Wild colors, gentle lines?

Engaging with color and line in an interactive children's environment

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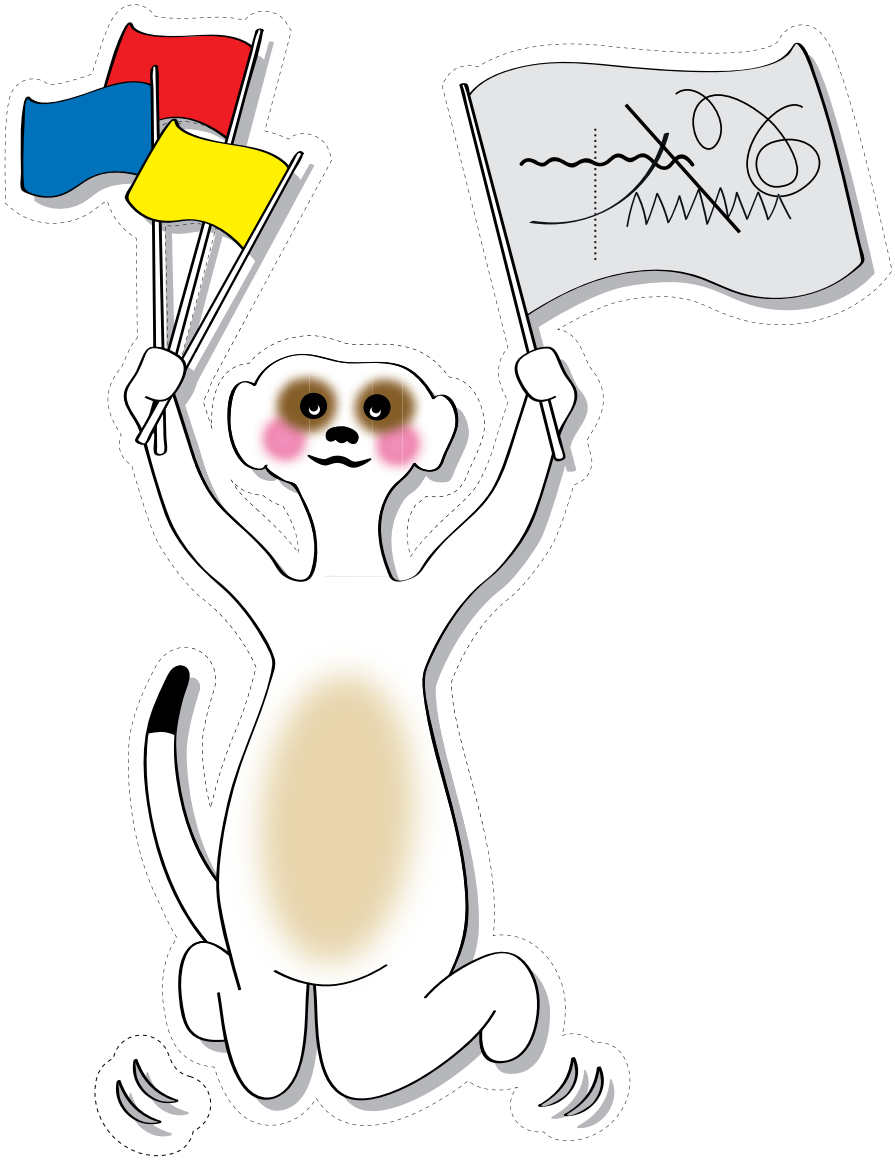
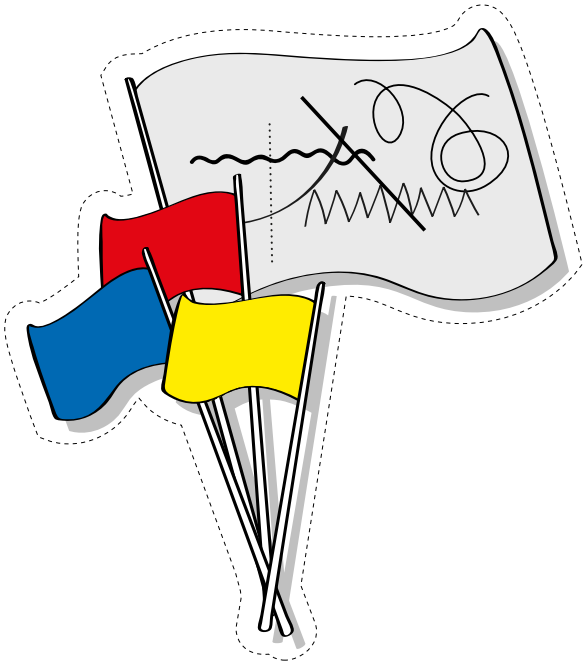


Content



Project Report

Hanna Brinkmann

1. Introduction

This report[1] presents the results of the transfer project "Wild colors, gentle lines? Engaging with color and line in an interactive children's environment".[2] The aim of this project was to disseminate the knowledge acquired in a previous research project to a very specific audience: children. We focused on science communication outside the university to encourage enthusiasm for arts and sciences. Thereby, we concentrated on the very basic elements of art: lines and colors. Together with our cooperation collaborate the children's museum ZOOM in Vienna, Austria, we transferred our acquired knowledge in a selected and explanatory manner, enriched with a strong, playful aspect to create thought-provoking impulses – not only for children but also for their parents or accompanying adults.

The initial research project "Universal Aesthetics of Lines and Colors? Effects of Culture, Expertise, and Habituation"[3] was an interdisciplinary cooperation between art history and psychology. Over three years, we conducted theoretical and empirical research to answer the question: to what extent are aesthetic effects of lines and colors universal? From the 18th century on, the specific qualities of lines and colors became a major topic of art literature (Rosenberg 2007). With the establishment of psychological laboratories in the mid-19th century, aesthetic phenomena also became subject to experimental research (Fechner 1876). A great number of art historians and psychologists assumed that lines and colors have inherent, specific aesthetic effects that are universally valid (e.g. Takahashi 1995). There is, however, empirical support for cultural variation in the cognitive processing of color in the domain of semantic categorization (Berlin and Paul 1969), linguistic relativity (Brown and Lenneberg 1954), and preference (Saito 1996). During the analysis of historical theories about lines and colors, it became clear that a major way to describe aesthetic effects as well as measuring them is by using bipolar adjectives such as "warm-cold" (Brinkmann et al. 2018). E.g., red is said to be a warm and blue a cold color – something we find in daily life, like on water taps, where color is used as a universal language. However, while we found in our experiments that color brightness is universally associated with positivity (Specker et al. 2018), we could not find universal effects when it comes to abstract art (e.g. Wassily Kandinsky). Our participants were either psychology or art history students of the University of Vienna and – for a cross-cultural comparison – students in Tokyo. However, all viewers have been adults.

The transfer project allowed us to get a feeling if children react differently since all our hypotheses have only been tested with adults so far. It took place in a number of different concurrent ways: 1. verbal and visual communication within the framework of an installation of research stations in the museum's entrance area; 2. participation through rating and coloring; and 3. active engagement in workshops through a deeper explanation of the topic and the creation of animated films in a digital format. Children's awareness about lines and colors and their aesthetic effects should enhance the development of significant verbal,

visual, perceptual, creative and emotional skills. Further, it is a great way to give them a sensory vocabulary for describing the world around them (e.g. Charleroy 2012; Alekseeva and Savebkova 2017).

Due to COVID-19 – after months of thinking, designing, and re-designing because of the newly necessary security measures – the opening of the research stations on the effects of various lines and colors in the ZOOM children's museum was delayed by two weeks. When we could finally start, the feedback of the children was heart-warming and motivating. For many children, the first lockdown had been especially hard (Dalton, Rapa, and Stein 2020; Green 2020) and as all museums, the ZOOM was confronted with closure. Children's culture was absent for months. Many children who came to our research stations told us, that it was the first event they attended after the lockdown. During the duration of the installation (July–October 2020) over 200 children participated in the project. This is a success, particularly due to the containment strategies the museum had to initiate: A one-way system, prior registration for the exhibition and only a limited number of children allowed in the forum. Additionally, we could hold workshops with small groups of children and discuss their favorite colors, the universality of aesthetic effects, and why they agreed or did not agree on specific meanings of lines and colors. These workshops resulted in nine animated short films, where the children expressed different moods or effects with only lines and colors. These films were presented in a film premier.

2. Research Stations

The following text will briefly describe the research stations. In order to prepare the complex matter of the original project "Universal Aesthetics of Lines and Colors?" (with adults only) for the applied sphere and for children in particular, a massive simplification was needed. The interactive installation (design by Dorothea Brunialti) located in the foyer of the ZOOM museum was open to all visitors and free of charge. We came up with 1) a voting station for colors only, 2) one station devoted to assign lines and 3) the coloring station with a reduced version of the famous Kandinsky Bauhaus Questionnaire which investigated color and form correspondences already in 1923 (e.g. Immelmann et al. 2019).

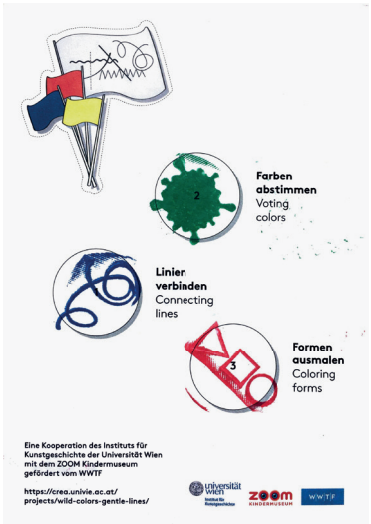
Instead of tokens for the rating we opted for colored paper, which was also safe for small children (in case they would swallow it). Further, this added more volume to the containers, which were designed not to be visible at first sight and therefore offered a surprise effect for the children: After voting, they could circle the station and see the colorful results at the back. In addition, the children loved to scrunch up the paper and throw it into the slot they thought it would fit best (Fig. 1). The installation's content was verbally communicated through easy-to-comprehend descriptive panels, both in German and in English in order to reach ZOOM's wide international audience.

Figure 1 © René Steyer

Figure 2 © René Steyer

Moreover, we offered three publications of the initial project (Brinkmann et al. 2018; Immelmann et al. 2019; Specker et al. 2018) as contextual information for adults (Fig. 2). Children could be encouraged to engage with different lines and colors and to share their personal experience offering them to become "color and line researchers". They received a collection pass and for each station (marked with a number stuck to the floor) there was a matching stamp. The completed collection pass identified them as official "color and line researchers" and could be taken home (Fig. 3). The benefit of this concept is that it not only contains an experimental and participatory element, but also provides an immediate insight in the ongoing inquiry with a "surprise effect" when looking behind the high voting station.

Figure 3 © René Steyer



To implement the content in a way which was understandable for children, we introduced "Eddi", the figure of a meerkat, to explain and navigate the children through the subject. The storyline begun with the descriptive panel at the entrance of the room: "Eddi is a meerkat. They are often very curious. They ask lots of questions – just like researchers do." In this text, the children were invited to get an envelope from Eddi at the cash desk. Eddi the meerkat was a recurring figure in each research station while also being projected on an animated wall, where it invited the children to the project with the slogan "Come join us". When touching this wall, the children could draw colorful lines (Fig. 4). Eddi's purpose was also to serve as an optical bracket of the installation.

The twelve word-pairs used in the initial research project are terms that are common in the historical literature to characterize aesthetic effects: passive-active, lively-still, happy-sad, aggressive-peaceful, positive-negative, soft-hard, warm-cold, heavy-light, smooth-rough, bodily-spiritual, masculine-feminine, intrusive-cautious (e.g., Brinkmann et al. 2018).

Figure 4 © René Steyer

For the children a smaller set with comparatively easy terms was used: happy-sad, soft-hard, warm-cold, heavy-light and fast-slow referring to the originally used word pair of lively-still. To make this reduced set of terms even more understandable, especially since some of the children just learned to read, the adjectives were illustrated with one Eddi each. For "hot" an Eddi stands next to a fire and for "cold" an Eddi stands in the snow. To avoid influencing the children's color choice, mostly black and white were used for these illustrations and brown for Eddi to avoid influencing the children's color choice (Fig. 5). Further, the facial expression of Eddi was always the same, even for happy and sad. This was again motivated in order to avoid influencing the choice by positive or negative priming through the options given. We are, of course, aware that even with the limitation of Eddi's facial expression, this cannot be compared to a controlled experiment in the laboratory. It should rather be seen as an approximation, where we weren't able to control all variables possibly influencing the children's choice. Besides the Eddis, also parents or other children around were possible factors influencing the evaluation.

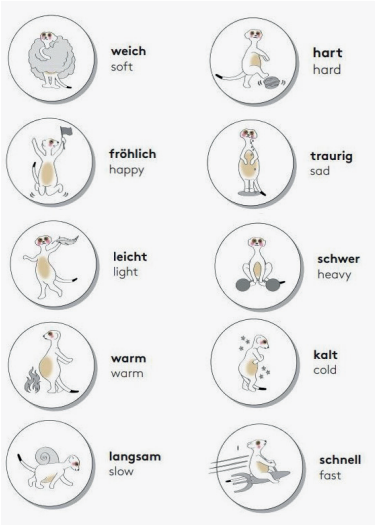


Figure 5 © Dorothea Brunialti

At the cash desk, children got the abovementioned envelope containing the stamp pass and six colored papers (the three primary colors blue, red and yellow, as well as orange, green and pink). Brown, Eddi's color was not part of the colors in the envelope. An instruction printed on the envelope explained that the paper had to be scrunched and used for research station number two. It also explained that there were no right or wrong answers – only the free choice of the child would matter. On the research station the ten terms were displayed next to each other in a long row (see Fig. 1). As we observed, typically, children would first look at the selection and then carefully decide which colors in their envelope would fit best to which term. After voting, they could take a look at how the other children had rated. They discovered that the perception of another person can be different from their own. When they looked at the results with other children, they often talked about the reasons why they had chosen specific terms. For example, Paul, a six-year-old boy had thrown his red paper into the slid labelled "hot". "Because a fire is red" he explained to a boy next to him, who responded, "fire can also be blue, for example at the gas stove" and another one said, "I chose red for heavy, because when you lift something heavy your head turns red". We listened to these conversations during participatory observation. Meaning making within a peer group was a new perspective which had not been part of the initial project. Through the interactive installation with its "surprise-effect" design, as well as through the participation in the workshops, children experienced the relativity of the (often taken-for-granted) universality of one's own perception; universality was indeed not proven by the initial project.

Another station was dedicated to the aesthetic effects of lines, a topic rather neglected in research (exceptions: Takahashi 1995; Stamatopoulou 2008; Boddy 2015; Brinkmann et al. 2018). In the initial project, we divided original abstract artworks, for example by Kandinsky, into their single parts to show the variety of lines as well as the very different impression when presented individually or in combination (e.g., Brinkmann et al. 2018; Specker et al. 2020). To bring this aspect to the installation for the children as well, we covered one wall with different kinds of lines and placed seating furniture in front of it (see Fig. 6). On the table a block of paper was displayed. It showed the same ten terms as the color station and six different lines: a straight diagonal line, a curly entwined line, a wavy horizontal line, a zigzag line, an upward curve and a dotted line. In the task presented we

asked the children to connect each line with one term they thought would match the character of the line best. This station was sometimes received as the hardest to master, as we cautiously gave ten terms but only six lines. This should prevent a strong leaning to just match every line with a term only to finish the exercise. More terms should therefore animate the children to consciously choose the terms and lines, with always leaving four terms without a line. Additionally, we asked them for their first name and their age. This sheet could be inserted into a mailbox which was installed next to the board with the ink pads.

Figure 6 © René Steyer

The third station was inspired by Kandinsky's questionnaire and is related to color: Kandinsky himself created the questionnaire at the Bauhaus in 1923 to test if basic shapes (triangle, circle, square) are attributed to the primary colors yellow, blue, and red (e.g., Immelmann et al. 2019). This correspondence between the primary colors and the basic forms became a main topic in art education and until today psychologists investigate this question (Jacobsen 2002; Kharkhurin 2012; Makin and Wuerger 2013)the Bauhaus revolutionized art and design by using simple colors and forms. Wassily Kandinsky was especially interested in the relationship of these two visual attributes and postulated a fundamental correspondence between color and form: yellow triangle, red square and blue circle. Subsequent empirical studies used preference judgments to test Kandinsky's original color-form combinations, usually yielding inconsistent results. We have set out to test the validity of these postulated associations by using the Implicit Association Test. Participants pressed one of two buttons on each trial. On some trials they classified shapes (e.g., circle or triangle. In museum shops, we even find puzzle games with the "right" solution: according to Kandinsky, the triangle would go best with yellow, the square with red and the circle with blue (see Fig. 7).

Figure 7 © René Steyer

Based on this, we came up with a coloring station with a reduced version of the questionnaire for the kids with this short text:

"About 100 years ago, the painter Wassily Kandinsky asked himself whether each of the three primary colors (blue, yellow, and red) would fit particularly well with one of the three forms depicted. What do you think? Which of Eddi's colors go particularly well with which shape or does it make no difference at all?"

The project was conceptualized especially for children from reading age on as well as the accompanying adults. Despite COVID-19 we reached over 200 children. In total 214 children threw their completed questionnaires into the designated mailbox. Some wanted to keep their questionnaires and took them home. Others only participated in the voting station, so we have no definite numbers. COVID-19 was the biggest challenge we experienced in this project, which was originally conceptualized as collaborative, interactive and hands-on – all three aspects are difficult during a global pandemic. Due to these circumstances, we had to change the concept several times and we had to pause the project for some weeks because of the lockdown situation in Austria. Meetings and planning in person and in the museum had been impossible and it was uncertain if we could conduct the installation at all. We had to improvise with materials, and we think this can also be a learning for other museums and further installations. In respecting hygiene concerns and cleaning needs, we found new ways to still include hands-on stations. However, the stations were far apart from another; instead of one big table, there were two-seaters, the wall to draw on was washable and every child got a separate envelope with the colored paper. And of course, located at the museum's entrance there was a sink for washing hands. We think that similar concepts might be seen more in museums in the future.

Another challenge we experienced was a low interest in reading the easy and bi-lingual panels, describing the project and encouraging the participation. Here, our presumption of adult supervisors' own initiative to read the panel to the children, was wrong. We think that there are specific expectations by parents/adults when visiting the ZOOM children's museum, which is known for a very pro-active mediation and education. Several accompanying adults expected us to explain the research stations instead of reading the explanation themselves for their children. We did not have the resources to be on site every day which would have been the ideal scenario, because while some children were perfectly fine on their own, the installation worked smoother with our mediation. We dedicated approximately one hour a day on-site. In our experience, this seems to be very effective and fruitful for further projects. During this hour we came close to a living-laboratory situation (Corriveau et al. 2016) having a dialogue with children. Usually this would have been the place where many children and adults would wait for the next guided tour and this was also the scenario we had in mind when originally planning the project. Sometimes no one showed up, since part of ZOOM's hygiene concept was a one-way-system, which did not allow crowding in the forum. However, the positive effect of the one-way-system was, that we were able to conduct interviews with some children since it was a quiet and calm setting where we easily could talk to the children without major disturbances. In the end we conducted five interviews. From these, but also from participating observation, we conclude that the research stations were a great way for the children to learn for example to identify and name different colors, lines, and shapes, but also to think about their effects, to sort and classify the visual

objects, and to "discriminate and interpret the visible actions, objects, symbols – natural or man-made – that they encounter in their environment" (Debes 1969, 27). Further, they got in contact with the "perception of the Other" (Fedor 2014) and experienced other perspectives on the same subject. But it was not only about learning (Black 2012), but also about teaching. We got to know the opinions and feelings of the individual children and the stories and emotions they connected with lines and colors. Finally, yet importantly, it was a fun and interactive experience.

3. Workshops

In addition to the installation, we conducted free of charge animation workshops for nine groups of children together with ZOOM's media artists. The workshops started in the forum of the ZOOM with a conversation about the effects of lines and colors, embedding the research stations. This part would take 30 to 60 minutes and we were able to be responsive to the ideas and associations the children had. Then we went to the ZOOM Animation Film Studio (German: Trickfilmstudio) where we met the media artist (for further information see Kaiser 2014). After getting a basic introduction to the technical setup we started the creative part of the workshop with three out of the ten terms that the children had already encountered at the research stations. These terms were randomly pulled out of a small bag and served as a starting point for the films to give an impulse for moods or emotions that were translated into film. However, during the creative process and the general workflow stories could emerge, which moved far from the initial terms.

In a second step the children discussed about the story they would like to tell and how to implement this story with the materials provided such as colored paper, wire, cords and cables. Entirely in the spirit of the Animated Film Studio, all the production steps involved collaborative work. Creative ideas were transformed into short films. The media artists supported the teams on a technical and aesthetic level. Keeping the children as close as possible to the theme of lines and colors and motivate them to solely work in abstract ways posed to be the most challenging task of the film productions. After the film was completed, sound was added via Kaossilator (a portable music synthesizer that provided a broad range of sounds). This brought another dimension of color and line-perception to the films as the children tended to choose e.g. especially frenzied sounds for fast moving lines or spherical and lethargic "music" to slow moving motions or scenes of depicted sadness. In a last step, the groups decided on a title for their work.

In the end, we were able to present nine short films in a special film premier on September 19th, 2020 in the ZOOM forum where we projected the films on the interactive painting wall and served popcorn for the guests (Fig. 8). Due to hygiene protocol only a small audience could attend the event.


Figure 8 © Lea Daro

The Animated Film Workshops were free of charge, and especially the Vienna Hobby-lobby, a free leisure programme camp for children (https://www.viennahobbylobby.com/), as well as individual visitors, benefited from this offer.

4. Analysis of collected material

As mentioned above, the main aim of this project was to communicate knowledge from an academic project to a non-academic audience, in our case children and their families. A secondary aim was to get a sense, if children respond and think differently to the topic of aesthetic effects of lines and colors compared to the adult participants in our experiments. Yet, the research stations in the museum have not been in a controlled setting and therefore we have to be very careful with conclusions. We are aware that the material we can analyze is quite "noisy". However, it seems still reasonable to describe what we could find, also for further research in this field. Further, we wanted to encourage children to participate in our research and to create new works involving lines and color themselves. These works are for example the animated films. The material we could interpret is the following:

Number of colored paper in the voting station
146 of the connecting-lines sheets
214 of the Kandinsky sheets
9 animated films
5 interviews (recorded audio files)
Many subjective observations

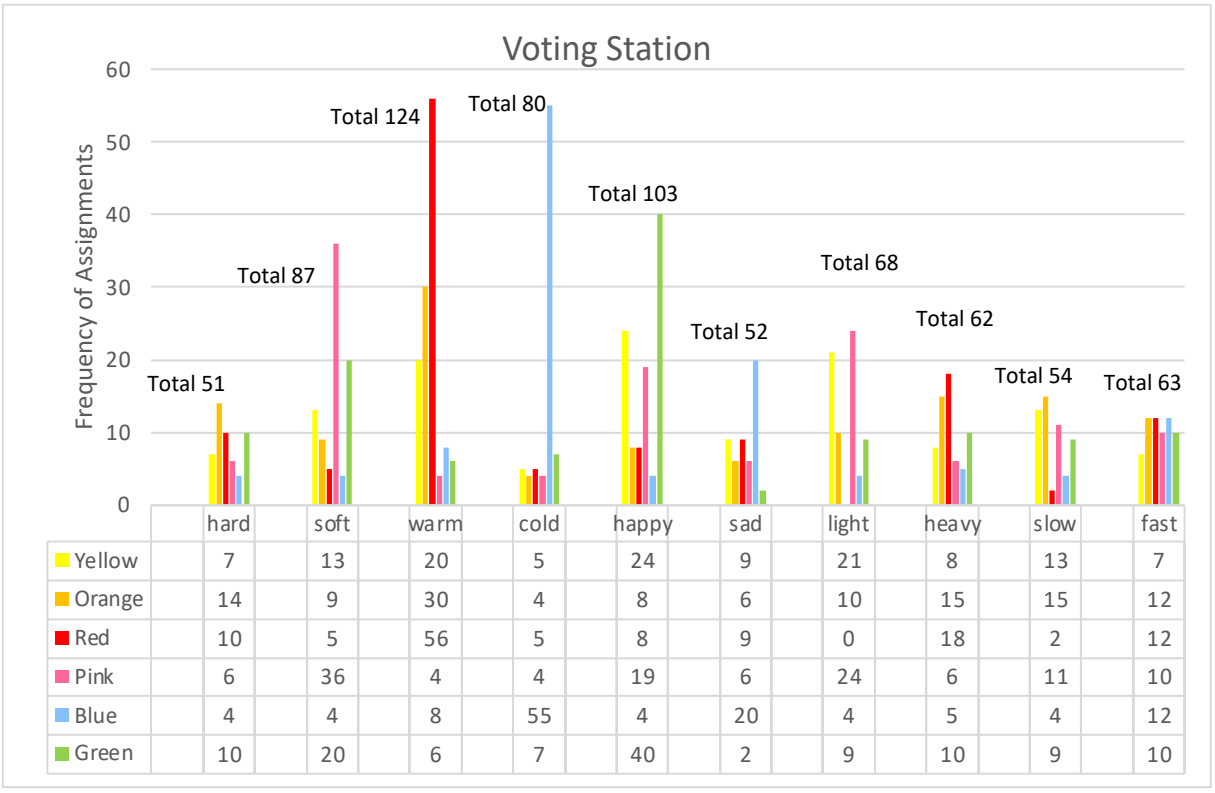
In the following the different research stations as well as the animated films are analyzed and enriched with the interviews and observations.

4.1 Color voting station

The voting station was for sure the most interactive element and it brought a playground atmosphere to the forum: children could climb on it; they could throw the paper in and they could circle it and inspect the Plexiglas containers with all the colorful paper in it. Some children tried to open the containers and halfway through the project one child succeeded and emptied out all of the containers.

This resulted in all of the collected papers to be strewn about the floor in manner which forbade us to reconstruct the distribution as it had been before. After adjusting the furniture, we had to start the paper collecting all over again.

From what we could count, there were two very clear assignments: 1. red for warm and 2. blue for cold with over 55 votes each (see Fig. 9). While orange comes second for "warm" with 30 votes, the vote for "cold" is even clearer since no other color had been used more than seven times (green). Surprising to us, the term "happy" was also quite clearly assigned 3. to the color green. For "soft", pink was used 36 times, which makes it the 4. distinct term. The interviews provide some insights into the thoughts behind the children's choice.



	hard	soft	warm	cold	happy	sad	light	heavy	slow	fast
Yellow	7	13	20	5	24	9	21	8	13	7
Orange	14	9	30	4	8	6	10	15	15	12
Red	10	5	56	5	8	9	0	18	2	12
Pink	6	36	4	4	19	6	24	6	11	10
Blue	4	4	8	55	4	20	4	5	4	12
Green	10	20	6	7	40	2	9	10	9	10

Figure 9 with red, blue, green and pink as the colors signed most clearly to one term.

Subject 1, 8 years:
Original transcription:
I: Vielleicht magst du mir erzählen bei der Station wie du dich entschieden hast, welche Farbe wo hingehört.
B: Ich hab mich so entschieden, weil manche Farben auch aussehen wie die Dinge, z.B. Tränen sind Blau.
I: Mhm.
B: Und z.B. Feuer, das ist rot.
I: Mhm, ok das hast du also mit Objekten assoziiert?
B: Aber bei manchen Dingen wusste ich es eigentlich nicht so ganz. Da habe ich einfach irgendeine Farbe hineingegeben.
English translation by the author:
I: Maybe you could tell me at the voting station how you decided which color belongs where.

B: I decided that way because some colors also look like things, e.g. tears are blue.
I: Mhm.
B: And for example fire, that's red.
I: Mhm, ok, so you associated that with objects?
B: But with some things I didn't really know. I just put some color into it.

Subject 2, 14 years
Original transcription:
Und wenn du willst können wir kurz aufstehen und rumgehen und wenn du dich noch erinnerst, wo du welche Farbe eingeworfen hast, kannst du mir sagen, warum? Oder vielleicht zuerst wo du welche Farbe eingeworfen hast und dann warum du sie da eingeworfen hast.
B: Also ich hatte, bei schnell hatte ich gelb, weil, ich weiß nicht genau warum.
I: Mhm.
B: Langsam hatte ich glaube ich nichts. Schwer hatte ich auch nichts. Leicht war, was war leicht? Ich weiß, ich weiß grad nicht, aber traurig war
I: Ist ok.
B: Keine Ahnung. Fröhlich hatte ich rot.
I: Mhm.
B: Bei kalt hatte ich blau. Warm hatte ich orange. Also wegen blau und orange, weil's halt keine Ahnung, verbindet man halt, oder ich verbinde es mit halt Feuer und Eis, so was. Weich war rosa, weil es erinnert mich so ein bisschen an so irgendwas Liebliches oder so was.
I: Mhm.
B: Und hart war grün. Weil, weiß ich nicht.
English translation by the author:
And if you like we can get up and walk around for a moment and if you remember where you threw in which color, can you tell me why? Or maybe first where you threw in which color and then why you threw it in there.
B: Well, I quickly threw in yellow, because I don't know exactly why.
I: Mhm.
B: Slowly, I don't think I had anything. Heavy I didn't have anything either. Light was, what was light? I know, I don't know right now, but sad was...
I: It's ok.
B: I don't know. For happy I had red.
I: Mhm.
B: For cold I had blue. Warm I had orange. So because of blue and orange, because I don't know, I associate it with fire and ice, something like that. Soft was pink, because it reminds me a bit of something mellow or something like that.
I: Mhm.
B: And hard was green. Because, I don't know.

Subject 3 (no age)
Original transcription:
Und bei der Abstimmstation da? Du hast ja auch einfach die Farben reingeworfen. Hat es da einen bestimmten Grund gegeben?
B: Ja, eigentlich schon.
I: Ja, wie war denn der? Also, magst du mir das erzählen?
B: Ja.

(I lacht)
B: Also bei langsam, da sind ja meistens die Schnecken langsam. Dann gibt's halt, die sind halt meistens hell und dann hab ich dann gelb reingeschmissen.
English translation by the author:
And at the voting station there? You just threw in the colors. Was there a specific reason?
B: Yes, actually.
I: Yes, how was that? Do you also like to tell me?
B: Yes.
(I laugh)
B: Even with slow, the snails are usually slow. Then there is, they are mostly light and then I threw in yellow.

Subject 4, 10 years
Original transcription:
I: Und wenn wir das gleiche mit den Farben an der Abstimmstation, weißt du da noch wie du es reingeworfen hast?
B: Ja. Beim Kalt war es Blau.
I: Mhm.
B: Beim Warm es Rot, nein Orange war's da.
I: Ok. Weißt du auch noch wieso? Was hast du dir denn dabei gedacht?
B: Weil Orange ist ein bisschen Gelb und Rot zusammengemischt und da kommt bei mir Orange raus.
I: (lacht) Und das ist dann warm?
B: Ja.
I: Ok und bei den anderen, weißt du das auch noch?
B: Bei (.....) Bei, beim Langsam da hab ich (...), nein beim Schnell hab ich Rot benutzt.
I: Mhm.
B: Weil, weil's, weil's wenn die Rakete ganz schnell heraufgeht dann hat es meistens Feuer hinten.
English translation by the author:
I: And if we do the same with the colors at the voting station, do you remember how you threw it in?
B: Yes. For cold it was blue.
I: Mhm.
B: For warm it was red, no orange it was.
I: Ok. Do you also know why? What did you think?
B: Because orange is a bit of yellow and red mixed together and that's where orange comes out for me.
I: (laughs) And that's warm then?
B: Yes.
I: Ok and with the others, do you remember that too?
B: For slow I used ..., no for fast I used red.
I: Mhm.
B: Because, because, because when the rocket goes up very quickly, it usually has fire behind it.

Subject 5, 8 years
Original transcription:
I: Wie war das denn bei der zweiten Station mit den Farben? Weißt du das

noch ungefähr was du wo reingeworfen hast.
P: Bei warm, also hab ich Gelb reingeworfen.
I: Mhm, wieso?
P: Weil warm ist irgendwie die Sonne und das Feuer.
I: Ok. Und bei den anderen Farben weißt du das auch noch?
P: Ich glaub rot war schwer.
I: Ah das ist sehr interessant.
P: Rot war schwer, weil das halt schwer ist und dann das Rot.
I: Ok.
P: Dann wird man halt meistens rot im Gesicht, das ist so.
I: Ach so, wenn du was Schweres dann wird man rot im Gesicht oder wie? (lacht) Das ist toll.

English translation by the author:

How was that at the second station with the colors? Do you remember roughly what you threw in where?
P: For warm, I threw in yellow.
I: Mmm, why?
P: Because the sun and the fire are somehow warm.
I: Ok. And can you remember that also for the other colors?
P: I think red was heavy.
I: Ah that's very interesting.
P: Red was heavy because that's just heavy and then red.
I: Ok.
P: Then your face turns usually red, that's the way it is.
I: Oh, if you have something heavy then you get red in the face? (laughs) That's great.

The adjectives "hard" and "fast" got the least votes. How can these results be explained? "Hard" and "fast" are terms, typically used to describe lines which might serve as a first explanation for this outcome (the same terms used in this color voting station were also used for the lines station). When it comes to hue, it seems likely that the connection between warm and red and blue and cold is learned – you see it on the water tap everyday it is used as a universal language. These terms evoked the highest agreement in our original experiment as well (Specker et al. 2020). It is a conventional notion such as blue and sad and yellow and happy. This last notion was, however not confirmed, since green was rated as the happiest color by the kids. In other studies green was found to be rated as "unhappy" by children (Pope et al. 2012) and yellow is typically rated as the color associated with happiness (Wexner 1954). Yet, in some of the studies, the selection of adjectives was much smaller, for example only three terms were used "happy", "sad" and "angry" (Zentner 2001) and the task was to rate, how various colors make one feel (Boyatzis and Varghese 1994). Our rating station was different insofar, as children could choose which color matched best with the offered terms (describing aesthetic effects). Also, there were only 5 colors but 10 terms which made it possible to not select certain terms at all.

Schloss et al. report in their paper *Blue hues don't bring the blues: questioning conventional notions of color–emotion associations* from 2020 that the conventional notion of yellow/happy and blue/sad that was found in various previous studies was due to differences in lightness and chroma rather than hue. This might also be the explanation for a study with children that found that happiness was mostly assigned to blue (Tharangie, Marasinghe, and Yamada 2009).

Here, specifications on the exact color used in our project are necessary: the green we chose was a very fresh and light one (Fig. 10). The results of a study conducted within the initial research project confirmed the relation between brightness and positivity (Specker et al. 2018). This could serve as a possible explanation for the color-emotion association of our bright green and the term “happy”. The pink used in the project that was mostly rated as “soft”, was a very light pastel rose that might have evoked the association of a fluffy cloud which may have synced with the Eddi illustrating the term “soft”. Subject 2 said in the interview, that the pink had something mellow or sweet which is connected to soft.

Figure 10 © Hanna Brinkmann

4.2 Connecting Lines

The completed line sheets that were handed in, each with one Eddi connected to one line, totaled 146. There were many more with two Eddis per line, which we excluded from our analysis. When looking at the children’s opinions line per line, we have the clearest result for line 1 which was mostly assigned to “hard” (see Fig. 11). Line 2, which is a round and curvy line, was most-ly assigned to “soft”. This correspondence reminds on the Maluma and Takete effect, also known as the bouba/kiki effect, a non-arbitrary correspondence between words and shapes. Wolfgang Köhler documented it in 1929 using nonsense words with rounded and not rounded vowels and shapes and demonstrated, that words with round vowels were assigned more often to shapes with round forms and the other way round (Köhler 1929, p. 133). It could also be replicated with toddlers (Maurer, D., Pathman, T., and Mondloch 2006). In our case, the present-ed terms are of course descriptive words with a meaning. The straight line appeared to be hard and the round one to be soft. However, we have to keep in mind, that the term “hard” was positioned next to the Line 1, which might have had an influence in the decision making process. It was the very first line in the row as well and we did not design a second version to control this variable (which would have been the case for a controlled experiment).

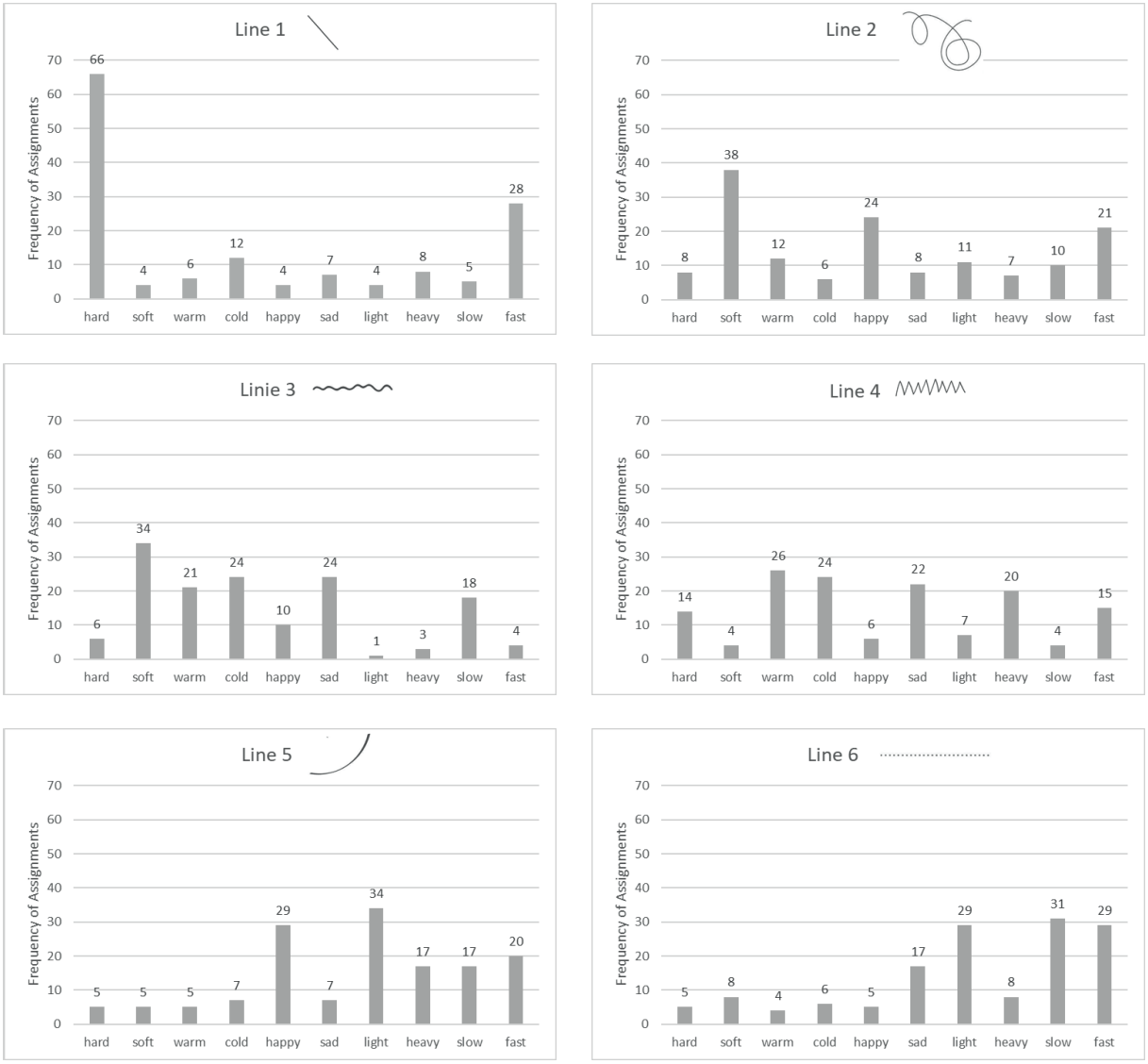


Figure 11 terms assigned to the different lines

Interestingly, in the interviews, line 5 was linked to the shape of the feather and therefore with the term "light". Indeed, this might be an explanation, why "light" is the term with most agreement for line 5. "Slow" is associated with the dotted line which is connected to a slow snail-like movement for the interviewed children and apparently not only for them: 29 kids assigned this line to "slow". But almost the same amount chose "fast" – a term describing movement as well.

Subject 1, 8 years
Original transcription:
I: Und bei den Linien? Vielleicht magst du mir nochmal erklären warum du welche Linie da zu welchem Eddi getan hast?
B: Weil das hier erinnert mich, wenn ich, wenn man fröhlich ist, ist man manchmal so ganz fröhlich ist und wie Loopinge im Bauch macht.
I: Schön.
B: Und das hier, wenn man weint, das, dann kommt wie ein Meer eben, Wasser ist das find ich. Und das hier, wo steil bergab geht, dann ist man sehr sehr schnell.
I: Ok. Und bei denen drei, weißt du da auch?
B: Also das finde ich wie eine Feder. Weil das auch so ein bisschen gebogen

ist. Und das, weil es wie ein Feuer die Zacken hat.
I: Ok. Und die Punktlinie?
B: Das find ich etwas langsam. Weil die Punkte ja auch Abstände haben.

English translation by the author:

I: And what about the lines? Perhaps you would like to explain to me again why you connected which line to which Eddi?
B: Because this reminds me on when I, when you're happy, you're sometimes so happy that it is doing loops in your stomach.
I: Nice.
B: And this, when you cry, that, then comes like a sea, I think that's water. And this here, where you go steeply downhill, you are very, very fast.
I: Ok. And with those three, do you know?
B: I think that's like a feather. Because it is bent a bit too. And that's because like a fire it has the spikes.
I: Ok. And the dotted line?
B: I find that a little slow. Because the points also have gaps.

Subject 2, 14 years

Original transcription:

I: Ok. Und beim Linienblatt, vielleicht können wir jede Linie einzeln einmal durchgehen? Du hast hier die gepunktete Linie zu traurig getan. Warum?
B: Ich weiß nicht. Irgendwie, sie wirkt instabil.
I: Ok.
B: Wie als wäre man traurig oder so was.
I: Ok. Und hier die geschwungene Linie zu leicht?
B: Die Form verbinde ich ein bisschen mit einer Feder, weil Federn auch so gebogen sind oder so was.
I: Mhm.
B: Oder leicht. Deswegen.
I: Die Zickzack-Linie?
B: Ja, die erinnert mich ein bisschen an Feuer.
I: Auch von der Form her?
B: Jaja. Also, ja.
I: Mhm. Die gewellte Linie?
B: Ich weiß nicht, für mich schaut sie weich aus.
I: Mhm. Hier unsere Kringel-Linie?
B: Ich find's, ich denke, dass sie am längsten braucht wahrscheinlich um gezeichnet zu sein, weil sie am meisten, also wahrscheinlich, wenn man sie ausrollen würde, die Längste wäre und deswegen dauerts halt am längsten und deswegen langsam.
I: Mhm. Und unsere Diagonale?
B: Sie wirkt halt sehr stabil und deswegen hart.

English translation by the author:

I: Ok. And with the line sheet, maybe we can go through each line individually? You connected the dotted line with sadly here. Why?
B: I don't know. Somehow, it seems unstable.
I: Ok.
B: Like being sad or something.
I: Ok. And here the curved line to light?
B: I associate the shape a bit with a feather, because feathers are bent that way or something.

I: Mhm.
B: Or light. Because of this.
I: The zigzag line?
B: Yes, it reminds me a bit of fire.
I: Also in terms of shape?
B: Yeah yeah. So yes.
I: Mhm. The wavy line?
B: I don't know, it looks soft to me.
I: Mhm. Here is our Kringel line?
B: I think, I think that it probably takes the longest to be drawn, because it would be the longest, probably if you rolled it out, and that is why it takes the longest and therefore slowly.
I: Mhm. And our diagonal?
B: It just seems very stable and therefore hard.

Subject 4, 10 years
Original transcription:
I: weißt du noch ungefähr was du mit was verbunden hast?
B: Ja. Das ganz Kringelige
I: Ja.
B: hat ausgeschaut für mich wie ein Wind
I: Mhm.
B: deshalb hab ich es mit kalt verbunden. Und die kleine Gepunktete hat für mich wie eine Langschnecke ausgeschaut.
I: Ok.
B: Weil, es ja immer so (tüt) ein bisschen weiter nach vorne geht.
I: (lacht) Ja.
B: Und die Wellen waren für mich wie (...) wie so kalt.
English translation by the author:
I: do you remember roughly what you connected with what?
B: Yes. The very curly one
I: yes.
B: looked like a wind to me
I: Mhm.
B: that's why I associated it with cold. And the little dotted one looked like a long snail to me.
I: Ok.
B: Because it always goes a little further forward.
I: (laughs) Yes.
B: And the waves were like (...) like cold for me.

Subject 5, 8 years
Original transcription:
I: Und weißt du noch, wie du die Linien verbunden hast? Also zum Beispiel eine sehr gekringelte Linie weißt du da noch was für eine Emotion du genommen hast?
P: Mh ich weiß nur, dass ich bei „schnell" hab ich die ganz gerade Linie genommen.
I: Aha, das ist sehr interessant. Wieso hast du das denn gemacht?
P: Weil halt, so wie Raketen halt nach oben schießen, ist das einfach gerade, da passen nicht Wellen und das Zickzack.

English translation by the author:
I: And do you remember how you connected the lines? So for example a very curled line do you know what kind of emotion you took?
P: Mh, I just know that for „fast" I took the straight line.
I: Aha, that's very interesting. Why did you do that?
P: Because just like rockets shoot up, it's just straight, waves and the zigzag don't fit for that.

4.3 Kandinsky Questionnaire

Assigning was also part of the Kandinsky Questionnaire, however on a purely visual level without the descriptive terms. In total, we could analyze 214 of the completed Kandinsky sheets. As Figure 12 shows, the color red was matched most often with the circle, blue with the square and yellow with the triangle, which is not Kandinsky's ideal version. Yet, the yellow triangle is in line with his assumption. Empirical studies by psychologists with adults showed that there is a clear preference for assigning red to the triangle and yellow to the circle (Kharkhurin 2012, 169; Jacobsen 2002) which was explained with the association of a warning traffic sign on the one hand and the sun on the other. However, especially children, who draw and paint a lot and learn such connections as "sun" and "yellow" assigned yellow the least to the circle in our sample. In the interviews we conducted, two children did talk about the connection of the circle and the sun – which led in one case to the choice of the color yellow and in the other to red.

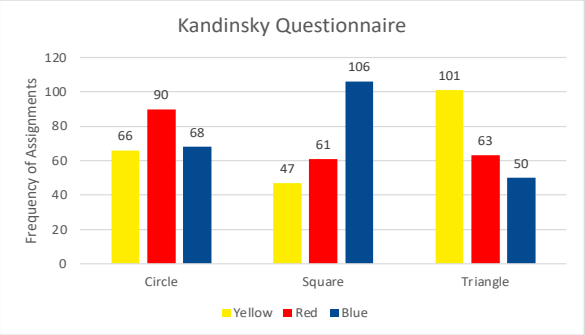


Figure 12 frequency of colors assigned to forms

Subject 4, 10 years
Original transcription:
I: Weißt du da noch wie du die Formen zugeordnet hast?
P: Ja, Gelb wie die Sonne.
I: Mhm.
P: Blau das Viereck, weil Wasser und weil das ist auch meistens so ein Fluss das Viereck.
I: Ok.
P: Und das Rote, das Dreieck, das hab ich dann ein Vulkanausbruch.
English translation by the author:
I: Do you remember how you assigned the shapes?
P: Yes, yellow like the sun.
I: Mhm.

P: Blue the square, because water and because the square is usually a river.
I: Ok.
P: And the red one, the triangle, that's a volcanic eruption.

Subject 5, 8 years
Original transcription:
I: Wie hast du die Formen ausgemalt, weißt du das noch?
P: Den Kreis
I: Mhm.
P: hab ich Gel-, hab ich Rot angemalt.
I: Ok.
P: Weil die Sonne heiß ist und
I: Ja.
P: Dann ist es warm.
I: (lacht) Ok. Bei den anderen Farben weißt du das auch noch?
P: Das Dreieck hab ich Gelb angemalt.
I: Mhm.
P: Weil, weil es fast so wie eine Blume ausgeschaut hat.
I: (lacht) Wie eine Blume?
P: Ja.
English translation by the author:
I: How did you color the shapes, do you remember?
P: The circle
I: Mhm.
P: I used yell-, I colored it red.
I: Ok.
P: Because the sun is hot and
I: Yes.
P: Then it's warm.
I: (laughs) Ok. With the other colors, you remember that too?
P: I painted the triangle yellow.
I: Mhm.
P: Because it looked almost like a flower.
I: (laughs) Like a flower?
P: Yes

When taking the colors assigned the most to one for, we get a result, that matches a color-form theory by one of Kandinsky's colleagues at the Bauhaus: Oskar Schlemmer, who was convinced by the red circle, the blue square and the yellow triangle (Schlemmer 1958, 194, see Immelmann 2019, 279).

4.4 Animated Films

A compilation of all nine films
can be accessed here: https://vimeo.com/459677269

1. *Gefühle* (Emotions)
2. *Game Over*
3. *Angstination*
4. *Langsamtraurigschnell* (slowlysadfast)

5. *Striche haben Gefühle* (Strokes have feelings)
6. *Nenne mich wie Du willst* (Call me as you like)
7. *Der Unglückstag* (The unlucky day)
8. *Die verrückten Würmer* (Crazy Worms)
9. *Der Kampf* (The Fight)

We worked with different media artists and the age of the children differed from group to group. Whereas previous studies analyzed the films according to narrative strategies for example (Scheibelhofer and Pollak 2008) the interpretation of abstract works is challenging. Protagonists are the three different terms expressed through lines, colors and sound.

"Gefühle" is in fact abstract, but the terms written on paper (as they have been pulled out the bag at the beginning of the workshop) star as protagonists in the film. They are included in the visual setting and this way the audience knows that "slow," "happy" and "fast" are the emotions or moods which are to be conveyed. For "slow", red and yellow are used as background colors and later some lines appear on the screen. The colors change for "happy" to pink and a light greenish yellow, which is also reflected in the cables. For "fast" pink disappears and blue is combined with the greenish yellow and a darker green.

"Langsamtraurigschnell", has the starting terms already in the title for the others, the audience has to guess. The three terms lead to a division of the films into three parts, which can be seen in most works and which is also supported by the sound.

Although we observed a strong attachment to the figurative and the representational, for example in "Game Over" with the flower drawn on the blue paper, or the 100 € drawn on a red paper in "Langsamtraurigschnell" we can conclude that the lines – abstract or formed as a figure – served always as the acting part, moving in front of a color. This is probably due to the materiality – the colored paper made an excellent background. However, it would have been of course possible, to give also the paper voluminous appearance as well – especially since in the forum the paper for the voting station had to be scrunched, something which was not taken over to the film studio.

5. Discussion

As stated above the so-called aesthetic effects of lines and colors, which serve as a base for the description of artworks in art history, were the core topic of the initial research project. In our controlled experiments with adult participants, we investigated the effect of lines and colors, but also their interaction and, in a further step, complete abstract works of art, for example by Kandinsky. In the present project art itself was only touched upon within the framework of the workshops. Children participating in the workshops could further learn about stop motion in film making, about expressing moods or emotions with abstract lines and colors, and digital skills. There was a big necessity in the groups to talk about emotions and especially how children felt during the first lockdown. The final clips were uploaded on ZOOM's website (https://www.kindermuseum.at/zoom_sammlung) so that the children could show their films also to their families and friends.

Compared to other studies, the focus of our project was first and foremost to communicate our research to children and let them research themselves by providing access to our methods and materials in a child-friendly way and in a child-friendly environment. Nevertheless, an analysis of the collected material as a by-product of this transfer-project is to a certain degree possible. We only conducted five interviews, but these case studies indicate, that despite our best intentions, Eddi's attributions to communicate the terms for children who cannot read yet, may have influenced the assignment of colors and lines to specific terms. In the interviews, especially the rocket (fast), the feather (light), the snail (slow), and the fire (warm) are mentioned several times. The color-object associations as well as the line-object associations had somehow to be translated to the terms describing aesthetic effects. The data analysis is a purely descriptive one, but it shows, that red and warm as well as blue and cold and further green and happy are agreed on more by the children compared to the other options. The same can be said for the straight line and fast and the curled line and soft. For Kandinsky questionnaire, there were no terms presented, so we can be sure that there is no influence by Eddi in this case. Also, we had many participants. It is interesting, that 106 children agreed with the assignment of blue and the square and Kandinsky's correlation of the triangle and yellow. The least agreement could be found for the circle. Thus, the answers do not seem totally arbitrary – yet, there is a lot of diversity when it comes to aesthetic effects of lines and colors. The aim of the project was to engage children in these partly philosophical discussions by participating in the research. All their thoughtful responses to basic visual elements as well as the creation of specific aesthetic effects by actively using basic visual elements in the production of their movies were both important parts of the project. These two components can be described as visual literacy and "(i)t includes understanding the rules, structure, 'grammar' and limitations of the field of 'visual communication'." (Wagner and Laven 2015, 83). While we could find some rules and structures, there are quite some limitations when it comes to a "grammar", because the agreement on the aesthetic effects of specific lines and colors was in many cases not very high, which corresponds with the results of the original project.

Regarding the further use of the project materials, we can report that the voting station was re-used in a Viennese school for an environmental project. The small seating furniture has remained in the foyer of ZOOM and continues to function well there. The questionnaires can be used for various workshops in schools and museums in this or a similar way. They give impulses to discuss the effects and perceptions of lines and colors and offer different ways to explore them.

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Footnotes

1 – Parts of this paper have been presented at the conference "Colors and Cultures – Couleurs et Cultures" which took place online from April 13–15 2021 and was organized by the UHA Mulhouse (France), the University of Basel (Switzerland), and the University of California, Berkeley (U.S.A.). The chapters 1, 2, 4.1, and 4.3 are expected to be published in the conference proceedings (edited by Samuel Ludwig and Astrid Starck 2022).

2 – The project NXT19-004 "Wild Colors, Gentle Lines? Engaging with color and line in an interactive children's environment" was funded by the WWTF (The Vienna Science and Technology Fund/Wiener Wissenschafts-, Forschungs- und Technologiefonds). I would like to thank the project team: Bettina Bernegger, Dorothea Brunialti, Lea Daro, Christian Ganzer, Luise Reitstätter, Raphael Rosenberg, Rosa Sancarlo and Andrea Zsutty for their work and commitment in this especially challenging time of the COVID-19 pandemic.

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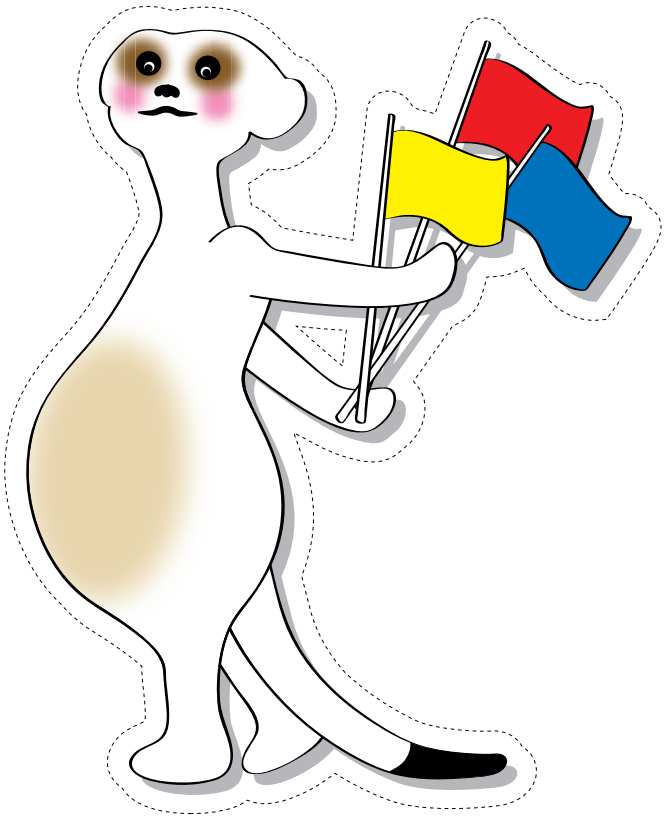

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