 10). These regression coefficients were not significant though ($p = 0.52$, $p = 0.60$ and $p = 0.11$ respectively, see Table 10). A post-hoc power analysis was done that resulted in a power of 0.49.

Multiple linear regression was used to investigate if the frequency count of different semiotic strategy usage was able to predict masculinity and femininity scores. When using *FemScore_stand* as DV and using *Perception_F*, *Imagination_F*, *Conceptualization_F* and *Analysis_F* as IVs, the resulting regression coefficients were very low and not significant (see Table 11). A post-hoc power analysis was done that resulted in a power of 0.09. When using *MascScore_stand* as DV while keeping the same IVs, the resulting regression coefficients were, again, very low and not significant (see Table 12). A post-hoc power analysis was done that resulted in a power of 0.10.

Logistic regression was used to investigate the potential relationship between biological sex and sense-making based on the frequency count of different semiotic strategy usage in the conversation. *Sex_C* was the DV and *Perception_F*, *Imagination_F*, *Conceptualization_F* and *Analysis_F* were the IVs. However, the coefficients were not significant and most of them were very close to 0 (see Table 13). Notably, IV *Analysis_F* had a coefficient estimate of -3.41 while the other estimates were closer to 0. (see Table 13). Figure 3 illustrates this difference.

Figure 3

Analysis_F



Notes. The left graph denotes *Analysis_F* for biological males and the right graph denotes *Analysis_F* for biological females.

Discussion

The present study looked at sense-making in receptive art and if this differed across biological sex and gender identity. Only one significant result was found but when this study is treated as a pilot study the results do show some interesting findings that future research could build upon.

Sense-Making and Gender Identity

The hypothesis that individuals with a higher femininity score would use more semiotic strategies was not supported by the results. There was a small decrease in the number of semiotic strategies used when the femininity score increased (r = -0.30). The hypothesis that individuals with a higher masculinity score would use less semiotic strategies was also not supported. It is noteworthy that the regression coefficient was relatively big (r = -1.604), showing that when the masculinity score increased the number of semiotic strategies decreased. However, this was not significant and this was likely because of a small sample size and, consequently, low power. This finding would be in line with the idea that masculinity is more associated with instrumental traits and less with expressive traits (Bem,

1981), were it significant. Results also did not indicate that femininity and masculinity scores mattered when it came to what type of semiotic strategy participants liked to use.

Sense-Making and Biological Sex

The hypothesis that females would use more semiotic strategies than males was not supported. Interestingly, the opposite result was found with males using approximately 11.6 more semiotic strategies than females did and this difference was significant. This could be because the sample size and power were small and the difference found was due to individual differences, rather than group differences.

Another reason could be that boys and girls are treated differently by people around them, causing differences in behaviour between them. As the participants from this study were all children, school is likely to play a big role in their lives and this also extends to their teachers. Swann and Graddol (1988) suggested that teachers subconsciously treat boys with more preferential treatment, prompting boys to participate more in class, consequently taking away time for the girls to do the same. This could lead to boys learning that it is socially accepted behaviour for them to be dominant in conversations, while girls learn that they are expected to be more quiet. This is also illustrated by what Spender (1982) found in her study. When both boys and girls were asked who dominates in the classroom, they all indicated that boys received the most attention and were the most liked. These findings suggest that children are aware of this gender difference which could turn into a self-fulfilling prophecy. It would be interesting to investigate this by pairing up males with females and participants with a high masculinity score with participants with a low masculinity score. This could give insight into why males used more semiotic strategies than females in this study.

Another interesting finding was done when looking at the type of semiotic strategy used between the sexes. Males tended to use the analytical strategy more compared to

females. Figure 3 illustrates this difference. An explanation could be that boys are more encouraged to do their best in STEM subjects (science, technology, engineering and math) and consequently like these subjects more (Weinburgh, 1995). All these subjects put a heavy emphasis on analytical thinking skills, making it easier for males to use the analytical strategy as they are more familiar with the concept. All these findings indicate that males have certain advantages over females which also shows in how they make sense of art through a conversation.

Sense-Making versus Biological Sex

The hypothesis that gender identity could explain variation in results as well or better than biological sex was not supported as the results were not significant. However, I did find results suggesting that gender identity explains variation of results that is not explained by biological sex. This is shown by the fact that when femininity increases, the amount of sense-making strategies increases (r = 2.14) and when masculinity increases it decreases (r = -1.15), but when someone is male they use more sense-making strategies (r = 12.87). This shows that being male and being masculine or being female and being feminine are not synonymous and that gender identity is a useful variable to add to your model in addition to biological sex. This finding is supported by other research that compares biological sex and gender identity as they all find that gender identity is at least as good as or a better predictor than biological sex (Clemens, et al., 2020; Compère, et al., 2018; Neale & Robbie, 2016; Strath, et al., 2020; Thomson & Zand, 2007).

Limitations and Future Directions

A very big limitation was the small sample size and consequently the low power this study had. Because of this, the chance for a Type II error to have occurred was high so it is likely that otherwise significant effects were missed. We did mean to use a bigger sample

size, but we had some problems with the recruitment of participants. I do think that treating this study as a pilot study that future studies can build upon is a valid idea, as there was enough theory to support the hypotheses in this study. To improve the recruitment phase it could be a good idea to start contacting schools earlier and suggest that this study be part of a cultural programme, instead of contacting schools on such short notice and expecting them to find time in their schedule to accommodate a decently long study like ours.

It would also be a good idea to exclude 6 and 7-year-olds in future studies, as we noticed that their attention span was too short for a study of our design and they required a lot of breaks to finish the study. Moreover, they were not able to fill in the questionnaire on their own as they were not able to read yet. This resulted in the researchers having to read everything aloud and caused the study to take longer than planned. The final drawback was that some of the questions were too difficult for them to understand, making their answers unreliable and possibly skewing the results.

Additionally, participants did not have an equal opportunity to answer in the conversation part of the study. It was observed that participants that first answered the prompt gave more elaborate answers while the other participant only added small things and left it at that. The second participant was also likely to answer “I agree with what was just said” and this made it difficult to measure their sense-making experience. A solution could be to fluctuate between which participant answers the prompt first or to change the conversation to an interview and interview both participants separately. This happened gradually with all the dyads anyway, as all the dyads stopped talking to each other and answered the researcher instead.

Conclusion

The present study shows that biological males use more sense-making strategies than biological females, indicating that they are more engaged in the sense-making experience in art. This could be explained by the difference in treatment boys and girls get in schools, as boys are subconsciously more encouraged to partake in classroom discussions than girls are by their teachers. It was also found that gender identity can be a useful variable to add to your model in addition to biological sex.

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Tables

Table 1

Descriptive Statistics

	Age
Valid	10
Missing	0
Mean	12.000
Std. Deviation	4.082
Minimum	6.000
Maximum	17.000

Table 2

Descriptive Statistics

	Age		
	F	M	U
Valid	3	5	2
Missing	0	0	0
Mean	14.333	13.000	6.000
Std. Deviation	4.619	1.871	0.000
Minimum	9.000	10.000	6.000
Maximum	17.000	15.000	6.000

Note. "*F*" means Female, "*M*" means Male and "*U*" means Unknown.

Table 3

Descriptive Statistics Including Imputation of Unknown

	SemStr_F		Age	
	0	1	0	1
Valid	5	5	5	5
Missing	0	0	0	0
Mean	33.400	21.800	13.000	11.000
Std. Deviation	8.264	8.556	1.871	5.612
Skewness	-0.834	2.160	-1.145	0.410
Std. Error of Skewness	0.913	0.913	0.913	0.913
Kurtosis	0.102	4.729	2.000	-3.140
Std. Error of Kurtosis	2.000	2.000	2.000	2.000
Minimum	21.000	17.000	10.000	6.000

Table 3

Descriptive Statistics Including Imputation of Unknown

	SemStr_F		Age	
	0	1	0	1
Maximum	42.000	37.000	15.000	17.000

Note. "Male" is coded as 0 and "Female" is coded as 1.

Table 5

Variables

Variable name	Definition
Age	Age measured in years
SemStr_F	Semiotic strategy usage measured by counting the frequency of use
FemScore_stand	Standardized femininity score
MascScore_stand	Standardized masculinity score
Sex_C	Biological sex with code "0" for male and code "1" for female
Perception_F	Perception strategy usage measured in frequency counts
Imagination_F	Imagination strategy usage measured in frequency counts
Conceptualization_F	Conceptualization strategy usage measured in frequency counts
Analysis_F	Analysis strategy usage measured in frequency counts

Table 6

Coefficients of SemStr_F

							95% CI	
Model		Unstandardized	Standard Error	Standardized	t	p	Lower	Upper
H_0	(Intercept)	27.600	3.166		8.716	< .001	20.437	34.763
H_1	(Intercept)	39.562	18.503		2.138	0.070	-4.191	83.315
	FemScore_stand	-0.304	3.332	-0.037	-0.091	0.930	-8.182	7.574
	MascScore_stand	-1.643	2.416	-0.274	-0.680	0.518	-7.356	4.070

Table 7

Independent Samples T-Test

	Test	Statistic	df	p	Location Parameter	SE Difference	Effect Size	SE Effect Size
SemStr_F	Student	2.181	8	0.970	11.600	5.320	1.379	0.768
	Mann-Whitney	22.000		0.982	13.000		0.760	0.365

Note. For all tests, the alternative hypothesis specifies that group 0 is greater than group 1. For the Student t-test, effect size is given by Cohen's d. For the Mann-Whitney test, effect size is given by the rank biserial correlation. For the Student t-test, location parameter is given by mean difference. For the Mann-Whitney test, location parameter is given by the Hodges-Lehmann estimate.

Table 8

Group Descriptives

	Group	N	Mean	SD	SE	Coefficient of variation
SemStr_F	0	5	33.400	8.264	3.696	0.247
	1	5	21.800	8.556	3.826	0.392

Table 9

Independent Samples T-Test

	Test	Statistic	df	p	Location Parameter	SE Difference	Effect Size	SE Effect Size
SemStr_F	Student	2.181	8	0.030	11.600	5.320	1.379	0.768
	Mann-Whitney	22.000		0.029	13.000		0.760	0.365

Note. For all tests, the alternative hypothesis specifies that group 0 is greater than group 1. For the Student t-test, effect size is given by Cohen's d. For the Mann-Whitney test, effect size is given by the rank biserial correlation. For the Student t-test, location parameter is

Independent Samples T-Test

	Test	Statistic	df	p	Location Parameter	SE Difference	Effect Size	SE Effect Size

given by mean difference. For the Mann-Whitney test, location parameter is given by the Hodges-Lehmann estimate.

Table 10

Coefficients for SemStr_F

Model		Unstandardized	Standard Error	Standardized[a]	t	p
H_0	(Intercept)	27.600	3.166		8.716	< .001
H_1	(Intercept)	29.069	16.742		1.736	0.133
	FemScore_stand	2.144	3.124	0.260	0.686	0.518
	MascScore_stand	-1.152	2.079	-0.192	-0.554	0.600
	Sex_C (1)	-12.871	6.786		-1.897	0.107

[a] Standardized coefficients can only be computed for continuous predictors.

Table 11

Coefficents of FemScore_stand

							95% CI	
Model		Unstandardized	Standard Error	Standardized	t	p	Lower	Upper
H_0	(Intercept)	5.665	0.383		14.777	< .001	4.798	6.532
H_1	(Intercept)	6.403	1.598		4.006	0.010	2.295	10.510
	Perception_F	-0.060	0.125	-0.210	-0.480	0.651	-0.382	0.262
	Imagination_F	-0.127	0.221	-0.382	-0.575	0.590	-0.694	0.441
	Concept._F	-0.020	0.235	-0.058	-0.085	0.936	-0.623	0.583
	Analysis_F	0.121	0.353	0.302	0.343	0.746	-0.785	1.027

Note. Concept._F stands for Conceptualization_F

Table 12

Coefficients of MascScore_stand

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	6.232	0.529		11.788	< .001	5.036	7.428
H_1	(Intercept)	7.313	2.160		3.386	0.020	1.762	12.865
	Perception_F	0.011	0.169	0.027	0.062	0.953	-0.425	0.446
	Imagination_F	-0.122	0.298	-0.266	-0.408	0.700	-0.889	0.645
	Concept._F	0.036	0.317	0.076	0.113	0.914	-0.779	0.851
	Analysis_F	-0.112	0.476	-0.203	-0.234	0.824	-1.336	1.113

Note. Concept._F stands for Conceptualization_F

Table 13

Coefficients of Logistic Regression on Sex_C

					Wald Test			95% Confidence interval	
	Estimate	Standard Error	Odds Ratio	z	Wald Statistic	df	p	Lower bound	Upper bound
(Intercept)	8.903	12.398	7350.976	0.718	0.516	1	0.473	-15.398	33.203
Perception_F	-0.013	0.352	0.987	-0.038	0.001	1	0.970	-0.703	0.676
Imagination_F	0.561	1.412	1.753	0.398	0.158	1	0.691	-2.207	3.329
Concept._F	1.141	1.465	3.129	0.779	0.606	1	0.436	-1.731	4.013
Analysis_F	-3.412	5.087	0.033	-0.671	0.450	1	0.502	-13.382	6.558

Note. Seks_C level '1' coded as class 1. Concept._F stands for Conceptualization_F

Appendix A

Gender Identity Questionnaire

Table A1

PAQ-8

Item number	English version	Dutch version
1 (F)	Not at all emotional – very emotional	Helemaal niet emotioneel – erg emotioneel
2 (F)	Not at all aware of feelings of others – very aware of feelings of others	Helemaal niet bewust van andermans gevoelens – erg bewust van andermans gevoelens
3 (M)	Never gives up easily – gives up very easily*	Geeft niet snel op – geeft erg snel op*
4 (M)	Not at all self-confident – very self-confident	Helemaal niet zelfverzekerd – erg zelfverzekerd
5 (M)	Feels superior – feels very inferior*	Voelt zich superieur – voelt zich erg inferieur*
6 (F)	Not at all understanding of others – very understanding of others	Toont weinig begrip voor anderen – toont veel begrip voor anderen
7 (F)	Very warm in relations with others – very cold in relations with others*	Heel warm in relaties met anderen – heel koud in relaties met anderen*
8 (M)	Succumbs under pressure – stands up well to pressure	Bezwijkt onder druk – presteert goed onder druk

Note. "(F)" indicates an item measuring femininity and "(M)" indicates measuring masculinity. "*" indicates when to reverse score an item.

Table A2

CPAQ

Item number	English version	Dutch version
1 (F)	My feelings get stirred up easily	Ik word snel emotioneel
2 (F)	I almost always notice how other people are	Ik merk bijna altijd op hoe anderen zich voelen
3 (M)	I give up easily*	Ik geef snel op*

Table A2

CPAQ

Item number	English version	Dutch version
4 (M)	Most of the time, I am not sure that I am right*	Vaak weet ik niet zeker of ik gelijk heb*
5 (M)	In most ways, I am better than most of the other kids my age	In veel opzichten ben ik beter dan andere kinderen van mijn leeftijd*
6 (F)	It is hard for me to understand what other people are feeling*	Het is moeilijk voor mij om te begrijpen wat anderen voelen*
7 (F)	I am not as friendly to other people as I should be*	Ik ben niet zo vriendelijk naar anderen als ik zou moeten zijn*
8 (M)	When things get tough, I almost always keep going	Wanneer dingen moeilijk zijn ga ik bijna altijd door

Note. "(F)" indicates an item measuring femininity and "(M)" indicates measuring masculinity. "*" indicates when to reverse score an item.

Appendix B

CODA Coding Scheme for Semiotic Strategies

Coding Scheme

Perception	Imagination	Conceptualization	Analysis
To see	To design	To judge	To research
To listen	To fantasize	To formulate	To structure
To feel	To pretend	To name	To test
To smell	To create	To categorize	To make connections
To touch	To imagine	To label	To analyze
To observe	To play	To symbolize	To explain
To recognize	To invent	To classify	To explore
To experience	To construct	To tell	To compare