

Semiotic Strategies Across Development Phases

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Abstract

Art remains a ubiquitous part of our lives, and the way that it is perceived and understood is significantly entangled with all of human meaning-making. This study explored how the meaning-making process with art varies among participants at different developmental stages and how they communicate their interpretations to peers. It uses qualitative data from dyadic conversations on meaningful art objects to understand art experiences, the meaning-making process and development. Focusing on four cumulative semiotic strategies - perception, imagination, conceptualization and analysis (van Heusden, 2015) - the dyadic conversations were coded to assess these strategies' usage. Hypotheses predicted that younger participants would use more concrete strategies, while older participants would engage into more abstract ones. The results showed that the imaginative strategy decreases with age.

However, perceptive, conceptual and analytical semiotic strategies revealed correlation with age. Visual analyses of State-Space Grids (SSGs) indicated mixed patterns for children and teenagers but consistent use of conceptual and analytical strategies among adults. This may hint at a developmental shift from perceptual and imaginative to conceptual and analytical semiotic strategies influenced by cultural knowledge and experience. Results emphasize the need for further research with larger samples and varied methods to refine our understanding of meaning-making with art across development.

Keywords: art experience, meaning-making, semiotic strategies, art interpretation, development phases, qualitative analysis

Semiotic Strategies Across Development Phases

Throughout history art has always played an important role for humans. Archeological excavations have found artifacts that date back 100.000 years, showing that the desire to express ourselves creatively has always been part of our history (Dutton, 2009). Art is closely connected to the context and time in which it is made. When we investigate art over the course of human history, we not only get a sense of the ideals of beauty and importance of the time the object was made, but we also get indications of what kind of materials and techniques were available for the creator. Thus, art is closely tied to the evolution of human culture by means of *Zeitgeist* (i.e.: "spirit of the time", see Reinelt, 2013), its discussions about beauty and meaning, the knowledge and techniques available to the creator and the affordances of the materials that are at hand. For these reasons, art is an interesting and important topic to investigate, and our engagement with art can tell us something about our psychology.

Looking at a painting, we can observe and engage with the lifetime and context of the artist and try to interpret its meaning. This interpretation of an artwork is based on the knowledge and preferences of the viewer (Pelowski, 2016). Yet, how does this knowledge form? In what way do we give meaning from a piece of art and how does this process of meaning-making differ from person to person? This paper set out to investigate how the meaning-making process of artworks differs for participants in different phases of their lifetime and development, as well as how they communicate the interpreted meaning of an artwork to their peers. Specifically: How do people give meaning to art?

Theoretical background

The psychology of Art

In his influential work *Art as Experience*, Dewey (1934) argues that in contrast with the traditional view that separates art from everyday life, art and aesthetic experience is not confined to the artwork itself but is a product of a continuous (creative) process that emerges from our interactions with the environment. Dewey (1934) emphasizes the importance of creative process and the engagement of the viewer or participant in the artistic experience.

The emphasis on the creative process and the viewers that are tied to an environment in which this process takes place has had an important impact on subsequent scholars of art. Leder et. al. (2004) aim to explain the psychological mechanisms underlying aesthetic appreciation of art, suggesting a model for aesthetic experiences. The model supports the notion of a viewer that not only perceives the artwork, but puts emphasis on the viewer's internal and external environment. This includes previous experiences, memory and memory integration, personal preferences and cognitive mastering as well as the social environment of a beholder of art. Leder and Nadal (2014) further refine the model and add emotional affective state and continuous affective evaluation as emotional processes that accompany the process underlying aesthetic appreciation of art. According to Leder and Nadal (2014), an aesthetic experience has three major aspects that influence the evaluation of aesthetic quality: First, it has an evaluative dimension (valuation of an object). Second, it has an affective dimension (the object is felt and draws attention). Finally, it has a semantic dimension. The latter dimension explains that an aesthetic experience is a meaningful experience, and not only a stimulus response (Leder & Nadal, 2014).

Pelowski et al. (2016) adapt these models and embeds them into the *Stage model of Art Experience*, arguing as well that art experience is a complex and multifaceted process and adding that art experience can lead to a transformative experience in an individual and a change in one's perspective. Pelowski et al., (2016) agrees that art experiences are meaningful experiences and describes them as a meaning-making process. According to Pelowski (2016),

this meaning-making process starts with the basic visual processing of an artwork, implicit and later explicit integration of previous experiences in relation to what is conceived, working towards deeper understanding, emotional reactions and finally self-reflection and sometimes transformative experience (Pelowski 2016). The process of meaning-making is a dynamic interplay between several internal processes of an individual, an artwork and the environment at hand.

Semiotic strategies and Meaning-making

According to van Heusden (2009), human meaning-making is characterized by recursive interactions between memory and the environment at hand. Throughout evolution, living species developed various reaction patterns to their surroundings with which they engage. These patterns of reactions together form our memory and evolve as we learn new reactions in response to changing environments. Humans connect new information from their environment with previously learned knowledge or patterns of reactions, making the meaning-making process recursive. This is called semiotic activity, where we continuously connect perceived reality with stored memories and signs (Jorna & Van Heusden, 2003). The meaning-making process involves two steps: First, we identify new information based on what we already know. Second, we compare stored patterns with current reality, continuously refining or changing our old patterns (Jorna & Van Heusden, 2003). Humans can also reflect on and modify how they engage with their surroundings, making the process both recursive and active (van Dorsten, 2015; van Heusden, 2015). According to van Heusden (2015), the human meaning-making process involves four cumulative semiotic strategies: perception, imagination, conceptualization and analysis. These semiotic strategies build upon each other in terms of complexity, moving from concrete to abstract meaning-making and can be employed at will (for an overview, see Figure 1).

The perceptual strategy involves sensory perception. The beholder of an artwork will

first see the artwork as it is a portrait. This involves the perception of concrete sensory qualities of an artwork. For instance, when perceiving a painting, this will likely be the different colors and shapes that together make the full artwork. As noted before, the process of seeing the qualities of the artwork go hand in hand with recognition of what is portrayed, we recognize a particular shape inside the artwork because of our prior knowledge. Other perceptual semiotic signs include: seeing, smelling, hearing and touching, and the emotions these sensations evoke (van Heusden, 2015; van Dorsten 2015).

The imaginative strategy concerns active and concrete manipulations of the perceptions at hand. In the case of the painting, one can imagine one-self sitting inside the landscape portrait and feel how it is to be there. A different way of enacting the imagination strategy is to imagine hanging the painting upside down, or in a different environment. Thinking about a future condition or imagining using an object in a different matter are both enabled by the imagination strategy. When engaging in imagination the sign (the painting) and its meaning are still connected to reality, but are removed further away from the actual perception (van Dorsten, 2015).

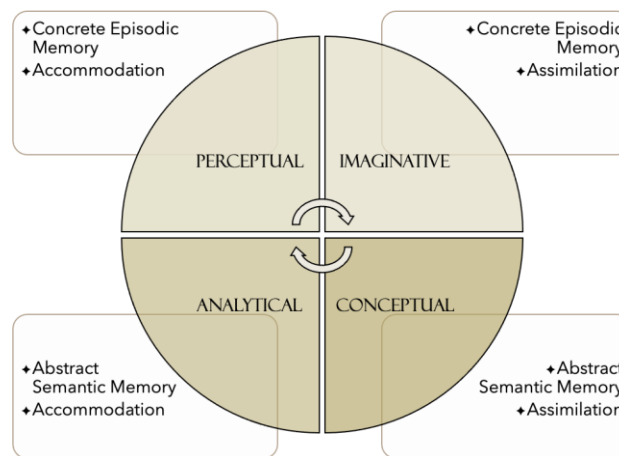
The conceptual strategy makes use of language to create and share more abstract concepts. Language allows humans to form abstract ideas that go beyond immediate experiences. People agree on specific signifiers (words or symbols) to represent their ideas. These agreements make communication more effective, everyone within the same culture understands what the signifiers represent (van Dorsten, 2015). The signifiers chosen are arbitrary, there is no inherent connection between the object and the concept it represents. For example, the word “painting” has no natural connection to the physical object it represents. Conceptualization is therefore culture-specific. The same idea might be expressed differently in different languages and cultural contexts (van Heusden, 2015; van Dorsten, 2015). Conceptualizations include: Judging, classifying and labeling. Conceptualization involves

understanding underlying concepts, ideologies and cultural references involved in the artwork. Agreeing to something, is conceptual and observations of abstract feelings like nostalgia and awe are also considered part of the conceptual strategy (van Dorsten, 2015).

The analytical strategy involves abstract perception. It is a recognition and analysis of the underlying structures of what we experience. This strategy helps us to deconstruct and analyze the formal structural element of an object. It reflects on why something is made the way it is. Recognizing the rules governing the structure of an artwork and extracting meaning out of the different parts that tell us something about the artwork and the world in which it is created is part of the analytical strategy (van Heusden, 2015; van Dorsten, 2015).

Figure 1

The four semiotic strategies and dimensions of human cognition as per van Heusden (2015)



Development over a lifetime

The semiotic strategies one can employ when making sense out of something are cumulatively more complex (van Heusden, 2015; van Dorsten, 2015). While utterances and observations of a perceptual kind are easy to form and perceive, imagination, conceptualization and analysis build on accumulative knowledge about the environment in which we live and our reaction patterns with which we engage in it. Especially

conceptualization and analysis are developed based on cultural knowledge passed on from experiences, education and engaging with the environment and other people for longer time periods (van Dorsten, 2015).

According to Thelen & Smith (1994) development is a complex, non-linear process that is influenced by multiple interacting systems which is called a dynamic systems perspective. Thelen's dynamic system perspective views acquisition of new skills and development as a self-organizing process where new behaviors emerge from the interactions of various subsystems (Thelen & Smith, 1994). Development does not follow a fixed sequence but is dynamic and non-linear, where small changes in one part of the system can lead to significant changes in behavior. Different factors, including environment, physical growth, genetics and task demands interact in order for behavior to emerge (Smith & Thelen, 2003).

According to dynamic systems theory, development is a process of continuous adaptation where children actively engage with their environment. Through this engagement, children self-organize their behaviors and cognitive processes (Thelen & Smith, 1998). Granott's (2009) exploration of sequences, transitions, and the Zone of Conceptual Development (ZCD) give further insights into the dynamic nature of development, complementing the dynamic systems perspective. Granott (2009) highlights how learning and development are characterized by non-linear progressions and transitions. This aligns with Thelen & Smith's (1994) emphasis on the self-organizing nature of development. Through the ZCD, a concept inspired by Vygotsky (1978), Granott (2009) argues that conceptual growth involves navigating through various phases, where each transition represents a reorganization of cognitive structures. This process of development is influenced by cultural knowledge and experiences, which makes interactions with the environment and others crucial for development (Granott, 2009; Vygotsky, 1978). Granott's (2009) insights on transitions and

Thelen & Smith's (1994) dynamic systems theory show how cognitive and behavioral changes go through phases and transitions and are driven by interplay of multiple factors, including cultural knowledge and experience.

This Study

This paper sets out to study the difference in semiotic strategies employed in the meaning-making process of art across development phases. Participants from different phases of development came to experience each other's art objects and discuss these with each other in dyads. Their conversations were recorded and transcribed. The transcribed conversations were then scored on their use of semiotic strategies throughout the conversation. According to Pelowski et al. (2016), art experience is an active and dynamic process between interpersonal as well as contextual and social factors and includes a meaning-making process. According to van Heusden (2015), the meaning-making process consists of four semiotic strategies that build upon each other and are increasingly complex and based on active engagement of the actor with their environment and learning new patterns and reactions over a lifetime. The dyads observed for this study were in different developmental phases of their life in order to observe whether the cumulative knowledge one gains in the course of a lifetime is represented in the different use of semiotic strategies. As reactions develop over the course of a lifetime and are rooted in culture specific signs that have to be acquired by actively engaging with the environment we expect to see a younger participants to use the less complex, and concrete semiotic strategies and older participants to employ the more complex and abstract semiotic strategies in their conversations with each other. This leads to the following hypotheses:

Hypothesis 1a. The relative count of the perceptual semiotic strategy used in the dyad conversations will be negatively correlated with participants' age.

Hypothesis 1b. The relative count of the imaginative semiotic strategy used in the dyad conversations will be negatively correlated with participants' age.

Hypothesis 1c. The relative count of the conceptual semiotic strategy used in the dyad conversations will be positively correlated with participants' age.

Hypothesis 1d. The relative count of the analytical semiotic strategy used in the dyad conversations will be positively correlated with participants' age.

The hypotheses mentioned above express interest in the incremental gain of knowledge and the acquisition of meaning-making skills over a lifetime. According to Thelen and Smith (1994), development is an active, non-linear process that depends on various interacting factors. Granott (2009) suggests that during development and learning, individuals navigate sequences and transitions through interactions with their environment and experiences. Literature on art experience indicates that these experiences emerge from actively engaging with artwork in a dynamic environment containing multiple factors and involve a meaning-making process (Pelowski et al., 2016). Research on meaning-making and the use of semiotic strategies argues that the four semiotic strategies- perception, imagination, conceptual, and analytical- build on each other and become increasingly complex (van Heusden, 2015; van Dorsten, 2015). The transition from perception and imagination, which are based on concrete episodic memory, to conceptual and analytical strategies, which are based on abstract semantic memory, requires considerable developmental growth (van Heusden, 2015).

Given these different factors of art, meaning-making, and development, this study will employ a visual analysis using state-space grids (SSGs) (Hollenstein & Lewis, 2006) to investigate how the development from perception and imagination semiotic strategies, hypothesized to be preferred by children, changes to a preference for conceptual and analytical semiotic strategies by adults. Following Granott's (2009) work on development, this study predicts a transitional phase in the teenage years where all four semiotic strategies will

be employed without any clear preference, as teenagers overcome challenges to reach new levels of understanding. This leads to the following hypotheses:

Hypothesis 2a. State-space grids for children will demonstrate attractor states in the perceptual and imagination areas of the grid, with low dispersion into other state-space areas.

Hypothesis 2b. State-space grids for teenagers will not display clear attractor states on the grid and will show high dispersion across state-space areas.

Hypothesis 2c. State-space grids for adults will demonstrate attractor states in the conceptual and analytical areas of the grid, with low dispersion into other state-space areas.

Methods

This study was approved by the Ethics Committee of the Faculty of Behavioural and Social Science at the University of Groningen (research code: PSY-2223-S-0252) and was conducted according to the Dutch ethical standards for scientific research. The study took place for five weeks, from May 1st to June 6th, 2023.

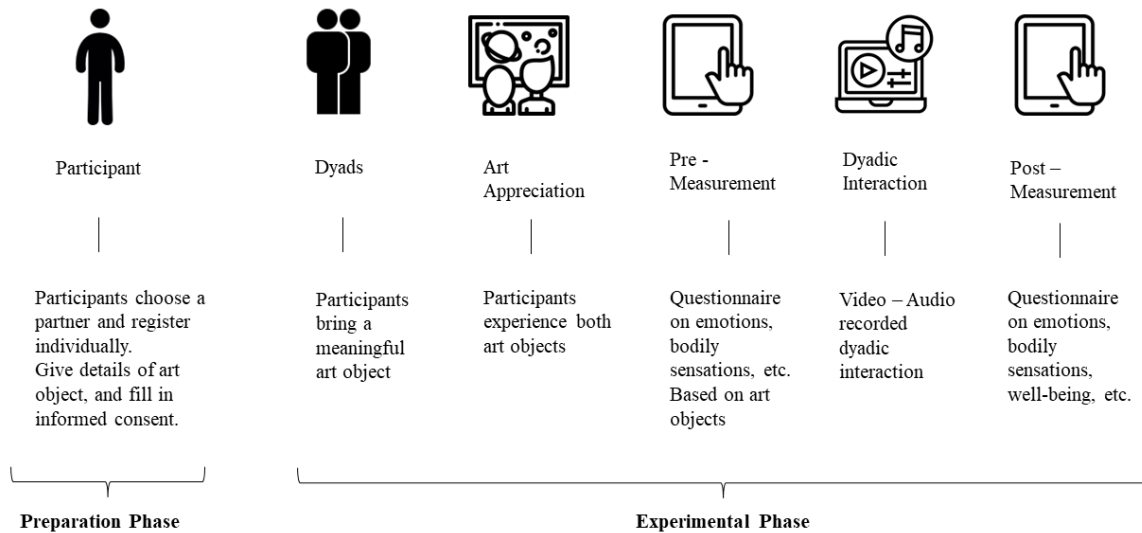
Participants

Over the five weeks of collection, data of 50 individual participants was gathered (25 dyads or pairs) who voluntarily participated in the study. The age of the participants ranged from 6 to 51 years old (29 females, 20 males, $M_{age} = 21,14$, $SD_{age} = 8,76$). The data was collected in either English or Dutch. Due to the exploratory nature of this study, seven dyads were selected in different phases of their lives and with a broad age range (age ranging from 6 to 51, 8 females, 6 males, $M_{age} = 21,21$, $SD_{age} = 14,81$). Participants were recruited through snowball sampling, volunteer sampling, and convenience sampling. More specifically, recruitment of potential participants living in the north of the Netherlands took place through convenience sampling. Recruitment methods included -1) targeted advertisement via research

panel website (SONA) aimed at first-year psychology students at the University of Groningen, Netherlands.; 2) public advertisement on the communication/social media platforms (e.g.: Facebook, Instagram, LinkedIn, Twitter, Whatsapp group chats; and 3) flyers distribution at local centers for leisure, elementary schools, culture and educational activities (e.g. Groninger Museum, Forum, schools, University buildings, UG Library, USVA, bookstores , literary cafes). A reward to participate was given in the form of a Pimm voucher of 10 euros offered to the participant or their legal guardians if the child was under 16 years of age. Alternatively, participants were given the choice to donate the money to a participating school for cultural activities.

Procedure of Data Collection

The study employed a mixed- and multi-method approach to investigate whether the sense-making process with art changes across developmental phases. Participants were instructed to bring a meaningful art object with them (for children this was simplified to a meaningful object and a referral guide was provided to adults for making such a decision, see Appendix A). Participants took part in the experiment as a pair/dyad to observe their (art) objects and talk about it as dyad (herein described as ‘dyadic interaction or conversation’) and filled in pre- and post-dyadic interaction questionnaires individually. The experiment was divided into two phases – the preparation phase and the experimental phase. Figure 2 illustrates an overview of the data collection process.

Figure 2*Overview of the Data Collection Process****Preparation Phase***

Participants who intended to take part in the study were asked to register through an online survey on Qualtrics (www.qualtrics.com, POVO, UT). The survey included a section for obtaining informed consent, ensuring it was secured before the experiment began. Prior to the data collection, participants were given information about the study and were instructed to sign up together with a known peer of their choice on mutual agreement. They were each asked to bring one meaningful (art) object such as a painting, photograph, film scene, music song, favorite book or poem – created by anyone, in digital or physical form, to the experimental location. For children this was simplified to just an object that is meaningful for them, including toys, photographs or something they created themselves. Participants were instructed not to reveal their chosen objects to each other before the experiment, and to not bring anything that could potentially upset the other person. Items that could not be brought physically to the location were sent digitally via email to the researchers, for later use in the

experiment. The experiment was conducted in multiple locations, namely the university laboratory (in case of adults) or the participants' homes (in case of children and teenagers).

Experimental Phase

In the experimental phase, each participant engaged in experiencing both their own and their peer's art objects, completed questionnaires, and participated in a dyadic interaction to discuss the art objects. The experiment proceeded as follows:

- (1) Each dyad was escorted to a room and seated together. Participants individually experienced their own or their peer's art object for a minimum of twenty seconds to a maximum of two-and-a-half minutes. The order of this experience was randomized and counterbalanced for each dyad.
- (2) Following the art appreciation, participants completed a pre-questionnaire via Qualtrics on a tablet, addressing the thoughts and reactions to both their own and their peer's art objects. The questionnaire included items on media preferences (van Klaveren et al., 2023), semiotic strategies (van Klaveren et al., 2023), the Geneva Emotion Wheel (GEW, Sacharin et al., 2012), and Bodily Sensation Maps (BSMs, (Schino et al., 2021)). Upon completion of the pre-questionnaire, the participants exchanged items, and the same process was repeated, beginning with the art appreciation.
- (3) This was followed by an audio- video- recorded 'dyadic interaction', or conversation, where participants were instructed to stand and discuss both art objects they had just experienced, using prompts for guidance. Each prompt was displayed on a screen and timed for two to three minutes. The entire interaction lasted between ten and twenty minutes. Both art objects were placed on a table during the interaction for engagement if necessary. The interaction concluded either after twenty minutes or upon discussion

of all prompts. The recordings were then stopped, and participants were asked to be seated again.

(4) Subsequently, participants completed the post-questionnaire, which included the same items as the pre-questionnaire (GEW, BSM), along with additional measures such as the adapted versions (for children and adults) of Personality Attributes Questionnaire (PAQ-8, Tibubos et al., 2022), and the Big Five Personality Test (BFPT, Denissen et al., 2008). As described, for the entire study, several quantitative variables were measured, yet, for the sake of this study, only qualitative data was used, obtained from the audio recordings of the dyadic interactions.

Dyadic interactions

After completing the questionnaires, participants engaged in a guided conversation about their items for a duration of ten to twenty minutes to measure speech content. These conversations were audio- and video-recorded. The objective of the dyadic conversation was to qualitatively assess how participants interpreted their items and communicated this interpretation to their dyadic partner. During the conversation, eight prompts were presented based on semiotic strategies (perception, imagination, conceptualization, and analysis) to guide the discussion (see Table 1). This semi-structured guided interaction was designed to facilitate a naturalistic conversation in a safe environment with a known peer, while the prompts provided a structured framework to ensure the participants had relevant topics to discuss. Additionally, this setup aimed to replicate the social aspect of experiencing art.

Table 1

Example of prompts used during the dyadic interaction

Semiotic strategy	Prompts for adults	Prompts for children
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General question to explore all the semiotic strategies at once	Why did you decide to bring this artwork with you? What do you think about what your friend brought?	Why did you bring your objects?
Perception	How does observing, touching, smelling, tasting, or listening to these artworks make you feel?	What do you notice about these objects/artworks?
Perception	Do you find these artworks beautiful or not? and Why?	Do you think these objects are beautiful?
Imagination	What purpose do these artworks fulfill by being made in this particular way?	What can you do with these objects/artworks?
Conceptualization	In what ways do you relate to these artworks?	What would you like others to know about your objects/artworks?
Analysis	What would you like other people to know about these artworks?	What can you learn from these objects/artworks?

Note. A series of follow-up questions to prevent the conversation from halting were stipulated. Researchers would aid participants in understanding the questions when needed, specifically in the case of children.

Technical Specifications

Two rooms were utilized for the experiment: the experiment room, where participants engaged in the study activities, and the control room, where researchers monitored participants and managed the display screen and audiovisual equipment.

The experiment room (Appendix B) was equipped with two chairs, two small tables, two tablets, a long table, a display screen, audiovisual recording equipment, and a laptop and/or headphones if necessary. This arrangement aimed to create a comfortable and naturalistic environment for the participants.

During the art appreciation phase, researchers provided tablets and headphones for art objects with audio/visual components. Tablets were also provided for the completion of questionnaires. The dyadic interactions were audio- and video- recorded using a microphone and a Logitech BRIO video camera. For recording and processing of audio and video two programs were used: AudioCapture (<https://github.com/labstreaminglayer/App-AudioCapture>) and SyncVideo (<https://github.com/markspan/VideoCapture>) respectively. We used LabRecorder (<https://github.com/labstreaminglayer/App-LabRecorder>) to save the audio and video streams to disk in XDF file format through LabStreamingLayer (LSL, <https://labstreaminglayer.org/>) open-source technology. To help participants keep track of the time allotted for experiencing the art objects and discussing the prompts, a visual timer was displayed on the screen in the experiment room.

Measures

For the study, qualitative data was utilized from the dyadic interaction phase. Initially, the audio recordings were verbatim transcribed. These transcriptions were then imported into ATLAS.ti (version 24), where they were coded using a coding scheme adapted from Van Dorsten (2015). This adaptation process involved collaborative discussions with a fellow researcher to refine and build upon the original coding scheme. For the complete coding scheme see Table 2.

Table 2

Coding Scheme for Semiotic Strategies

Semiotic Strategy	Description	Examples of Keywords	Examples of Sentences
Perception	Focuses on sensory qualities and immediate impact, eliciting emotional and sensory responses.	Seeing, Smelling, Hearing, Touching, Feeling, Recognizing,	- What a colorful bouquet of flowers. - Isn't that the same painting we saw yesterday?

	Includes references to past perceptions.	Experience, Observe, Notice, Consider	- The middle part of the song sounded very shrill.
Imagination	Involves active manipulation of perceptions, theorizing about past/future, and subjective connection with objects/art. Includes empathy and seeing resemblances.	Design, Fantasize, Play, Pretend, Shape, Would, Make, Create, Construct, Invent, Imagine, If	- When I see that picture I always imagine myself out there, drinking a mojito in the sun. - That chair would look wonderful in my living room.
Conceptual	Merges concrete memories into abstract categories, understanding concepts, ideologies, cultural references, and maker's intentions. Includes abstract feelings like nostalgia. Agreeing to an observation.	Judging, Naming, Classifying, Labeling, Represent, Belonging, Debate, Pronounce, Tell, Symbolize, Relate, Nostalgic	- That is beautiful! - Seems like this song has its roots in classical baroque. - This ring reminds me of what it is to be an Albanian citizen.
Analytical	Involves abstract perception, deconstructing and analyzing formal/structural elements, artistic choices, and overall organization.	Exploring, Comparing, Making connections, Testing, Made	- The spiritual feeling from this part is due to the C-major seventh chord. - The painting's optical illusion works due to repeating structures.
None	Sentences without a clear semiotic strategy or unrelated utterances (e.g., asking opinions about the experiment, rephrasing, or talking about unrelated topics like the weather).	None	- It is warm in here. - Do you know how much time we still have?

Note. Description, examples keywords and sentences for each semiotic strategy.

Once coding was complete, the transcriptions were exported as CSV files. The CSV files were subsequently processed in RStudio (version 4.3.2) to generate time series, capturing the semiotic strategies employed by both participants for each dyad, for every second of their interaction during their conversations.

Based on the time series, the following variables were calculated: the mean (the average time in seconds that each participant used for an utterance of a specific semiotic strategy), the standard deviation (the variability of the mean time), and, to test hypotheses 1a-d, the relative count. This method enabled us to measure participants' preferences for different semiotic strategies, independent of the duration of their utterances. By using relative counts instead of absolute numbers, we accounted for variations in the length of dyadic interaction conversations, facilitating meaningful comparisons between them.

For the visual analysis conducted to test hypotheses 2a-c, the SSG analysis, the coded time series data were utilized (Hollenstein & Lewis, 2006). For the analysis each expression in the dyadic interaction was categorized into discrete states and transitions between states were mapped onto a grid using the GridWare software (version 1.15a). GridWare enables the plotting of utterings from the dyads along two axes (y -and x-axes, both axes representing the semiotic strategies). The resulting grid represents the state-space, where each cell corresponds to a unique combination of two behaviors. This was done for each dyadic interaction conversation. Each circle (or node) represents an event (the expression of one participant, followed by the next utterance of the other participant). The bigger the node on the grid, the longer the expressions took. The lines in between nodes represent the direction of the conversation towards the next event, but do not represent time (Hollenstein & Lewis, 2006).

Data Analysis

To test Hypotheses 1a-d, Spearman's rank-order correlation was used to examine the relationships between relative counts of the different semiotic strategies and participants' age. Spearman's correlation was chosen due to its non-parametric nature, which is suitable for non-normally distributed data (Spearman, 1904). Excel was used to calculate Spearman's rank-order correlation. The results of the correlations were used to determine whether

significant correlations between the use of different semiotic strategies and age of participants existed.

To test Hypotheses 2a-c, the SSG-method was used to conduct a visual analysis of the interaction patterns during the dyadic interaction (Hollenstein & Lewis, 2006). Visual inspection involved examining the density and distribution of states within the grid to identify transitions and attractor states. The SSG-method and their description help to clarify the conversation in terms of dispersion of semiotic strategies used over time. By employing this method, the study aimed to provide a comprehensive view of the dyadic interaction patterns.

Results

The overall results for each semiotic strategy across all participants are as follows. For the perceptual semiotic strategy, the mean score is 8.81 ($SD = 4.26$), with a relative count of 0.19. The imagination strategy has a mean score of 7.28 ($SD = 3.01$) and a relative count of 0.12. The conceptual strategy exhibited a mean score of 13.57 ($SD = 11.87$), with a relative count of 0.56. Finally, the analytical semiotic strategy has a mean score of 9.63 ($SD = 5.07$) and a relative count of 0.12.

Overall, the conceptual strategy had the highest relative count ($count_{rel} = 0.56$), indicating it was the most prevalent semiotic strategy used. The perceptual strategy, with a relative count of 0.19 was somewhat less common, but still second. The imagination and analytical semiotic strategies were least prevalent, with both having relative counts of 0.12. For a detailed overview of the results for all participants see Table 3 and for a stacked bar plot for the relative count of semiotic strategies used per participant, see Figure 3.

Table 3

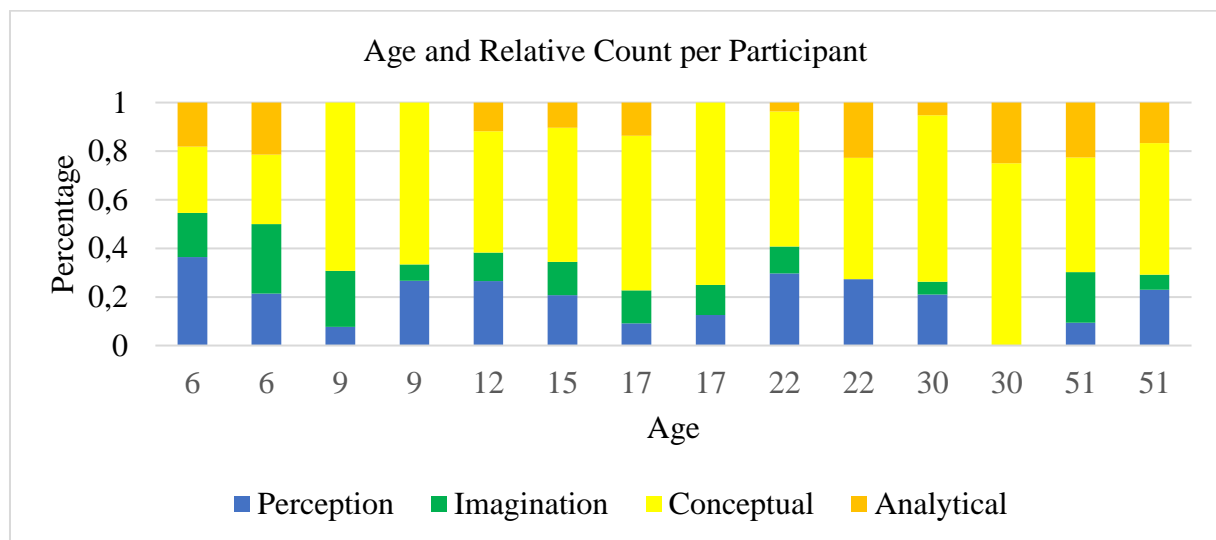
Statistics of Semiotic Strategies Used by Every Participant

Age	Semiotic Strategy											
	Perceptual			Imagination			Conceptual			Analytical		
	Mean	SD.	Rel. Count	Mean	SD.	Rel. Count	Mean	SD.	Rel. Count	Mean	SD.	Rel. Count
6	6	2.16	0.36	8	4.24	0.18	7	3.46	0.27	4	2.83	0.18
6	5.33	4.04	0.21	10.75	9.43	0.29	5.25	4.43	0.29	7.67	3.21	0.21
9	14	0	0.08	6.33	4.73	0.23	9.22	9.35	0.69	0	0	0.00
9	6	1.83	0.27	4	0	0.07	9.7	6.72	0.67	0	0	0.00
12	5.33	3.77	0.26	8.75	5.68	0.12	5.41	3.3	0.50	6.25	1.71	0.12
15	7	6.03	0.21	1.75	0.96	0.14	5.31	5.42	0.55	6.67	6.43	0.10
17	12	4.24	0.09	6.67	4.16	0.14	9.71	8.32	0.64	18	16.09	0.14
17	6.5	0.71	0.13	4.5	2.12	0.13	6.5	6.42	0.75	0	0	0.00
22	12.63	4.78	0.30	13.33	6.43	0.11	20.2	19.27	0.56	7	0	0.04
22	14.83	11.89	0.27	0	0	0.00	25.55	21.07	0.50	18.6	8.93	0.23
30	19.75	11.53	0.21	30	0	0.05	34.69	33.56	0.68	22	0	0.05
30	0	0	0.00	0	0	0.00	32.13	23.23	0.75	19.2	13.66	0.25
51	5.2	3.56	0.09	6.18	3.79	0.21	9.12	9.68	0.47	11.92	8.49	0.23
51	8.82	5.04	0.23	1.67	0.58	0.06	10.23	11.88	0.54	13.5	9.56	0.17
Total	8.81	4.26	0.19	7.28	3.01	0.12	13.57	11.87	0.56	9.63	5.07	0.12

Note. SD = Standard Deviation; Rel. Count = Relative Count.

Figure 3

Age and Relative Count Per Participant



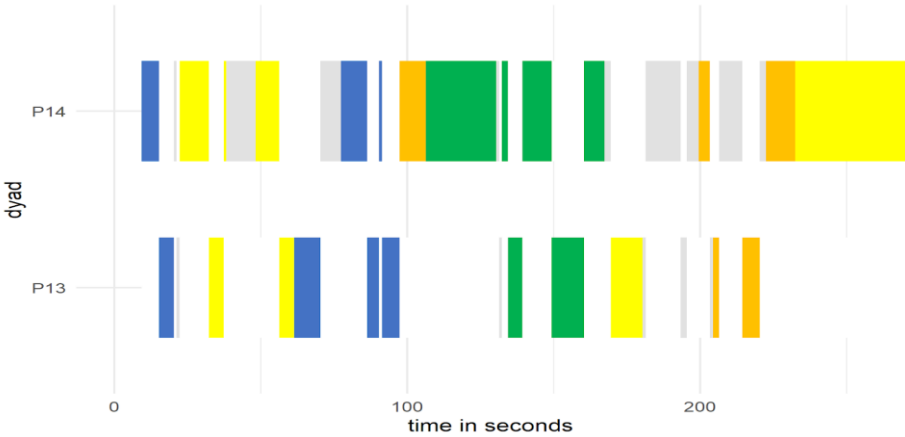
Note. Relative count of semiotic strategy used in the dyadic interaction for each participant.

Timeseries Analysis

Next to the quantitative analysis between semiotic strategy used and age, this study also zoomed in and looked at the dynamics of each dyadic conversation to describe how the developmental change in use of semiotic strategy manifests itself across ages. Inspecting the timeseries, in general, one can conclude that the conversations differ in length of time. With the exception of the dyadic interaction between 51-year old participants, the conversations became longer as the age of the participants increased. When inspecting each conversation specifically, one can see that participants differ in terms of their contributions to the conversations, their length of utterances and semiotic strategies used. For instance, participant: P14 (age of 6) talked more during their conversation than her partner and P20 did not express any utterances that were coded by imagination or perceptual semiotic strategy. Furthermore, children (conversations at age 6 and 9) expressions were more often coded as “none” (describing off-topic utterances) compared to older participants. Figures 4a-g, show timeseries for each coded dyadic conversation.

Figure 4a

Coded Time Series for Participants at the Age of 6



Note. Each color represents a code. Grey is coded as “none” and the four different colors represent the different semiotic strategies (blue = perception. green = imagination. yellow = conceptual. orange = analytical)

Figure 4b

Coded Time Series for Participants at the Age of 9

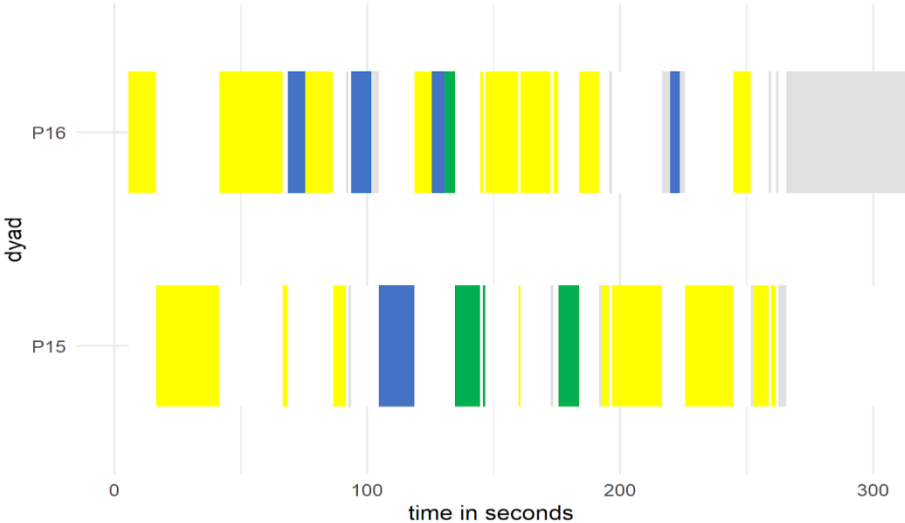
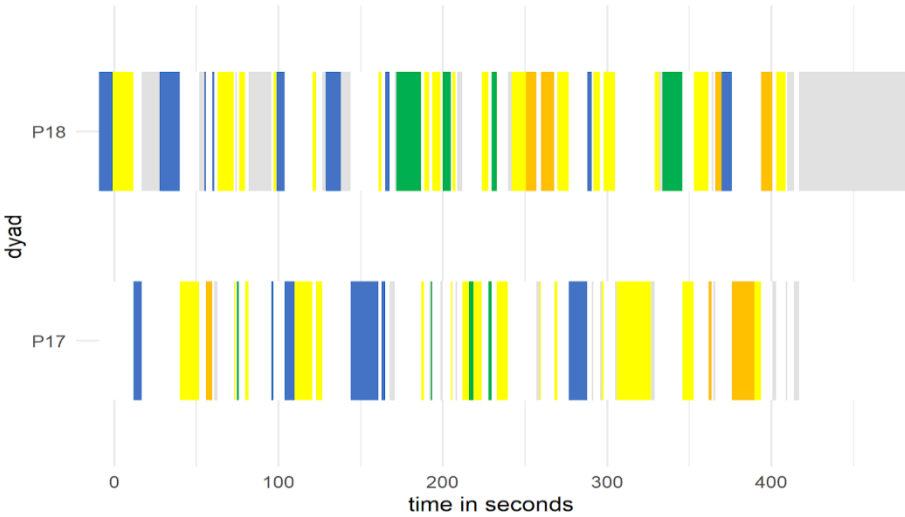


Figure 4c

Coded Time Series for Participants at the Age of 12 and 15



Note. Participant P18 is 12 years old, and Participant 17 is 15 years old.

Figure 4d

Coded Time Series for Participants at the Age of 17

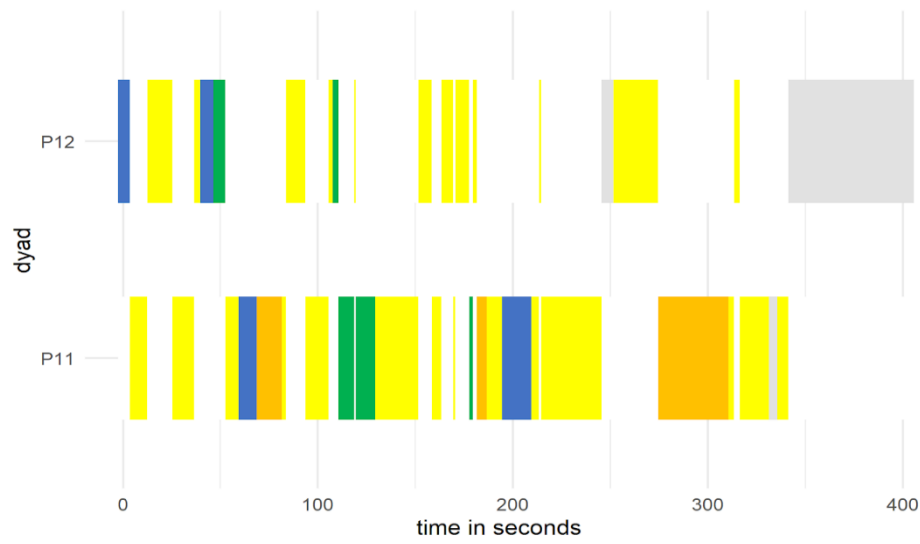


Figure 4e

Coded Time Series for Participants at the Age of 22

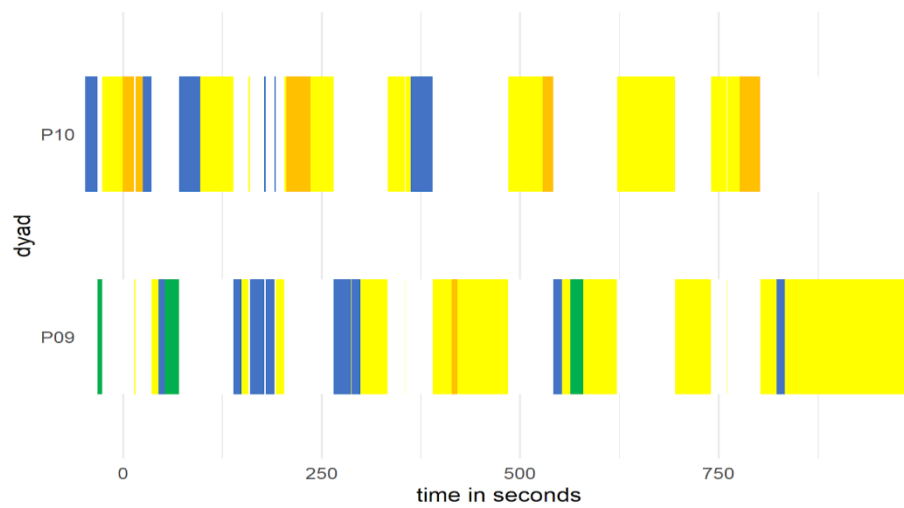
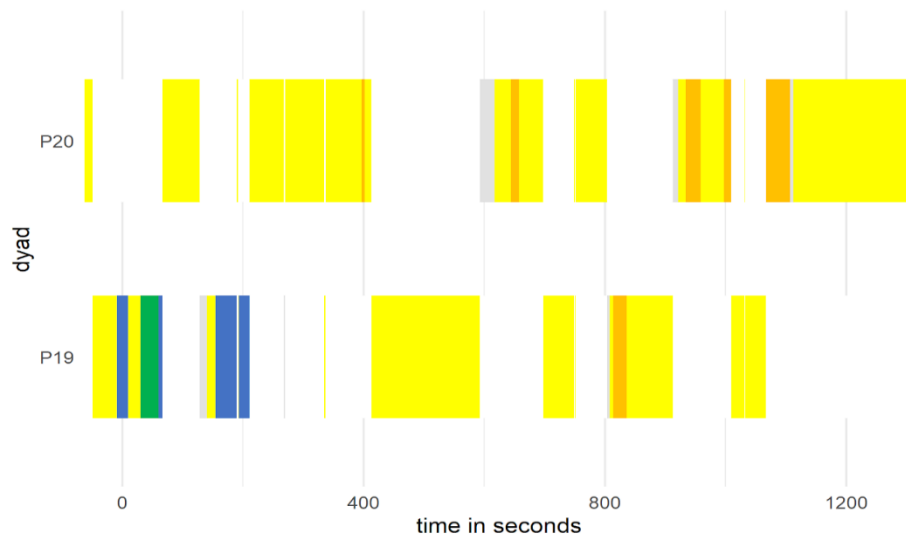
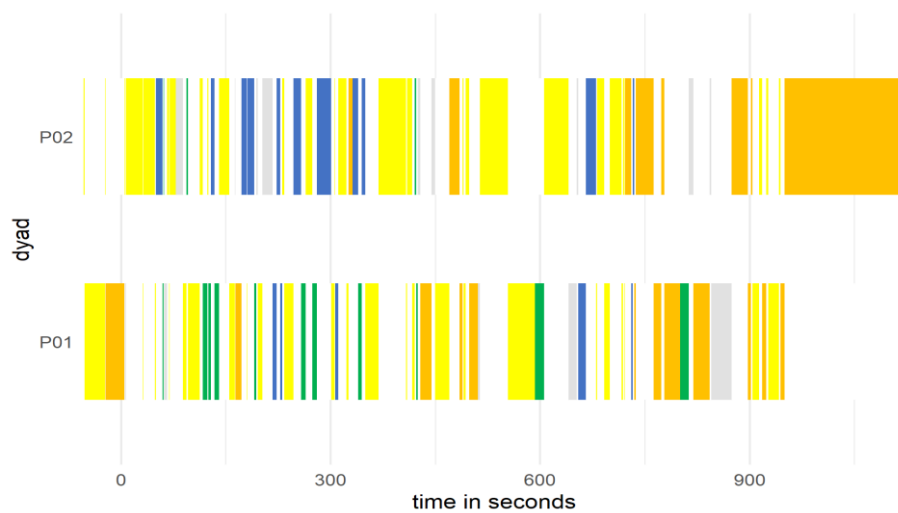


Figure 4f*Coded Time Series for Participants at the Age of 30***Figure 4g***Coded Time Series for Participants at the Age of 51***Spearman's rank Correlation Hypotheses**

To test hypotheses 1a-d, Spearman's rank correlations were computed to examine the effect of age and development on semiotic strategies used in dyadic conversations. For hypothesis 1a (Perceptual), the Spearman's rank correlation coefficient (ρ) between

participants' relative use of the perceptual semiotic strategy and age was found to be -0.26, albeit it is not statistically significant ($N = 14$, $T(12) = 0.92$, $p = 0.38$). For hypothesis 1b (Imaginative), results showed a significant negative correlation between participants' relative use of imagination and age ($\rho = -0.56$, $N = 14$, $T(12) = 2.32$, $p = 0.04$). For hypothesis 1c (Conceptual), the Spearman's rank correlation between age and the conceptual semiotic strategy was a non-significant weak positive correlation ($\rho = 0.22$, $N = 14$, $T(12) = 0.76$, $p = 0.45$). For hypothesis 1d (Analytical), participants' use of the analytical semiotic strategy showed a non-significant moderate positive correlation with age ($\rho = 0.30$, $N = 14$, $T(12) = 1.09$, $p = 0.30$). These results suggest varying degrees of correlation between participants' use of semiotic strategies (perceptual, imaginative, conceptual, and analytical) and age. While imagination demonstrated a significant negative correlation (confirming hypothesis 1c), the relationships between perceptual, conceptual, and analytical semiotic strategies and age were not statistically significant.

As a post hoc analysis, Spearman's rank correlation was computed to examine the directions concerning semiotic strategies together. To this end, the relative counts of perceptual and imaginative strategies were combined to create one variable, and the same was done for the conceptual and analytical strategies. The results are as follows: For the combined Perceptual and Imaginative strategies, Spearman's rank correlation (ρ) between these two semiotic strategies and age was found to be statistically significant: $\rho = -0.62$, $N = 14$, $T(12) = 2.75$, $p = 0.02$. For the combined Conceptual and Analytical strategies, Spearman's rank correlation (ρ) between these strategies and age was also significant but in the opposite direction: $\rho = 0.62$, $N = 14$, $T(12) = 2.75$, $p = 0.02$.

These results indicate a significant negative correlation between the rank of the relative count of perceptual and imaginative semiotic strategies used in dyadic conversations and the rank of the age of the participants. Additionally, a significant positive relationship was

found between the rank of the relative count of conceptual and analytical semiotic strategies used in dyadic conversations and the rank of the age of participants.

State-Space Grid Analysis and Hypotheses

To test hypothesis 2a-c. The coded dyadic conversation timeseries were loaded into state-space grids (figure 5a-g). Each state-space grid represents one conversation. The x -and y -axes represent the semiotic strategy used by each participant.

Figure 5a

State-Space Grid for Participants at the Age of 6

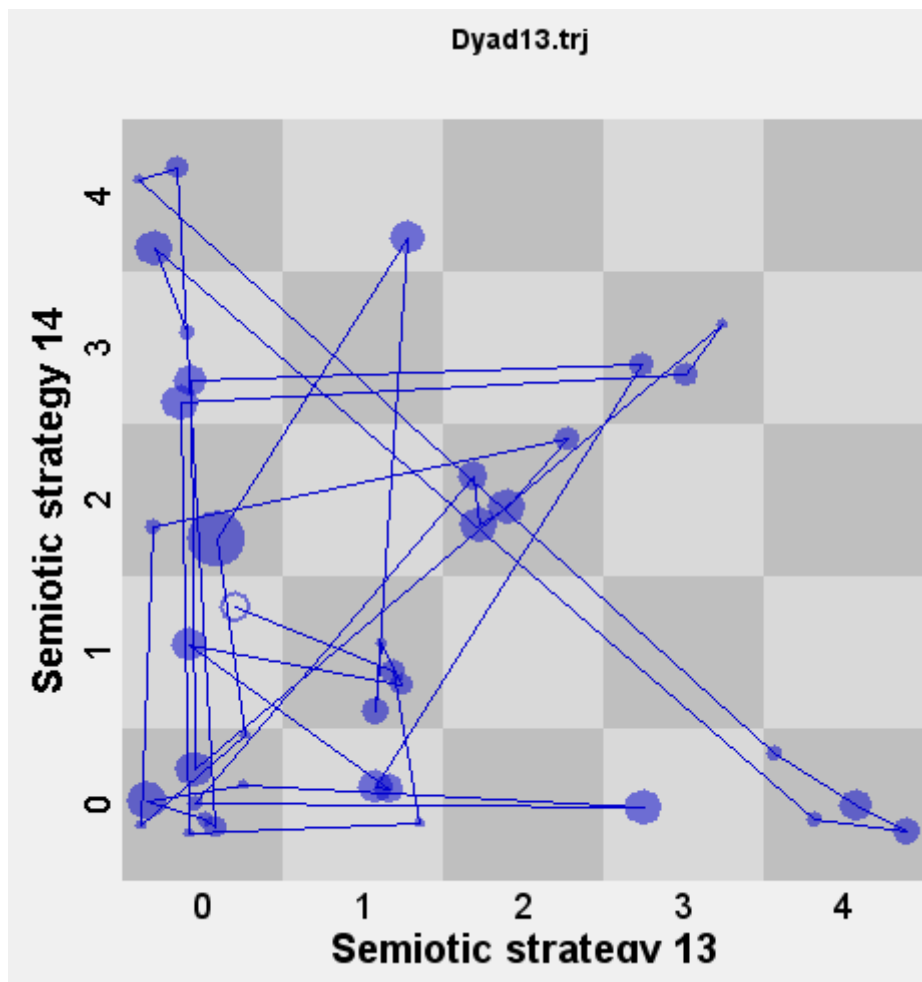
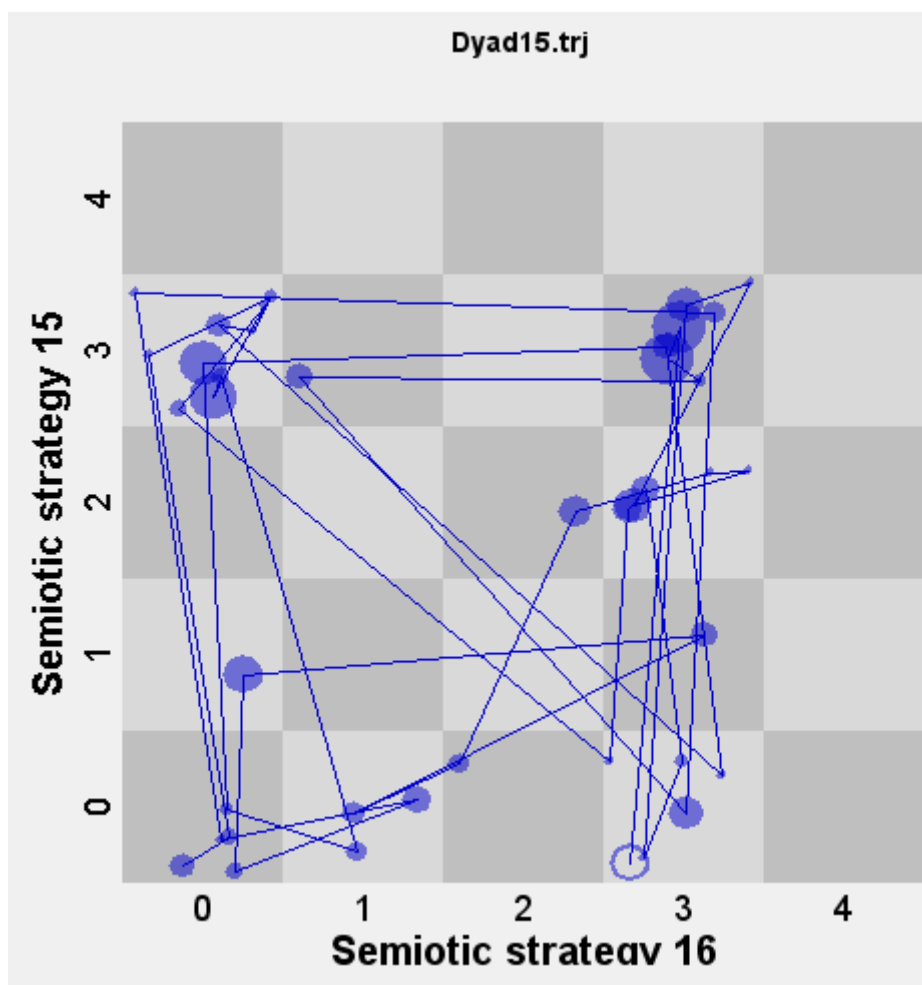


Figure 3a shows the results for participants at the age of 6 on a state-space grid. The results indicate that most interactions between the participants were taking place around the 0.

1 and 2 points (none, perceptual and imaginative respectively) on the x -and y-axis. with some minor dispersions into the 3 and 4 areas (conceptual and analytical). Strongest attractors are the 0-0, 1-1 and 2-2 state-spaces. Especially 0-0 is a strong attractor, indicating that the children, after shortly talking about the objects they brought, like to talk about other things in between.

Figure 5b

State-Space Grid for participants at the Age of 9

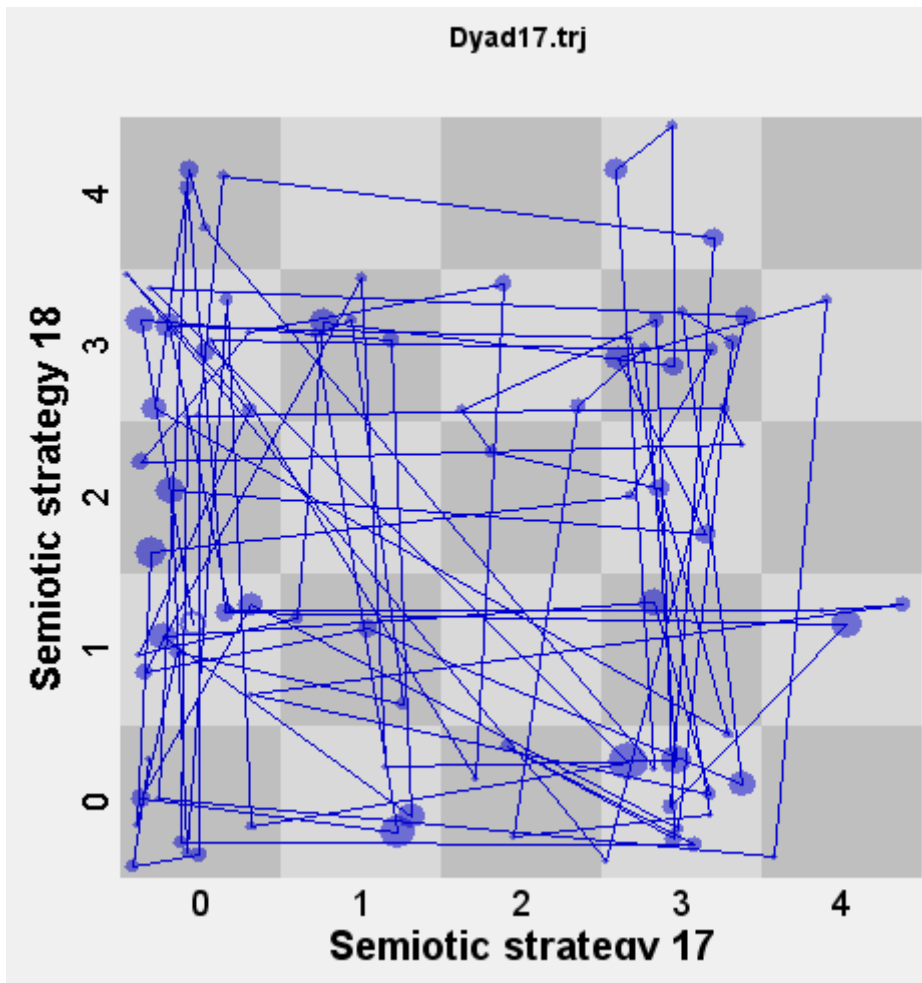


In figure 3b we can see a very clear attractor states at 3-3 and 0-3. Especially participant 15 (y-axis) hardly visited anything else than the conceptual area. For both

participants we can see that minor dispersion from the 3-3 and 3-0 region were made, before returning to the attractor state.

Figure 3c

State-Space Grid for participants at the Age of 12 and 15



Note. Participant 18 is aged 12 (y- axe), and participant 17 is aged 15 (y-axis)

When looking at the results displayed in figure 3c one can see no attractor state. There is dispersion across all of the areas except for the 4 (analytical) areas within the coded conversation. Nodes are evenly distributed in length, and the conversation moves over the whole of the grid, almost at random, with no clear return point or attractor.

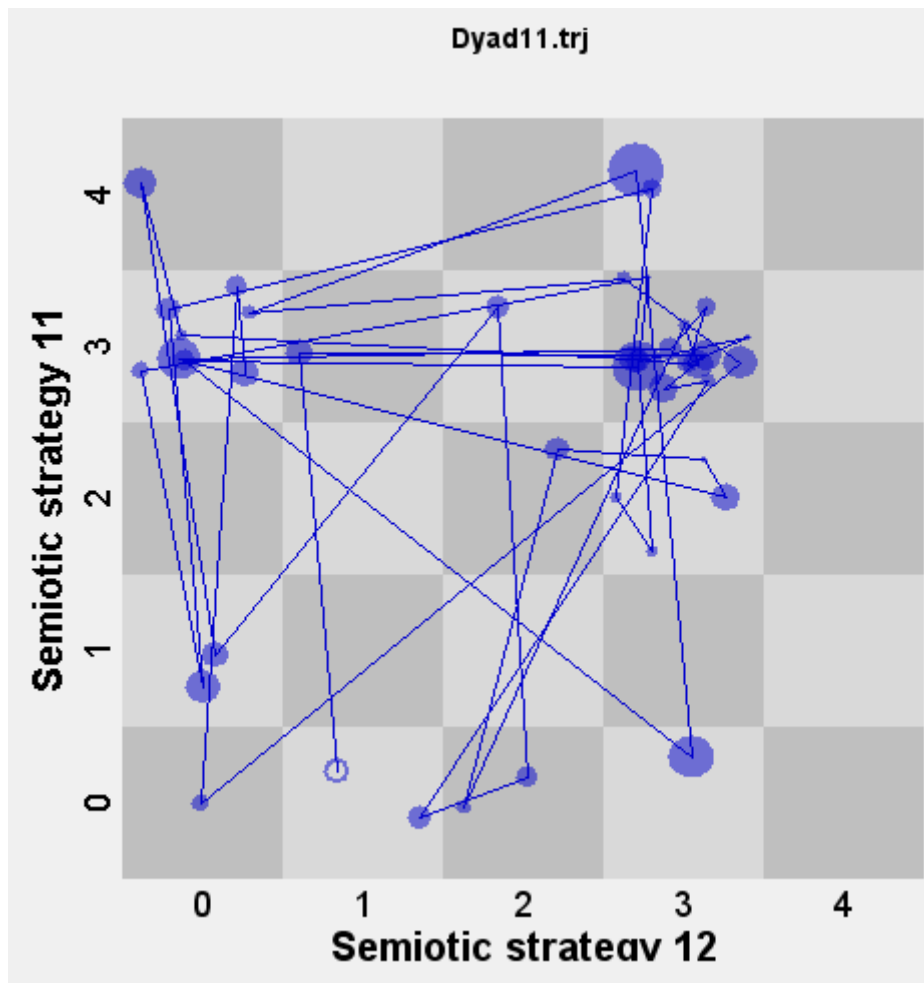
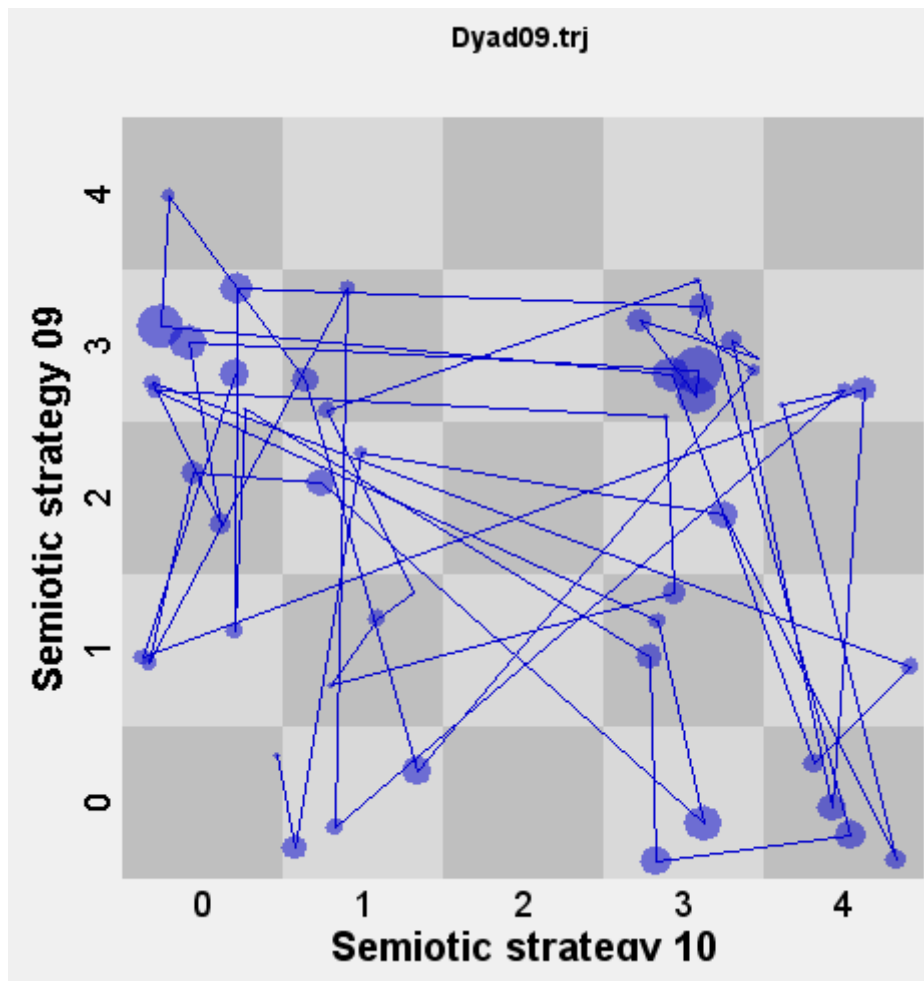
Figure 5d*State-Space Grid for Participants at the Age of 17*

Figure 5d shows the interaction between two teenagers at the age of 17. One can see a clear attractor state at 3-3 and 3-0 with some very minor dispersions, before returning towards the attractors. Only participant 11 makes utterances that were coded belonging to the analytical semiotic strategy.

Figure 5e*State-Space Grid for Participants at the Age of 22*

The results at age 22 show an attractor state at 3-3 and a slightly lesser attractor at 3-0. Overall there is quite a lot of dispersion with most cells being visited and the conversation moving all over the grid before returning towards an attractor. Especially participant 10 traversed into the 4 areas of the analytical strategy.

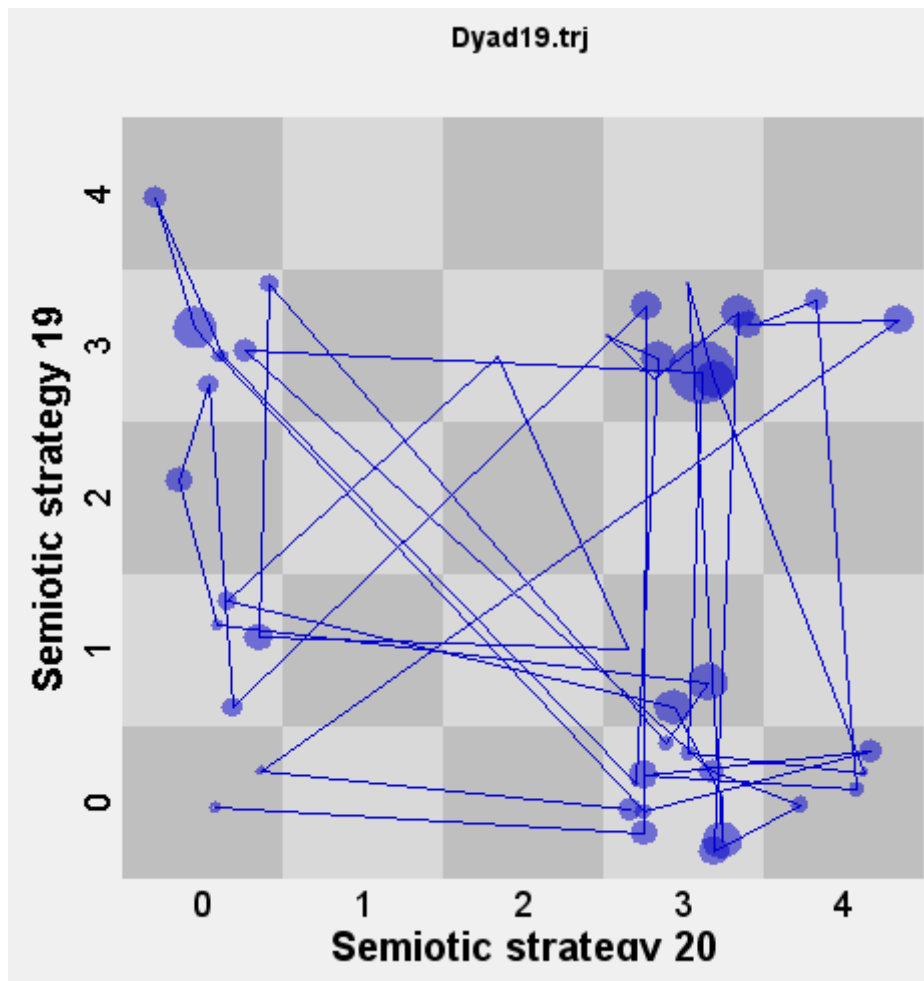
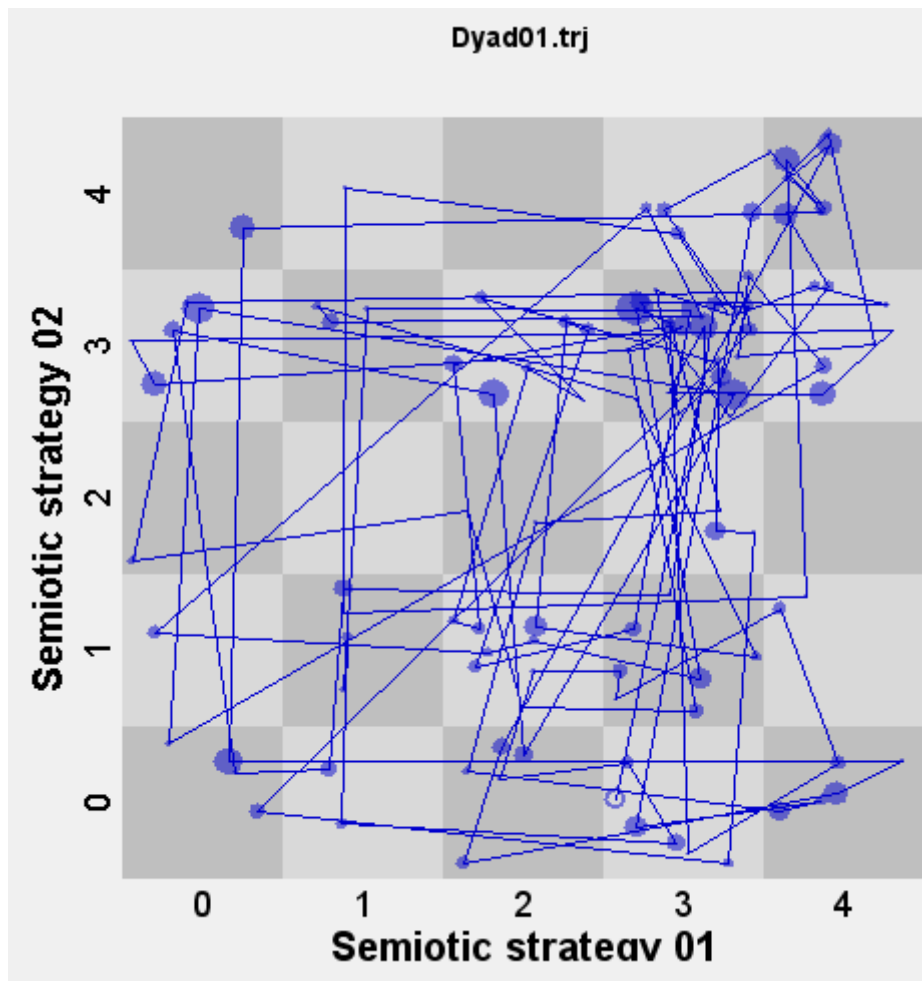
Figure 5f*State-Space Grid for Participants at the Age of 30*

Figure 3f. clearly show a strong emphasis by both participants to stay around the area of 3. With the strongest attractors at 0-3, 3-3 and 3-0. The conversation only shows minor dispersions before returning towards the attractors. Specifically, participant 20 contributed some analytical utterances to the conversation.

Figure 3g*State-Space Grid for Participants at the Age of 51*

The results of the conversation between this dyad show an attractor state at 3-3. The conversation made many dispersions before either returning towards the 3 area (mostly 3-3 state-space) or towards the 4-4 state-space. Out of all the included conversations, this is the only conversation in which both participants engaged in analytic strategies for a longer period of time.

Hypothesis 2a posited that the state-space grids for children would demonstrate attractor states in the 1 and 2 areas of the state-space grid, indicative of a tendency toward perceptual and imagination semiotic strategies, with low dispersion into other state-space

areas. The data partially supports this hypothesis. Figure 5a presents the state-space grid for a dyad of six-year-old children, illustrating a prominent tendency to remain within the 1 and 2 areas, thus supporting Hypothesis 2a. However, Figure 5b does not confirm this hypothesis, as the children in this dyad did not show a strong tendency toward the 1 and 2 areas, indicating a more dispersed pattern across the state-space grid. Overall, the evidence for Hypothesis 2a is mixed. One dyad supports the hypothesis with clear attractor states in the 1 and 2 areas, while another dyad does not exhibit this pattern.

Hypothesis 2b suggested that the state-space grids for teenagers would not display clear attractor states on the state-space grid and would show high dispersion across state-space areas. The results provide partial support for this hypothesis. Figure 5c clearly supports Hypothesis 2b, demonstrating that the teenagers' conversation lacks a clear attractor state and exhibits high dispersion across the grid. Conversely, Figure 5d contradicts this hypothesis, showing clear attractor states in the conversation. Thus, the results for Hypothesis 2b are inconclusive. One dyad aligns with the expectation of high dispersion and no clear attractor states, while another dyad does not.

Hypothesis 2c predicted that the state-space grids for adults would exhibit attractor states in the 3 and 4 areas of the state-space grid, reflecting a tendency towards conceptual and analytical semiotic strategies, with low dispersion into other state-space areas. The results mostly support this hypothesis. Figures 5e and 5f each demonstrate that adult dyads show clear attractor states in the 3 and 4 areas of the state-space grid, with minimal dispersion into other areas. Figure 5g, however, only partly supports Hypothesis 2c. Although there are attractor states in the 3 and 4 areas, there is also a higher amount of dispersion into other areas compared to the other adult dyads.

When considering all seven state-space grids, the results provide partial evidence for Hypotheses 2a and 2b. Specifically, one child dyad supports Hypothesis 2a while another

does not, and one teenage dyad supports Hypothesis 2b while another does not. In contrast, the evidence for Hypothesis 2c is mostly consistent, with two adult dyads showing attractor states in the 3 and 4 areas of the state-space grid and minimal dispersion, while one adult dyad shows attractor states but with a higher level of dispersion.

Discussion

This paper set out to investigate how the meaning-making process of artworks differ for participants in different developmental phases, as well as how they communicate the interpreted meaning of an artwork to their peers. To address this, the study focused on the semiotic strategies employed by participants across development phases in their dyadic conversations. These semiotic strategies (adopted from van Heusden, 2015) - perception, imagination, conceptualization and analysis - build upon each other in terms of complexity. It was hypothesized that, due to the increasing complexity, young participants would employ more concrete semiotic strategies; perception and imagination, while older participants would prefer more abstract strategies being conceptual and analytical semiotic strategies to communicate the meaning of artworks to their peers.

The study revealed mixed results for the correlations between age and semiotic strategies. While there was a significant negative correlation between age and the imaginative strategy, the relationship between perceptual, conceptual and analytical semiotic strategies and age were not statistically significant. However, a post hoc analysis utilizing a Spearman's rank correlation with both the concrete semiotic strategies (perception and imagination) and abstract semiotic strategies (conceptualization and analysis) together as one variable showed a significant negative correlation between the first variable with age, and a positive correlation between the latter and age.

Additionally, the visual analyses of State-Space Grids (SSGs) of the coded conversations provided more nuanced insights. While the presence of clear attractor states around perceptual and imaginative strategies was inconsistent for children, teenagers showed mixed patterns. One of the conversations showed high dispersion (as hypothesized) and the other conversation revealed clear attractor states contrary to the hypothesis. Adult dyads generally demonstrated more consistent attractor states in areas associated with conceptual and analytical strategies, reflecting the hypothesized preference for more abstract and complex semiotic strategies. Thus, on the basis of the visual analyses, this study found some evidence for a developmental shift in preference from perception and imagination towards conceptual and analytical semiotic strategies. Furthermore, one of two SSG analyses for teenage participants revealed the hypothesized high dispersion and low preference for any given strategy, giving tentative evidence for the notion of a transition phase for semiotic complexity during the teenage years (Granett, 2009).

Taking both the correlational and visual analyses together, the results indicated that as individuals age, their use of semiotic strategies in communicating the meaning of artworks seem to shift from perceptual and imaginative to more conceptual and analytical approaches. Furthermore, the results showed some evidence that the developmental process from perceptual and imaginative towards conceptual and analytical strategies is not linear. The process seems to rather reflect Smith & Thelen's (2003) dynamic process, where different factors such as cultural knowledge and experience interact in order for behavior to emerge. In line with Granett's (2009) arguments, development involves navigating through various phases, where each transition represents a reorganization of cognitive structures. Yet, these findings were not straightforward. While some of the data are in line with the hypotheses, other observations do not support the hypotheses.

An interesting observation is that in all the coded conversations together the conceptual semiotic strategy is by far the most prominent one, accounting for more than half of all coded expressions. It seems to be the preferred semiotic strategy for all participants in the sample except for the two participating children of 6 years old (See table 3 and figure 3). The prominence of the conceptual strategy found in the sample could have confounded the Pearson correlation hypotheses as well as creating attractor states in most of the SSGs. The strong preference towards the conceptual semiotic strategy may partly be explained by task constraints. Since the study focused on dyadic conversations, the task for participants was to talk about their experiences regarding the art objects. According to the literature on semiotic strategies, the conceptual strategy is closely linked to the use of language to form abstract ideas (van Dorsten, 2015; van Heusden, 2015). Following this logic, participants may transform more concrete experiences partly into abstract concepts in order to share them with their conversation partner, leading to the high usage of conceptual expressions.

Implications

The findings offer several interesting implications for the field of art experience and education, enriching our understanding of the meaning-making process and providing practical applications for educators and art professionals. The innovative study design demonstrates a novel approach to exploring art experiences, emphasizing not only the interpersonal aspects but also the influence of the social environment. This approach aligns with the multifaceted and complex nature of art experience as described by Pelowski et al. (2016), adding to the body of knowledge about how individuals interact with and derive meaning from art. Additionally, the study demonstrates the usefulness of qualitative data to investigate art experiences, the meaning-making process and development trajectories. This methodological approach provides rich, nuanced insights that cannot be derived by quantitative measures only, broadening the scope of research in this area.

The study also contributes to the theoretical framework of meaning-making with art, validating van Heusden's (2015) semiotic strategies. The results provide evidence that these strategies are distinct from one another in both use and complexity, underscoring their relevance in describing the cognitive processes involved in the meaning-making with art. This underscores the value of semiotic strategies in analyzing art experiences.

Furthermore, the results highlight the significant role of individual development and social interaction in shaping meaning-making abilities. This emphasizes the dynamic interplay between personal growth and environmental factors, suggesting that development through interactions with the environment and others can enhance individuals' capacity to derive meaning from art. The study offers partial evidence for a transition phase during the teenage years concerning meaning-making abilities. This insight can be valuable for educators, who can leverage this understanding to foster learning. By implementing meaningful interactions, teachers can use Vygotsy's (1978) Zone of Proximal Development and Granott's (2009) concepts to support and enhance their students' conceptual development. Moreover, the application of semiotic strategies in educational settings can enrich students' experiences and insights, thereby improving their meaning-making abilities. By implementing these strategies into arts education, teachers can facilitate deeper engagement and comprehension and enhance the quality of arts education.

Museums and other institutions offering art experiences can also benefit from these findings. By integrating the semiotic strategy framework into their programming, they can create prompts and activities that enhance visitors' engagement and understanding of art, leading to enriching and impactful art experiences. Finally, knowledge about the development of meaning-making skills can inspire artists to explore new creative avenues. Understanding how audiences of different ages and development phases interpret art can help artists create works that fit their audiences more precisely.

In summary, this study not only advances the theoretical understanding of art experiences, development and meaning-making but also provides practical applications for educators and art professionals. By employing these insights, this study adds to the way in which art is experienced, researched, educated and created.

Strengths, Limitations and Future Directions

While the innovative study design was a strength, providing a realistic environment for art experiences in a social context, it also introduced several limitations that should be acknowledged. The open design, which allowed for a partly naturalistic setting, introduced variability that could affect the study's outcomes. By giving participants their own choice of artwork, the study did not standardize the medium. This may have led to potential biases based on the type of artwork selected as different types of artworks may evoke different responses, potentially influencing the semiotic strategies employed by participants.

The focus on qualitative data allowed for an in-depth examination of each dyadic conversation, offering rich insights into the meaning-making process. However, this approach limited the sample size, making it challenging to compare groups of participants across different developmental phases. The small sample size also restricts generalizability of the findings and suggests the need for further research with larger, more diverse developmental groups to validate the study results.

Additionally, using conversations as a vehicle for the meaning-making process may have overemphasized the use of conceptualization as primary semiotic strategy. While this provided valuable information about the participants' thoughts during conversations, it may not fully represent their overall preferences for semiotic strategies. Adding more varied data collection methods, such as movement observation or coding of drawings, may have led to a more balanced view of the semiotic strategies employed by participants. Furthermore, to

facilitate the conversations, participants were given prompts directed at all four semiotic strategies. However, it is unclear whether these strategy-specific prompts were understood in this way, and utilized by the participants. This uncertainty could have affected the consistency of the conversations, potentially biasing the preference for particular semiotic strategies.

The study's focus on dyadic interactions incorporated the social aspect during the meaning-making process. However, this choice may also interfere with individual preferences that might emerge in solitary art experiences. For instance, participants may have steered each other to the employment of semiotic strategies against personal preferences. Therefore, future research could explore how individuals engage with art alone to provide a more comprehensive understanding of the meaning-making process.

Finally, while this study offers numerous interesting implications and insights, future research may refine the developmental aspects of this study. Focusing on specific sequences and transitions, and investigating other variables such as behavior that may provide more fine-grained insights into the development of meaning-making abilities. Additionally, this study investigated preferences for semiotic strategies in general, but did not differentiate between complexity within these expressions. It is possible that while children can utter meaningful perceptual sentences just as competent as adults, they lack complexity in their insights and expressions when engaging in conceptual and analytical talk.

Conclusion

This paper set out to investigate how the meaning-making process of artworks differs across different developmental phases as well as how they communicate the interpreted meaning of an artwork to their peers. Focusing on van Heusden's (2015) semiotic strategies - perception, imagination, conceptualization and analysis - the results support a developmental shift from concrete to more abstract and complex strategies, though not uniformly. While the

use of the imaginative strategy decreased with age, the other strategies did not show a general trend with age. Visual analyses of State-Space Grids showed that adults consistently used conceptual and analytical strategies in their conversations with each other, whereas children and teenagers showed mixed patterns. The findings suggest that development is a non-linear process which is influenced by cultural knowledge and experience. This highlights the need for further research with larger, more diverse samples and a multi-method approach.

References

- Denissen, J. J. A., Geenen, R., Van Aken, M. A. G., Gosling, S. D., & Potter, J. (2008). Development and Validation of a Dutch Translation of the Big Five Inventory (BFI). *Journal of Personality Assessment*, 90(2), 152–157. <https://doi.org/10.1080/00223890701845229>
- Dewey, J. (1934). *Art as experience*. New York: Minton, Balch & Company
- Dutton, D. (2009). *The art instinct: Beauty, pleasure, & human evolution*. Oxford University Press, USA.
- Granott, N. (2009). Sequences, transitions, and the zone of conceptual development in learning and development. In S. Vosniadou, D. Kayser, & A. Protopapas (Eds.), *Proceedings of the 2nd European Cognitive Science Conference 2009* (pp. 63-68). Routledge.
- Heusden, B. V. (2009). Semiotic cognition and the logic of culture. *Distributed Language*, 17(3), 611-627. <https://doi.org/10.1075/pc.17.3.07van>
- Heusden, B. V., & Gielen, P. (2015). Towards a New Framework for Arts Education. In *Arts education beyond art: Teaching art in times of change* (pp. 153-166).
- Hollenstein, T., & Lewis, M. D. (2006). A state space analysis of emotion and flexibility in parent-child interactions. *Emotion*, 6(4), 656–662. <https://doi.org/10.1037/1528-3542.6.4.656>
- Jorna, R. J., & van Heusden, B. (2003). Why representation(s) will not go away: Crisis of concept or crisis of theory? *Semiotica*, 2003(143), 113-134. <https://doi.org/10.1515/semi.2003.018>

Leder, H., Belke, B., Oeberst, A., & Augustin, D. (2004). A model of aesthetic appreciation and aesthetic judgments. *British Journal of Psychology*, 95, 489–508.

Leder, H., & Nadal, M. (2014). Ten years of a model of aesthetic appreciation and aesthetic judgments : The aesthetic episode - Developments and challenges in empirical aesthetics. *British Journal of Psychology*, 105(4), 443-464.

<https://doi.org/10.1111/bjop.12084>

Pelowski, M. (2016). Stages of aesthetic processing and aesthetic model: The psychology of art perception and the theory of aesthetic processing. *Psychology of Aesthetics, Creativity, and the Arts*, 10(1), 75-90. <https://doi.org/10.1037/aca0000044>

Pelowski, M., Leder, H., & Tinio, P. P. L. (2016). Visualizing the impact of art: An update and comparison of current psychological models of art experience. *Journal of Cognitive Neuroscience*, 28(11), 1580-1602. https://doi.org/10.1162/jocn_a_00956

Reinelt, J. (2013). Zeitgeist. *Contemporary Theatre Review*, 23(1), 90–92.

<https://doi.org/10.1080/10486801.2013.765132>

Sacharin, V., Schlegel, K., & Scherer, K. R. (2012). Geneva Emotion Wheel rating study (Report). Geneva, Switzerland: University of Geneva, Swiss Center for Affective Sciences.

Schino, G., van Klaveren, L.-M., Gallegos González, H., & Cox, R. (2021). Applying bodily sensation maps to art-elicited emotions: An explorative study. *Psychology of Aesthetics, Creativity, and the Arts*. <https://doi.org/10.1037/aca0000444>

Smith, L. B., & Thelen, E. (2003). Development as a dynamic system. *Trends in Cognitive Sciences*, 7(8), 343-348.

- Spearman, C. (1904). The proof and measurement of association between two things. *The American Journal of Psychology*, 15(1), 72-101. <https://doi.org/10.2307/1412159>
- Thelen, E., & Smith, L. B. (1994). *A dynamic systems approach to the development of cognition and action*. MIT Press.
- Thelen, E., & Smith, L. B. (1998). Dynamic systems theories. In W. Damon (Series Ed.) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 563-634). John Wiley & Sons.
- Tibubos, A. N., Otten, D., Beutel, M. E., & Brähler, E. (2022). Validation of the personal attributes questionnaire-8: Gender expression and mental distress in the German population in 2006 and 2018. *International Journal of Public Health*, 67. <https://doi.org/10.3389/ijph.2022.1604510>
- van Klaveren, L.-M., van Dorsten, T., & van Heusden, B. (2023). Mapping Pupils' Cultural Consciousness: Design and Evaluation of a Theory-Based Survey. In E. Schurig, & A. Lehmann-Wermser (Eds.), *Aspects of multiculturalism in arts education: Proceedings German-Dutch Colloquium on Research in Arts Education* (Forschungsbericht ed., Vol. 33, pp. 78-89).
- Vygotsky, L. S. (1978). *Mind in Society: Development of Higher Psychological Processes* (M. Cole, V. Jolm-Steiner, S. Scribner, & E. Souberman, Eds.). Harvard University Press. <https://doi.org/10.2307/j.ctvjf9vz4>

Appendix A

Instructions

Instructions for the selection of the art object to be brought by the adult participants were the following:

“Bring an artwork that is important to you. It can be anything. Think of paintings, sculptures, photographs, a song, poetry, videos or pictures you encountered online, a scene from a movie, a memento from your life, a music track you composed, a drawing you sketched, a picture you took, a video of your performance, etc. You can use our referral guide (see worksheet attached) to help you understand the reasons behind your choice. If you use it, please bring it to the lab and hand it to the researchers. Please, try to choose something your project buddy does not know about and do not discuss your choice with your buddy. Do not bring anything that you think your buddy could find upsetting.”

The referral guide mentioned gave the following information:

This guide is to help you choose an artwork important to you. It can be anything.

Think of paintings, sculptures, photographs, a song, poetry, videos or pictures you encountered online, a scene from a movie, a memento from your life, a music track you composed, a drawing you sketched, a picture you took, a video of your performance, etc.

Think of the reasons behind your choice. Is it your liking? If so, what do you like about it? Is it something you feel connected to? Why? If you do use this guide, bring it to the lab and hand it to the researchers.

Please, do not discuss your choice with the project buddy and try to bring something the buddy does not know about. Please, do not bring anything that you think your buddy could find upsetting.

Please look at the artwork that you chose. What do you think or feel about it? Why is it important to you? You use the box below to write, draw or paint anything that helps you express your thoughts, ideas or feelings.

This information was adapted for each age group. For example, Figure 1 illustrates snippets of the Information Form provided to the children.

Figure 1

Information Form for participants under age 11.

We ask you to find a friend that wants to do this project with you. You both do these activities:

1. FIND A OBJECT DEAR TO YOU

You both find a **object that you think is very important to you**. Keep it a secret from your friend before the next task.
TIP: A grown-up can help you!

2. MEET WITH YOUR FRIEND

You and your friend will meet at a special place. You will bring your dear objects and **answer some questions and talk** about these objects.
 We would like to record these activities.

3. BE CREATIVE

If you want, you can tell us in other ways about your thoughts and feelings (by **drawing** or **writing** for example).

All the questions we ask will be safe and secure with us.

Please look at your dear object.
What do you think or feel about it? Why is it important to you?
 Use this page to write, draw or paint anything that helps you express your **thoughts, ideas** or **feelings**.

Appendix B

Experiment Room Set-Up

