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Social-Spatial Perception from an Observer's Perspective

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Disclaimer:

A thesis is an aptitude test for students. The approval of the thesis is proof that the student has sufficient research and reporting skills to graduate, but does not guarantee the quality of the research and the results of the research as such, and the thesis is therefore not necessarily suitable to be used as an academic source to refer to. If you would like to know more about the research discussed in this thesis and any publications based on it, to which you could refer, please contact the supervisor mentioned.

Abstract

In communication, non-verbal communication is an important source of information. One form of non-verbal communication, called *proxemics*, involves the use of physical space by individuals. There is an extensive line of research on proxemics behaviour, such as proximity and degree of eye contact. Surprisingly, there is not much research on the interpretation of proxemics from people who are not part of the interaction. However, observing others can provide us with important information about their relationship, for instance. The aim of this exploratory study is to make a start in this line of research. In an online questionnaire, we asked 100 people to interpret a collaboration in a university setting. The respondents were asked to tell something about a collaboration between two individuals for eight different pictures, where the position of the individuals varied in distance and orientation. For each picture, they were also asked to interpret the successfulness and pleasantness of the collaboration on a scale from 0 to 100. The findings suggest that people are consistent in their interpretation of successfulness and pleasantness to some degree. There seemed to be a tendency for respondents to give either a positive or negative evaluation for most of the pictures. The data also suggest consistency between men and women. This study aims to inspire and provide a basis for more research into the topic of social-spatial perception from an observer's point of view.

Keywords: non-verbal communication, proxemics, physical distance, online questionnaire

Introduction

When thinking about communication, it is likely that the first thing that comes to mind is people talking to each other. We use our lungs, mouth and lips to make sounds, which form words and sentences. In that way, we can tell each other what we are thinking about, share stories or tell a joke. However, spoken words are often not enough to really get our message across. Nonverbal communication is just as important in social interactions as verbal communication, since it gives extra information that words alone cannot convey. This information is sent both intentionally as well as unintentionally (Hall et al., 2019).

Proxemics is one of the subcategories of non-verbal communication, along with other domains, such as haptics and kinesics (Hans & Hans, 2015). The term *proxemics* was coined by Hall (1963) to define how human beings use the space around them to communicate. This includes the distance between people, as well as spatial orientation. The domain of distance describes how far people are apart from each other. The domain of orientation describes the degree in which people are facing each other and have eye contact. The distance and orientation that is kept often differs in different situations. In a job interview, for example, it is often considered inappropriate to come very close or turn your back to the interviewer. With romantic partners, however, you can come very close and you do not always have to maintain eye contact in a conversation.

As well as other forms of nonverbal communication, the proximity and orientation of other persons can tell an individual a lot about the social relation of the observed persons (Hall, 1990, Lawson, 2007). Most of this information is sent and processed unintentionally. Therefore, both the people in the conversation as well as the observer do often not notice this (Jones, 1971).

The concept of proxemics is also reflected in our languages, which shows us how strong proxemic concepts are intertwined with our day to day communication (Hans & Hans,

2015). Different sayings and metaphors, for instance, incorporate proxemic concepts (Hall, 1990, Schubert, 2005). For instance, you can say you are ‘close’ to a person you have a strong bond with. This does not mean you are always within a few meters away, you can still be good friends if one of you moves to a different country. The same goes for someone who is considered ‘distant’, they could be standing right next to you. These metaphors do not refer to the absolute position in space, but to the abstract ideas we have about space and the meanings of the ways we use it (Hans & Hans, 2005).

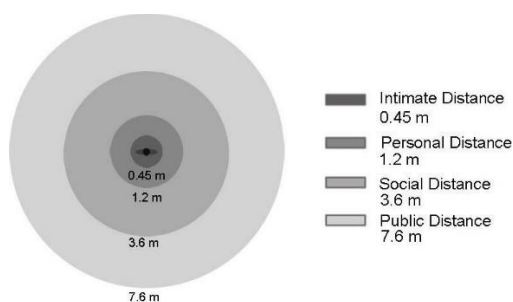
The next sections will go into the domain of distance, including the four distances by Hall (1990), and the domain of spatial orientation. Furthermore, individual differences will be discussed, with a focus on gender differences for proxemics.

Proximity - Distance

The distance between people often depends on the relation between the interlocutors and the context of the interaction. Hall (1990) divided the space around a person into four zones: the intimate, personal, social and public distance (Figure 1). Each of these zones can, in turn, be divided into a close phase and a far phase. The zones are however based on research with middle-class Americans, and may not be applicable to every culture (Hall, 1990).

Figure 1

A Schematic Overview of the Four Distances by Hall (1990)



Note. Berber et al. (2016)

The Intimate Distance

The intimate space is the zone that is closest to the individual and ranges from physical contact to a distance of 45 centimetres distance between the individuals (Hall, 1990). This distance is related to intense feelings, such as love, comfort and anger (Qu & Yun, 2021). When strangers invade the intimate zone, this can be seen as an intrusion of the personal space, which can lead to feelings of hostility (Qu & Yun, 2021). American adults tend to avoid the intimate space in public (Hall, 1990). In public spaces, when taking more distance is not possible, people take a 'co-existing' role (Lawson, 2007) where they avoid eye contact and try to touch others as little as possible.

The Personal Distance

The personal distance ranges from 45 centimetres to 1.2 meters. This distance is mostly kept between close friends and family (Qu & Yun, 2021). The term personal distance should not be confused with terms as personal space, which refers to an individual's preferred distance from others (Burgoon, 1978).

The Social Distance

The third zone is called the social distance, and varies from 1.2 metres to 3.6 metres. This zone is seen as appropriate for more formal conversations, such as business meetings or a conversation with strangers. Usually, the close phase is reserved for informal contexts, such as people who have worked together for a longer time.

The Public Distance

The furthest zone is the public distance, which starts at 3.6 metres from the individual and has no outer boundary (Hall, 1990, Lawson, 2007). The public distance is mainly the distance used when people are not interacting, since this distance is enough to ignore each

other without being rude. This distance can, however, be used in interaction with other people. These interactions are mainly impersonal. The close phase is often used for conversations with strangers, while the far phase is typical for situations as performances or public speaking (Lawson, 2007).

Distance and Gender

The findings discussed above do not apply in the same way to every individual, however (Hall, 1990, Kenner & Katsigmalis, 1993, Sorolowska et al., 2017). Previous research suggests that men and women display different behaviour in terms of proximity and orientation. In one study, people getting into a taxi at five different taxi stands in Adelaide were observed. All observed taxis had a male driver. Most women sat in the back of the taxi, regardless of them traveling alone, with other women or with men. Men predominately sat in the passenger seat, also when traveling together with a women. Thus, the women in this study kept more distance between themselves and the male driver than men did (Kenner and Katsimaglis, 1993). The findings of a cross-cultural study in 42 different countries were in line with those of the previously mentioned study of taxi-seat choice (Sorokowska et al., 2017). These findings suggest that women in general keep more distance from other people as compared to men. The findings of Sorokowska et al. (2017) suggest that this is not only the case for a specific culture, but for women all over the world.

In a different study, however, a different tendency was found. In this study, men and women were observed in a hospital. Strangers (male and female) approaching one of the research assistants (also male and female) were observed. Interestingly, women were found to approach male assistants more often than female assistants. Furthermore, the women who approached the male assistants overall came closer than the women approaching female assistants. For men, however, no clear preference for male or female assistants was found, and

they kept more distance from both male and female assistants than women did (Madden, 1999).

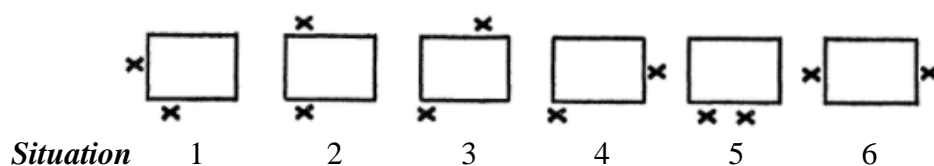
Proximity - Orientation

A second aspect of proximity is spatial orientation, which refers to the degree to which people are facing (or turned away from) each other (Batchelor, 1972, Marquardt & Greenberg, 2012). Spatial orientation has been studied in different ways, such as seating positions around a table or eye contact, and can say a lot about the relationship and conversation between people (Sommer, 1967, Argyle & Dean, 1965, Batchelor, 1972, Lawson, 2007).

According to Sommer (1967), there are different factors that contribute to the use of space by people in interaction with each other. One of them is the task of a group. Whether the group is cooperating or competing, for instance, can have an effect on the preferred position of the different interlocutors. According to Sommer (1965, 1967), people who are cooperating on a task prefer to sit side-by-side (situation 5 in figure 2), people who are merely in a conversation prefer to sit in a 90 degree angle (situation 1 in figure 2), and people who are competing prefer to sit face to face (situations 2 in figure 2). People who are not interacting prefer to sit as far from each other as possible where they can still avoid eye contact (situation 3 in figure 2).

Figure 2

Different Seating Positions of Pairs Around a 1-2-1-2 Table



Note. The squares represent the table. The x's represent the seated individuals.

Adapted from Sommer (1965)

In a different study on orientation, the freely chosen seating positions of different groups were observed. Before entering an empty space, respondents were told they either were going to work together as a group or going to work on their own. Then, the respondents could place their chair anywhere in the empty room. The groups were larger than the previously mentioned study, which focused on pairs. Overall, respondents who were told they had to make a decision as a group, sat closer together than the respondents who were told to make a decision individually. The respondents from the latter group did place their chairs closer to one person so they could communicate with them. Furthermore, the collaborating groups sat in a way where they could see the other members of their group. In contrast, some respondents from the individual decision group sat with their back turned to other people in their group (Batchelor & Goethals, 1972).

Eye Contact

An important part of spatial orientation is the possibility of eye contact (Sommer, 1967, Marquardt & Greenberg, 2012). Overall, it is easier to keep eye contact with someone when you are facing each other than when one of you is turned away. Eye contact is important in a conversation, because it fulfils the need for affiliation in a conversation (Argyle & Dean, 1965). It signals investment in the conversation, and can help infer information from the eyes. Too much eye contact, however, can lead to anxiety. It is a part of intimacy, and can make people feel vulnerable when maintained for too long (Sommer, 1967, Argyle & Dean, 1965). Interlocutors have to find an equilibrium where they can benefit from the positive effects of eye contact, while avoiding the negative effects of too much eye contact (Argyle & Dean, 1965).

The same equilibrium is reflected in the co-existing role (Lawson, 2007). This role describes people in a public setting where they are not interacting, they are merely co-

existing. According to the zones of Hall (1990), people should be in the public space to be able to ignore each other without being rude. When choosing a seat in public transport, for example, people first try to find a seat where they do not sit next to, and can easily avoid eye contact with, someone else. However, this is not always possible. In the busy morning, when the trains are full, people will have to sit next to someone else, or stand close to each other. In that case, it is impossible to stay in each other's public zone. This is resolved by avoiding eye contact and ignoring each other, thus maintaining the equilibrium (Lawson, 2007, Hall, 1990).

Gender Differences in Eye Contact

Previous research also found gender differences in eye contact. In their study on the intimacy equilibrium model, Argyle and Dean (1965) found that respondents placed with a same-sex confederate maintained more eye contact than respondents who were paired with someone of the opposite sex. In both cases, women maintained more eye contact with their partner than men did. The researchers suggested, however, that the amount of eye contact could be higher in romantic couples than demonstrated in the opposite-sex pairs of strangers in this study.

Left-right orientation

Besides eye contact, spatial orientation can also be described in terms of left-right orientation. This part of spatial orientation describes where people are in the space, based on the observer's point of view. When you look at two people, usually one is on the right and one is on the left. This left-right orientation can also influence a person's interpretation of other people and their relationship and interaction (Suitner et al., 2017).

Gender Differences in Left-right Orientation

Stereotypically, men are considered to have more agentic traits as compared to women (Deaux & LaFrance, 1998). They are often seen as leaders, having high confidence and being competitive. Women, however, are often seen as being communal. They are associated with traits as being warm, helpful and caring, but also as being passive and less assertive than men (Deaux & LaFrance, 1998, Suitner et al., 2017). The spatial agency bias (Suitner et al., 2017) suggests that these stereotypes are associated with spatial concepts, in particular the left-right dimension. This is reflected in western paintings, where agentic groups are predominately portrayed on the left of less agentic groups, and graphs, where the data of men are often positioned on the left side of the data of women. Therefore, Suitner et al. (2017) suggested that the more agentic person would be faced to the right in a conversation (because they are standing on the left side from the observer's point of view), and the more communal person would be faced to the left. The results suggested that people who are portrayed right-facing are indeed seen as more agentic than when the same person is portrayed as left-facing. These findings suggest that there is a certain expectation from men and women concerning their spatial behaviour, and their behaviour can be interpreted differently.

Not only the interpretation by other people differs for men and women, they also behave differently themselves. For instance, some research suggests that women tend to sit next to each other more often than men, who prefer to sit facing each other (Sommer, 1967). In the earlier mentioned study, where people could place their seat anywhere they wanted, men and women sat closer to a person of the same sex as themselves as opposed to a group member of the opposite sex (Batchelor, 2017).

The findings on differing behaviour of men and women could be explained by our cultural norms on gender norms. In our culture, holding hands or hugging each other in public is considered to be more acceptable for women than it is for men (Sommer, 1967). Opposite-

sex pairs may try to avoid uncomfortable situations, by keeping more distance or making less eye contact (Argyle & Dean, 1965).

The Interaction of Proximity and Orientation

In real life, the different domains of proxemics are not processed separately. Proximity and orientation work together to convey non-verbal messages (Walker & Trimboli, 1989). In the intimacy equilibrium model, proximity and eye contact are two of the factors people can use to maintain the equilibrium (Argyle & Dean, 1965). When people are seated close to each other, for instance, this can feel as an intrusion of personal space. This can then be balanced by avoiding eye contact, restoring the equilibrium. Research found that both the total proportion of eye contact during the conversation and the length of glares increased when the distance between people increased (Argyle & Dean, 1965). This balance between proximity and eye contact is also reflected in the earlier mentioned co-existing role (Lawson, 2007). The equilibrium is also reflected in the study by Sommer (1959), where people predominately chose a 90 degree angle seating position when they sat down to have a conversation, and not face to face.

While factors as relationship, topic of the conversation and group tasks have an influence on proxemic behaviours, proxemic messages can also have an effect on the context (Sommer, 1967). When someone often gets too close, for instance, people can feel uneasy and anxious. This, in turn, could negatively affect the friendship. This influence of the spatial context could also be used in a good way, however. Suitner (2017), for instance, used a spatial bias in a way to reduce sexism. They used their findings on the association of right and left with agency and communion, respectively. These findings were applied in a task where women, who are associated with communion, were shown facing right, and men, who are associated with agency, were shown facing left. Completing this task reduced sexism in

respondents by making them learn a new association, where women were seen as more agentic than before, and men as more communal than before (Suitner, 2017).

Cultural Differences in Proxemics

The meaning people give to the distance and orientation of the person they are interacting with, may differ between individuals and cultures, however. In some cases, evidence for cultural differences has been found (Hans & Hans, 2015). In collectivistic cultures, for instance, more emphasis is placed on nonverbal behaviour as compared to individual cultures (Jones, 2013). Furthermore, people from Arabian countries tend to tolerate intrusion of the personal space more than Germans (Hall, 1990), and the meaning of some gestures is different in Asian and European countries (Jones, 2013).

The Current Study

Most of the research that is currently available has focused on the use of space by individuals, their behaviour and preferences. The four different distances with their own characteristics (Hall, 1963), suggest that people are consistent in interpreting the proximity in their own interactions, at least in the same culture. Furthermore, the literature suggests that people are also consistent in their behaviour concerning orientation (Sommer, 1967, Argyle & Dean, 1965, Batchelor & Goethals, 1972). This should mean that people may also interpret other's behaviour in the same way as others.

There is little research on social-spatial perception, that is, the interpretation of proxemic cues by an *observer*; someone who is not part of the interaction. Research on an observer's perspective is also important, since we also interpret social cues by other people when we are not part of an interaction (Wellens & Goldberg, 1978). This helps us estimate how the relationship between other people is. For example, when people are in each other's

intimate space, we tend to think that they are probably emotionally close to each other as well. This interpretation is often made unconsciously, but proxemics is also used when making a conscious effort to understand the social dynamics in a new situation. For instance, when you are starting a new job, and you are trying to find out how formal the relationship between your colleagues is, you could watch their proxemic behaviours.

Furthermore, understanding how people interpret the distance and orientation of others can expand our understanding of people's understanding of their own conversation partners and why people behave in the way that they do. Besides, a lot of the research is only on behaviour. Studying the interpretation of behaviours helps form a richer picture of the psychological processes underlying these behaviours.

The aim of this study is to get an insight in how people perceive the interaction of others, from an observer's perspective. The main research question is RQ1: *To what extent is social-spatial perception consistent between individuals?* Furthermore, regarding the many gender differences found for proximity and orientation, the second research question is RQ2: *To what extent does social-spatial perception differ between men and women?*

Regarding the aforementioned literature on proximity, where evidence for certain tendencies in proxemic behaviour and interpretation were found, our first hypothesis is H1: Social-spatial perception is consistent between individuals.

For gender differences, previous results for proximity are mixed. However, most literature suggests that men keep more distance than women (Kenner & Katsimaglis, 1993, Sorokowska, 2017). Therefore, it could be argued that women would judge a smaller distance more positively than men would. Considering the earlier mentioned literature on spatial orientation and behaviour of men and women, it could be argued that men and women would have different ideas on which distance and orientation are preferred in certain situation. Our hypothesis for RQ2 is H2: Social-spatial perception differs between men and women (in the

sense that the interpretation is consistent within women and within men separately), with women being more positive to more intimate proximity and orientation than men.

The next section will elaborate on the methodology of this study. Then, the data analysis and results will be discussed. After that, the findings will be compared to the research questions and hypotheses, and the previous discussed literature. The last section will conclude.

Method

Respondents and Study Design

Respondents were recruited via Prolific Academic (<https://www.prolific.co/>). This crowdsourcing platform allows researchers to distribute surveys to a large population. Approximately 60.000 people are registered on Prolific. The platform is available in most countries that are part of the Organisation for Economic Co-operation and Development. It is also available in some South Asian countries. All respondents are at least 18 years of age. Prolific respondents have been found to be more naïve, honest and diverse than other samples such as Amazon Mechanical Turk. Furthermore, data collected on Prolific is in general of higher quality as compared to data collected on CrowdFlower (Peer et al., 2017).

The questionnaire was posted on Prolific at the fourth of March 2022. No exclusion criteria were set, meaning the questionnaire was available for the entire population. The questionnaire was set to close after reaching 100 respondents, and the only sample demand was to have an equal amount of men and women. The target of 100 respondents was reached the same day.

A total of 113 respondents started the questionnaire, 100 of them completely finished it. One of the people who did not finish, did fill in all the questions except for the one at the end: *“Please use the text box below if you have any comments for the researchers”*. Therefore, this respondent will also be considered to have finished the questionnaire completely and included in the data analysis. The final sample thus consisted of 101 respondents.

The age of the respondents ranged from 18 to 57 years, with a mean of 26.8 ($SD = 6.9$). The sample consisted of an equal amount of men and women. Fifty respondents said they identify as male, 48 as female, and 2 answered *other*. Most of the respondents completed a bachelor’s degree from college or university (38.8%), followed by secondary education

(32.6%) as highest education completed. Two percent completed primary education, 14.3% completed trade/ technical/ vocational training, and 12.2% completed a master's degree from college or university. The respondents were from 21 different countries. The selected countries are mostly situated in Europe, and the other countries spread across the Americas and Africa. Most of the respondents said they were born in South Africa (29.7%), followed by Portugal (15.8%).

The study had an experimental research study design to study between-subject variation. Eight different positions (Table 1) were evaluated by the respondents on pleasantness and successfulness, as well as the description of the collaboration (the open-ended question). Between-subject factors were consistency of interpretation for pleasantness and successfulness, as well as gender.

Materials and Measures

The questionnaire for this study (see Appendix A) was in English and was made using the software program Qualtrics. A hyperlink to the questionnaire and a short description of the study were posted on Prolific. After the introductory page, the questionnaire started with a short explanation of the task. The respondent then would be shown eight different pictures, in randomized order, each depicting a student and their supervisor (Figure 3). In each picture, the distance or orientation of the two people would differ from the one in Figure 3. An overview of all distances and orientations can be found in Table 1. For each picture, the respondent was asked to answer four questions. The first question was an open-ended question, asking what the respondent could say about the collaboration (*What can you tell about the collaboration between those individuals from this picture?*). The second and third question asked the respondent to rate the collaboration on successfulness (question 2) and pleasantness (question 3), using a slider (0 = not at all successful/ pleasant, 100 = extremely

successful/ pleasant). The final question asked about recognition, and was a multiple choice question (*Do you recognize the situation in the picture from your own life?*).

Table 1

Positions of the Student and Supervisor (SV) in the Eight Different Pictures

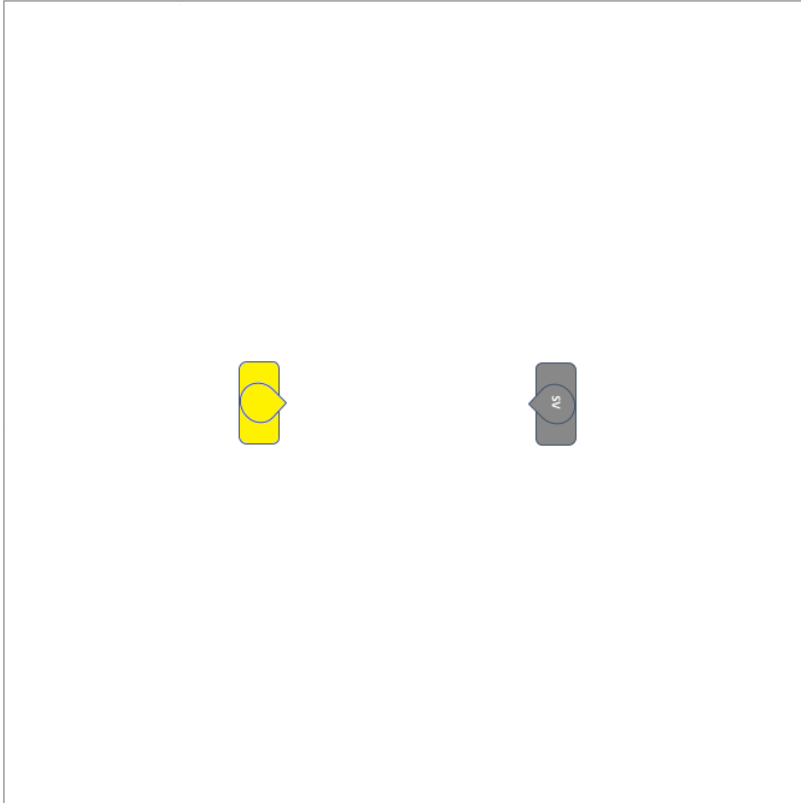
Picture	Distance	Orientation			
		Student		Supervisor	
		Position	Eye Contact	Position	Eye Contact
1	Personal	Left	Facing SV	Right	Facing student
2	Public	Left	Facing SV	Right	Facing student
3	Social	Left	Facing SV	Right	Facing student
4	Social	Left	Turned backwards	Right	Turned backwards
5	Social	Left	Turned sideways	Right	Facing student
6	Social	Left	Facing SV	Right	Turned sideways
7	Social	Right	Facing SV	Left	Facing student
8	Social	Left	Turned sideways	Right	Turned sideways

Note. SV = supervisor.

After answering the questions for each of the eight pictures, the respondent was asked to look at one of the previous seen pictures again (the one in Figure 3). For this picture, there were two open ended questions to help estimate the overall judgment of the distance that was used for the pictures that differed in the orientation. The first question asked about the judgment of the distance (*Disregarding the position of the two individuals, what do you think of the distance between the individuals in this picture?*). The second question asked the respondent to estimate the distance between the individuals (*Can you guess the distance between the individuals in this picture (in meters)?*).

Figure 3

One of the Pictures Used in the Questionnaire



Note. The yellow figure represents the student, the grey figure represents the supervisor. In this picture, the student and supervisor are facing each other (orientation) and they are in the social space (distance).

Procedure

The hyperlink to the questionnaire and a short description of the study were posted on Prolific. The population of Prolific could access the questionnaire through the link, which they could fill in on their own device (computer, smartphone or tablet). First, the respondents were informed of the topic and ethical aspects (anonymity, confidentiality, etc.) of the study. After giving consent to participate in the study, the questionnaire started. After completing the

questions, the respondents were thanked for their participation and redirected to Prolific to finish the questionnaire and receive their financial compensation.

Processing of Open Text Responses

The question ‘What can you tell about the collaboration between the individuals in this picture?’ was an open question. The responses on this question were coded using inductive content analysis (Elo & Kyngäs, 2007). With this method, the codes are derived from the data, as opposed to being formed in advance.

Eight different pictures for 100 respondents yielded 800 responses. All of these responses were copied into a new excel sheet and randomised to avoid biases in the coding. Three researchers created codes on the basis of the first 400 responses in a codebook. The researchers then created a first version of the codebook together. Subsequently, the responses were again randomised and a new sample of 400 responses was used to evaluate the first version of the codebook. For each of the responses, the researchers checked whether the response fitted one of the codes. Responses that did not fit one of the codes were labelled ‘other’. After evaluating these 400 responses, two of the researchers continued the process by assigning a code to the other 400 answers. These were then evaluated again, a final code was assigned to each of the responses, and the final codebook was formed (Appendix B).

Data Analysis

The sample characteristics and descriptive data were obtained using the statistics programme JASP. The interpretations of successfulness and pleasantness were analysed using JASP, too. To estimate whether the interpretations were consistent between individuals, the descriptive statistics and Levene’s test were used. This was done for each of the 16 sliders separately. To study gender differences, a t-test or non-parametric Mann-Whitney U test was used.

For the Levene's tests which we used to test the consistency of scores, a hypothetical sample of the same size as the real sample was added, where the variance of scores on successfulness and pleasantness was 0. This was done by making all scores of the 'respondents' in this hypothetical sample 50¹ for each picture. Using Levene's test, the variances of the real sample were compared to the variances of the hypothetical one, for successfulness and pleasantness for each picture. In other words, the variances of the scores of the real sample were all compared to a variance of 0.

¹ The middle value of the sliders (0-100).

Results

Consistency of Evaluation of the Collaboration

In this section, the consistency of evaluations of the collaboration is discussed for each picture separately. Each of the eight subsections will start with some descriptive statistics. These subsections discuss the results for the sliders regarding pleasantness and successfulness. The scores for successfulness and pleasantness were not normally distributed for all of the sliders for successfulness and pleasantness. Therefore, the medians and interquartile range for each slider are reported in addition to the means and standard deviations. The descriptives for the scores successfulness and pleasantness are summarized in table 2. Figure 4 and Figure 5 show the violin plots for successfulness and pleasantness for each picture. The outcomes of the Levene's tests will also be discussed in this section.

The codes for the open questions are also discussed in the subsections for each of the pictures. The responses on the open question varied a lot between individuals. Some people interpreted the quality of the collaboration (e.g. *Good collaboration, No collaboration*). Others interpreted the relationship between the student and supervisor (e.g. *Friendly/ comfortable/ they get along*). Part of the responses did not interpret the collaboration or the relationship. They only described the picture, for example by saying that the student was turned to the side, or possible activities of the student and supervisor. The full codebook is added in Appendix B. Appendix C gives an overview of the percentages for each of the codes, per picture. In this result section, only the responses that gave an interpretation of the collaboration or relationship between the supervisor and student are discussed. Responses that only described the picture or activities, as well as unclear responses or responses that did not fit one of the codes, are left aside for now.

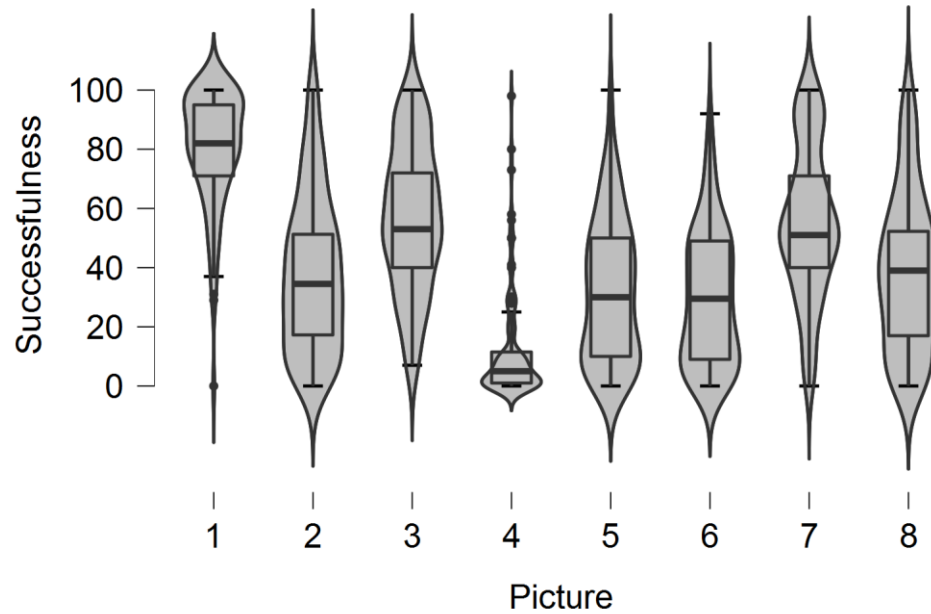
Table 2

Descriptive Statistics for the scores on Pleasantness and Successfulness

Figure	Successfulness				Pleasantness			
	Mean	SD	Median	IQR	Mean	SD	Median	IQR
1	80.30	19.15	82	24	74.07	21.74	80	30
2	38.02	26.17	34.5	34	34.88	25.77	30	39.5
3	56.83	24.46	53	32	52.98	24.99	50	34
4	12.3	18.49	5	10.5	15.16	22.86	5	16.25
5	32.17	23.38	30	40	28.57	23.92	27.5	30.25
6	29.63	22.38	29.5	40	26.78	22.89	20	31
7	55.41	25.68	51	31	51.11	26.08	51	37
8	38.51	26.29	39	35.25	35.9	25.94	30	37

Figure 4

Violin Plots of Successfulness Scores for each Picture

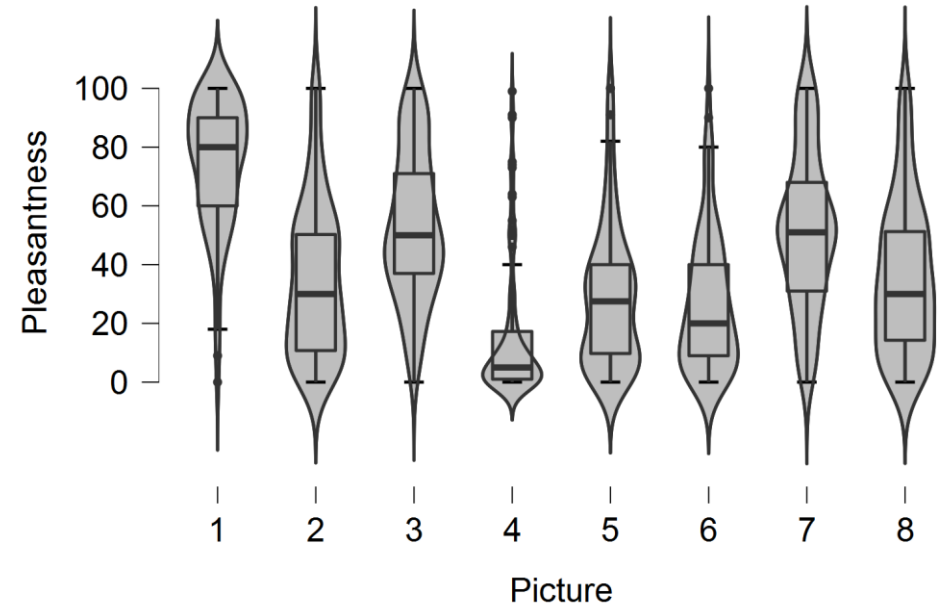


Note. The box represents the interquartile range (IQR), with the bottom line being the boundary of the first quartile. The upper line is the boundary of the third quartile. The thick line in the middle of the boxplots is the median.

The dots in the plots for figure 1 and 4 represent outliers.

Figure 5

Violin Plots for Pleasantness Scores for each Picture



Note. The box represents the interquartile range (IQR), with the bottom line being the boundary of the first quartile. The upper line is the boundary of the third quartile. The thick line in the middle of the boxplots is the median.

The dots in the plots for figure 1 and 4 represent outliers.

Levene's Test

Levene's test was used to compare the variances of the responses to a variance of 0 (hypothetical sample). All of the Levene's tests were significant.

Picture 1

Picture 1 depicted the student on the left side and the supervisor on the right side. They were in the personal space, which was the closest distance of all pictures. As seen in table 2, the median for successfulness was 82 (IQR = 24), and the median for pleasantness was 80 (IQR = 30). Both distributions were skewed towards the higher scores and had the highest medians of all pictures (see table 2 and figures 4 and 5).

In the open question, the largest part of the respondents described the collaboration as a *good collaboration* (30.3%), followed by *both are interested/ motivated/ paying attention* (11.9%), *friendly/ comfortable/ they get along* (7.3%) and *ok/ sufficient collaboration* (5.5%). Overall, the responses were positive about the collaboration.

Picture 2

In picture 2, the student and supervisor were in the public space, with the student on the left and the supervisor on the right. They were again facing each other. The median for successfulness was 34.5 (IQR = 34) and the median for pleasantness was 30 (IQR = 39.5).

Distant was most often found in the codes for the open question (34.5%). Respondents also said that there was *no collaboration* (8.4%) or a *poor collaboration* (6.7%). Respondents also interpreted the collaboration as *formal* (3.4%), *ok/ sufficient collaboration* (2.5%), or *uncomfortable/ awkward/ weird* (2.5%)

Picture 3

The student and supervisor were again facing each other, with the student on the left and the supervisor on the right. In this picture, they were in the social space (further away than picture 1, closer than picture 2). The median for successfulness was 53 (IQR = 32), the median for pleasantness was 50 (IQR = 34).

Distant was also the most mentioned in the responses for the open question for picture 3 (18.8%). Respondents also said it was a *good collaboration* (12%) or *ok/ sufficient collaboration* (8.5%). Respondents also responded *both are interested/ motivated/ paying attention* (8.5%) and *little collaboration* (5.1%).

Picture 4

In picture 4, the student and supervisor were depicted with their backs turned to each other. They were in the social space. The student was on the left side, the supervisor on the right side. Both the distribution for successfulness as well as pleasantness was skewed towards the lower scores. The median for successfulness was 5 (IQR = 10.5). The median for pleasantness was also 5 (IQR = 13.8). These were the lowest medians of all pictures.

For the open question, the responses spoke quite negatively about the collaboration. Most respondents (24.3%) responded that there was *no collaboration* between the student and supervisor. The highest percentages after that were for *poor collaboration* (15.3%), *both are not interested/ motivated/ paying attention* (9%) and *conflict/ arguing/ upset/ contemptuous* (7.4%).

Picture 5

Picture 5 showed the supervisor on the right, facing the student. The student was on the left, turned sideways. They were again in the social space. As seen in table 2, the median

for successfulness was 30 (IQR = 40) and 27.5 for pleasantness (IQR = 30.25). Both distributions were skewed towards the lower scores.

In the open question, most respondents responded that *the student is not motivated/ interested/ paying attention* (17.9%), followed by *the supervisor is supervising the student* (11.6%), *poor collaboration* (9.8%), *the supervisor is motivated/ interested, the student is not* (7.1%) and *no collaboration* (5.4%).

Picture 6

In picture 6, the student was depicted facing the supervisor. The supervisor was now turned sideways. They were again in the social space. For successfulness, the median was 29.5 (IQR = 40), the median for pleasantness was 20 (IQR = 31). Both distributions were skewed towards the lower scores (see figures 4 and 5).

The supervisor is not interested/ motivated/ paying attention was mentioned most (26.9%) for the open question, followed by *poor collaboration* (8.3%), *the student is motivated/ interested, but the supervisor is not* (8.3%), and *no collaboration* (5.6%).

Picture 7

The student and supervisor were again depicted in the social space, facing each other. The difference with picture 1 was that the student was now at the right side, and the supervisor on the left. The median for successfulness was 51 (IQR = 31). For pleasantness, the median was also 51 (IQR = 37).

For picture 7, *distant* was again the most mentioned in the open question answers (19.3%). Respondents also said that the collaboration between the individuals was a *good collaboration* (13.2%), followed by *ok/ sufficient collaboration* (9.6%) and *both are interested/ motivated/ paying attention* (7%).

Picture 8

In picture 8, the student and supervisor were again in the social space, with the student on the left. In this picture, both individuals were turned sideways. The median for successfulness was 39 (IQR = 35.25) and 30 for pleasantness (IQR = 37).

For the open question, *both are doing their own thing/ working separately/ in parallel* was mentioned most respondents (16%), followed by *no collaboration* (10.4%), *poor collaboration* (7.2%), *distant* (7.2%) and *ok/ sufficient collaboration* (6.4%).

Gender Differences for the Interpretation of Successfulness and Pleasantness

For each of the 16 variables on successfulness and pleasantness (sliders), a t-test or non-parametric alternative was conducted to test for gender differences. The means and standard deviations for gender are in table 3. First, the data was inspected to establish whether the assumptions of normality and homogeneity of variances were met. Shapiro Wilk's test for normality was used to test for normality. According to the test, the data were not normally distributed. A t-test's robustness is good enough for non-normal distribution when all groups are larger than 30, however, and a t-test was used despite the data not being normally distributed. A Levene's test for homogeneity of variances was used to inspect the homogeneity of variances for each slider. Levene's test was only significant for successfulness for picture 4 (($F(1) = 11.56, p < .001$). Therefore, the gender differences were tested for the interpretation of successfulness of picture 4 with the Mann-Whitney U test instead of a t-test. This test did not find a significant difference between men and women for the interpretation of successfulness ($U(96) = 1080, p = .393$).

Since Levene's test was not significant for the other scores, the gender differences for these were tested using a t-test. These t-tests found only one significant difference between men and women, which was for the interpretation of pleasantness of picture 1 ($t(96) = -2.196, p = .031$). For this slider, the mean was higher for women ($M = 79.4, SD = 19.6$) than for men

($M = 69.9$, $SD = 23$). For the other sliders, no significant difference between men and women was found.

Table 3

Means and Standard Deviations of the scores on Pleasantness and Successfulness for Men and Women

Figure	Successfulness				Pleasantness			
	Men		Women		Men		Women	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	77.2	20.9	83.9	17	69.9	23	79.4	19.6
2	38.9	23.5	38.5	29	36.5	23.7	34.6	28
3	54.7	23.8	59.4	24.5	51.9	25	54.2	25.6
4	9.5	12.2	15.9	23.7	15.6	23.1	14.6	23.4
5	33.4	22.7	33.4	22.7	28.6	25.4	29.1	23.8
6	31.3	21.7	31.3	21.7	29.3	24.4	26	22.1
7	54.9	24.1	54.9	24.1	51.4	24.3	51.2	28.8
8	39.3	25.8	39.3	25.8	34.7	24.5	38.5	27.7

Estimation of Distance

At the end of the questions about the pictures, the respondents were showed picture 3 again, and were asked to estimate the distance between the student and supervisor. With the construction of the pictures, the distances were calculated on scale with the measurements of the figures that represented the student and the supervisor. Whereas the distance between the individuals for the social space was calculated to represent a distance of 2.4 metres, a lot of

the respondents overestimated this distance. Twenty percent estimated a distance between 1 and 3.5 metres (the boundaries of the social space, rounded to a distance that is divisible by 0.5). Over half of the respondents (57%) overestimated the distance. Some respondents thought the distance was more than one hundred metres, a few even estimated the distance to be over one kilometre.

Discussion

This exploratory study aimed to investigate the consistency of social-spatial perception from an observer's perspective. The first research question was *To what extent is social-spatial perception consistent between individuals?* We hypothesised that people are consistent in their interpretation of proxemic behaviours as an observer, since previous literature suggests consistency of people's behaviour and interpretation of behaviour when they are part of the interaction. Besides the consistency of the interpretation of people in general, gender differences were also studied, with the second research question being *To what extent does social-spatial perception differ between men and women?* For this research question, the hypothesis was that men and women interpret proxemic behaviour differently, with women being more positive about closer interaction than men.

The findings partially support the hypothesis for the first research question. The descriptive statistics did suggest some degree of consistency. Picture 1, for example, was skewed towards the positive scores and pictures 4, 5 and 6 were skewed towards the negative scores. Levene's test was significant for all of the pictures, which suggests that the variance of the interpretation of successfulness and pleasantness was significantly different from 0 for all situations. However, this test is fairly strict for measuring consistency, since it assumes a variance of 0. A variance of 0 would mean that every respondent gave the exact same score for successfulness and/ or pleasantness, which would be highly unlikely.

The responses on the open questions seemed to be rather consistent, in the sense that responses were mostly positive or negative about the collaboration or the relationship between the student and supervisor. For picture 1, for instance, the four most often coded topics were all positive about the collaboration or relationship, whereas the codes were quite negative for picture 4. Furthermore, for the pictures where either the student or supervisor was turned away, a large part of the responses discussed the poor involvement of the individual that was

turned away. When the other person was mentioned in the response, they were mostly evaluated positively or neutrally.

In conclusion, some of the data suggested consistency, whereas some of the data did not. Overall, it seems people are consistent in their interpretation to some degree. For some situations, the respondents showed a tendency towards a negative evaluation and for some pictures they showed a tendency towards a positive evaluation. However, it seems there could be individual differences or contextual that influence the consistency of interpretations as well, since some pictures seem to be interpreted more consistently than others.

The data did not support the hypothesis for the second research question. The tests for gender differences were not significant for any of the variables on successfulness and pleasantness, except for the pleasantness for picture 1. This significant effect could also be the result of chance capitalisation. If there was truly a difference between men and women, there probably would have been more significant differences.

Estimation of Distance

Although there is not much research on social-spatial perception, there is extensive research on proxemics. The conformity of the results with previous literature for distance was mixed. There seemed to be a certain distance that respondents preferred in this context. The smaller the physical distance between the student and supervisor, the more positively the respondents' interpretation of the collaboration was. The picture where the student and supervisor were in the personal space had the highest medians for successfulness and pleasantness. According to the literature, however, the social space is the most preferred space for this context. In this study, a lot of the pictures with the social space had *distant* as one of the most frequent codes for the open questions. It could be possible that respondents think that

they supervisor and student have a more casual relationship than the contexts associated with the social space.

There is another possible explanation for these findings. As seen in the last subsection of the results, over half of the respondents overestimated the distance between the student and supervisor. It would be possible that respondents interpreted the picture of the personal zone to represent a conversation in the social zone. Future research could add some more cues to help respondents interpret the distance between individuals in the pictures.

Limitations and strengths

One limitation of this study is that it only focused on one context. This was a deliberate decision, and helped isolate the effects of the distance and orientation. The literature suggests, however, that the behaviour and interpretation of proxemics differs between contexts. Therefore, the findings could have been completely different for a pair of romantic partners, for example.

Another limitation of the study concerns the ecological validity. In the real world, non-verbal communication is richer than proxemics alone. If you are observing people in a conversation, you can see gestures or facial expressions, maybe you can even hear their tone of voice. We use these cues to interpret the situation, too. While the results of this study suggest that people are consistent in their interpretation of proxemic cues, it could be possible that when they have more information from other non-verbal dimensions they are not that consistent anymore.

Despite limitations, there is a lot of effort put into strengthening the study. One of the strengths of this study is the method of coding the open text data. Firstly, all responses were put in a separate data file and were randomised to avoid expectancy bias. Secondly, the codebook was formed by three researchers, who all made a codebook separately (based on

50% of the responses) before sharing their ideas and creating a codebook together. Finally, the first version of the codebook was tested on a new set of 50% of the responses before deciding on the final codebook.

Another strength of the study was the population of the study. Due to the use of Prolific Academic, the study sample is more representative than samples that are formed by means of a convenience sample, which often consist of students or people from the researcher's social environment. The population of this study consists of people with different characteristics, such as different ages, different educational backgrounds, and the respondents lived in 21 different countries.

Future Research

Since there is very little literature on social-spatial perception from an observer's point of view, there are many options for future research. Different contexts and relations could be studied, such as a romantic dinner or argument between a romantic couple or public speaking for strangers. It may well be that people interpret other people's behaviour differently for different kinds of contexts or relationships. Besides, it could be that men and women do interpret proxemic cues differently in other contexts than the one that was used in this study.

After gaining more insight in the people's interpretation of distance and orientation in different contexts, it would be interesting to involve personal differences, such as age and gender. For the latter, research could also investigate the target's gender as opposed to the observer's gender. This research could study same-sex (both male and female) and opposite-sex pairs and take into account the earlier mentioned intimacy equilibrium model (Argyle & Dean, 1965).

Considering the literature on proxemics (Jones, 2013, Hans & Hans, 2015), it would be interesting to study the differences in social-spatial perception from an observer's

perspective between cultures. This research could focus on the meaning people give to certain distances between conversational partners. Do people from other cultures interpret a closer distance still as a formal conversation, for example? Since proxemic behaviour differs between cultures, it is plausible that people from different cultures also interpret these behaviours differently from an observer's point of view.

Finally, future research could also switch the picture of the description of the proxemic behaviour from being the stimulus to being the response. In this study, respondents interpreted the interaction based on the picture, but it would also be interesting to provide the respondents with a description of the context and let them select a picture that they think fits the context best.

Conclusion

Although proxemics is a widely studied topic, not much literature is available on the observer's point of view. This study aimed to provide evidence for the importance of this line of research, by investigating the consistency of people's interpretation. The results suggest that people are fairly consistent in their interpretations of distance and orientation as an observer and provide evidence for a tendency that goes beyond people that are actually part of the conversation. This exploratory study could function as a starting point, and will hopefully inspire more research on social-spatial perception from an observer's point of view.

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Appendix A

Questionnaire

INFORMATION ABOUT THE RESEARCH

'SOCIAL-SPATIAL PERCEPTION FROM AN OBSERVER'S PERSPECTIVE'

➤ **Why have I received this information?**

You have been invited to participate in the research project 'Social-spatial perception from an observer's perspective'. You have received this information to inform you about what you can expect if you decide to participate. This research is about how an observer interprets the spatial orientation of other people in a conversation. The research is being conducted from 10 January 2022 until 1 May 2022. The research plan has been approved by the Ethics Committee of the Faculty of Behavioural and Social Sciences (ECP) at the University of Groningen. The research is being conducted by Renske Kingma, Dr Kai Epstude and Dr Salome Scholtens from the University of Groningen, The Netherlands.

➤ **Do I have to participate in this research?**

Participation in the research is voluntary. However, your consent is needed. Therefore, please read this information carefully. Ask all the questions you might have, for example if you do not understand something. Only afterwards you decide whether you want to participate. If you decide not to participate, you do not need to explain why and there will be no negative consequences for you. You have this right at all times, including after you have consented to participate in the research.

➤ **Why this research?**

This research is about your interpretation of other people's cooperation, based on their spatial orientation and distance.

➤ **What do we ask of you if you participate in the research?**

Before you participate in this research, you will be asked for your consent to participate. In the questionnaire, you will see several different pictures of a student and a supervisor and you will be asked to interpret their cooperation based on what you see. There are no wrong answers, we are only interested in your interpretation of the pictures. Completing this questionnaire will take about 10-15 minutes. You will be compensated by Prolific.

➤ **What are the consequences of participation?**

You will be compensated for taking part in this research via Prolific. There are no known risks to your participation. You are only asked to invest time.

➤ **How will we treat your data?**

We will only collect your answers to the questions in the questionnaire. To ensure your privacy, the data will be handled confidentially. The researchers will have no access to personal information, and the collected data (including age, gender and nationality) cannot be traced to you, your email or your IP-address. Prolific will not share your name and email with the researchers.

➤ **What else do you need to know?**

You may ask questions about the research at any time: before, during or after completion of the questionnaire. You can do so by sending an email to one of the researchers (k.epstude@rug.nl).

Do you have any questions or concerns regarding your rights as a research participant? If so, you may also contact the Ethics Committee (ECP) of the University of Groningen: ec-bss@rug.nl.

Do you have any questions or concerns regarding your privacy, or regarding the handling of your personal data? If so, you may also contact the Data Protection Officer of the University of Groningen: privacy@rug.nl.

You have the right to have a copy of this information form.

You can take a picture of this using your phone camera or take a screenshot using the Print Screen button on your computer.

INFORMED CONSENT**'SOCIAL-SPATIAL PERCEPTION FROM AN OBSERVER'S PERSPECTIVE'**

- I have read the information about the research. I have had enough opportunity to ask questions about it.
- I understand what the research is about, what is being asked of me, the consequences that participation may have, how my data will be handled, and what my rights as a participant are.
- I understand that participation in the research is voluntary. I myself choose to participate. I can stop my participation at any moment. If I stop, I do not need to explain why. Stopping will have no negative consequences for me.

Consent to participate in the research:

Yes, I consent to participate; this consent will remain valid until 01 July 2022

No, I do not consent to participate

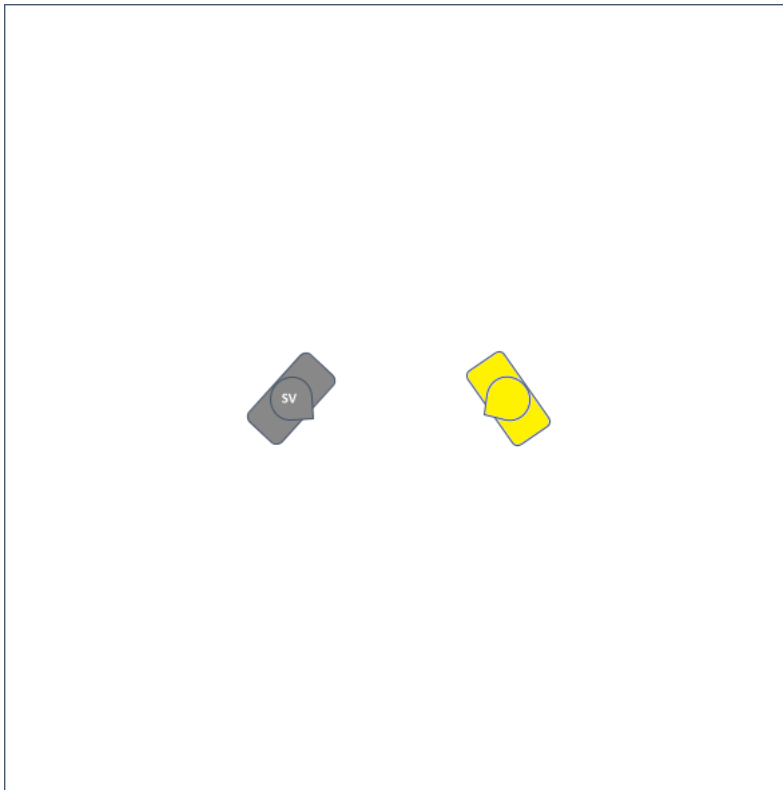
You have the right to have a copy of this consent form.

You can take a picture of this using your phone camera, or take a screenshot using the Print Screen button on your computer.

Please read the following instructions carefully.

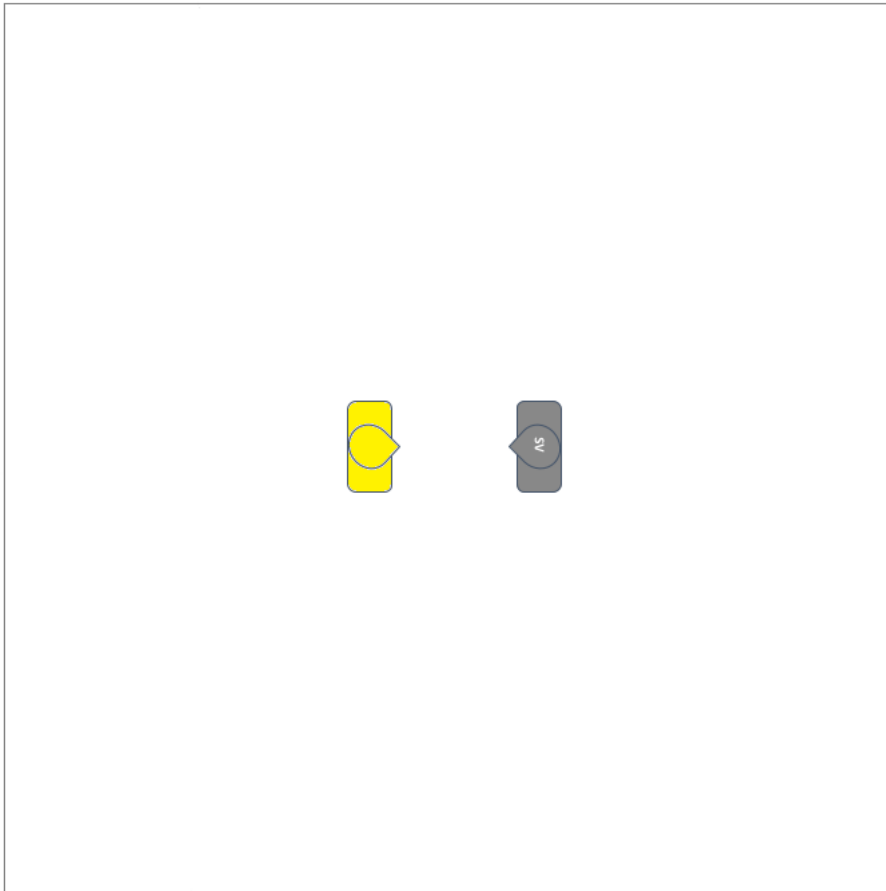
Thank you for taking part in this study. You will now see eight pictures that schematically represent a collaboration between a university student and their supervisor, as in the example below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student. They are collaborating on a project and the supervisor is supervising the student. We will ask the same four questions for each picture. Please look carefully at the picture you see, and answer the questions below the picture. We wish to remind you that there is no right or wrong answer, we are only interested in your interpretation.

This picture is an example. The questionnaire will start on the next page.



Question 1

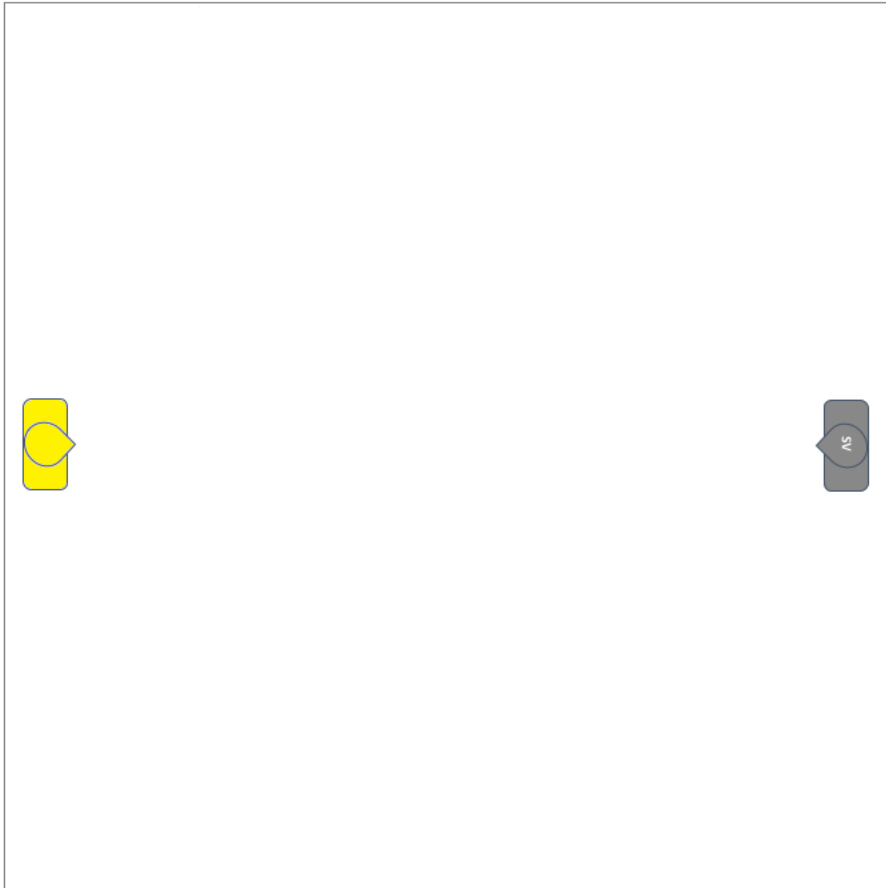
Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

Question 2

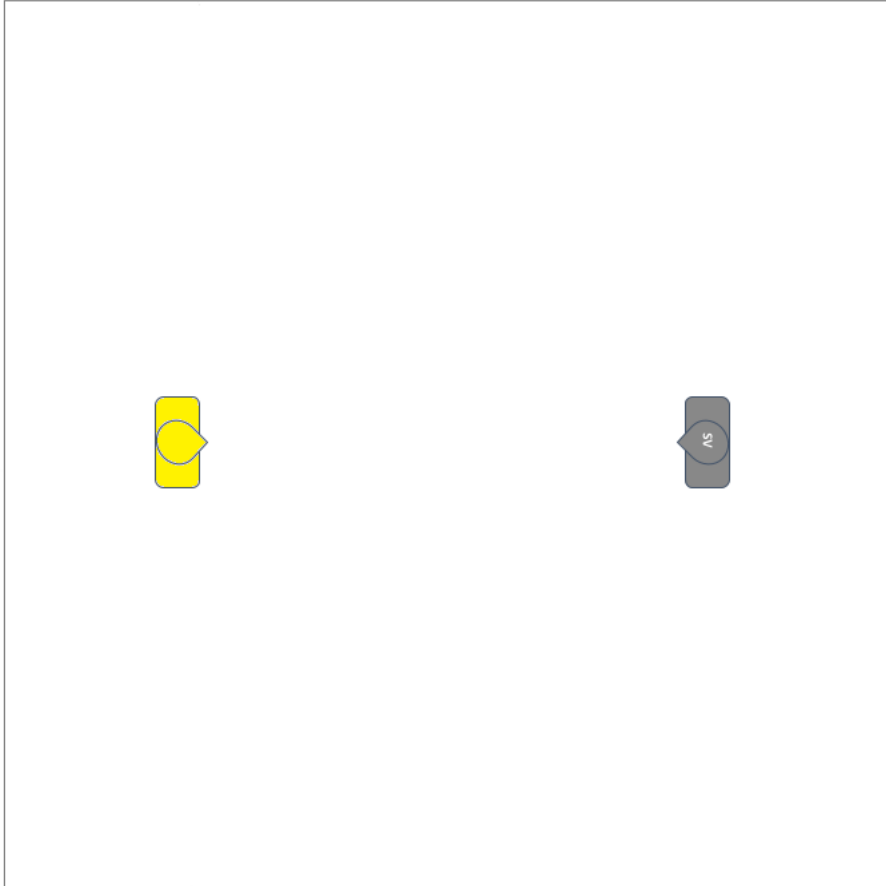
Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

Question 3

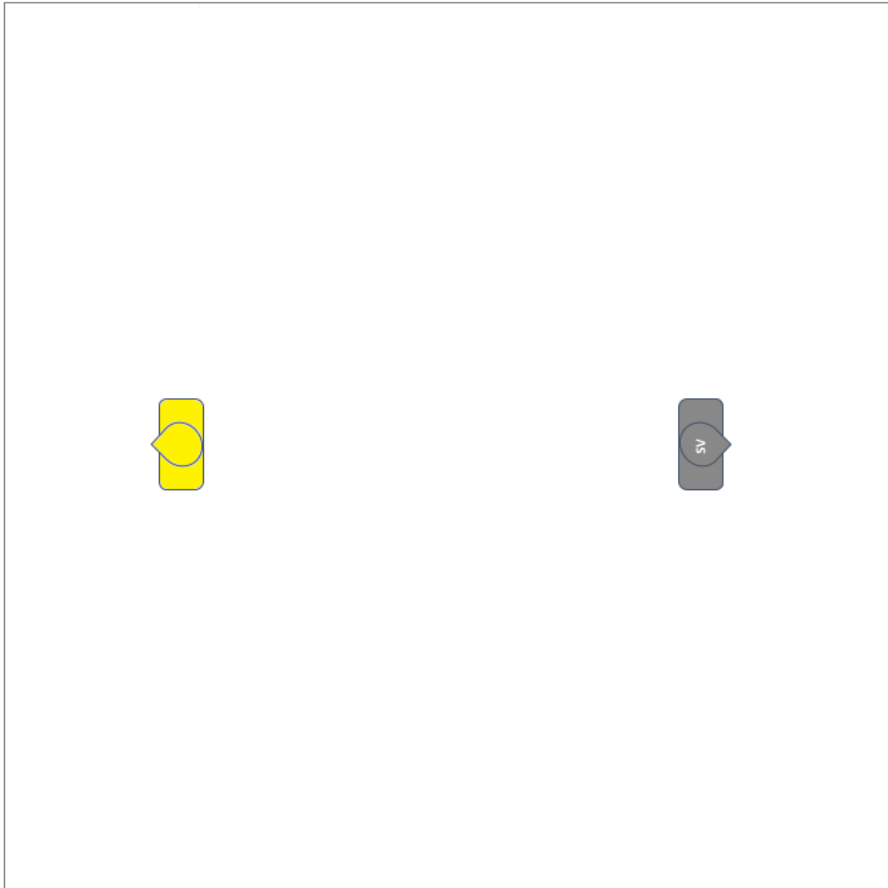
Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

Question 4

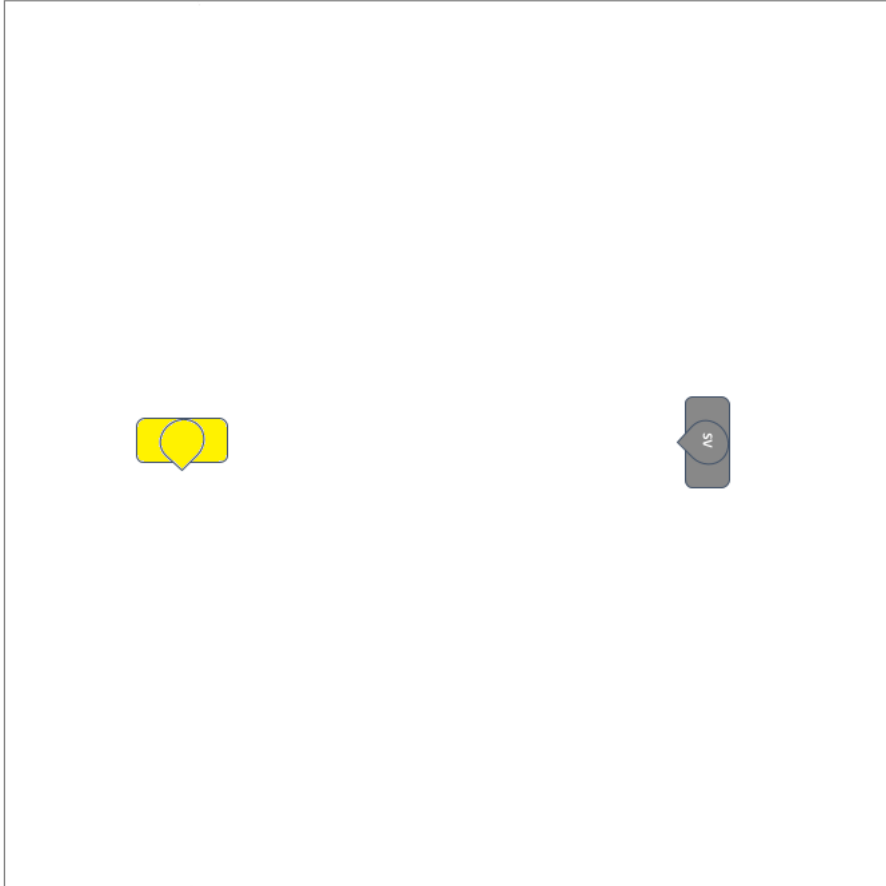
Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

Question 5

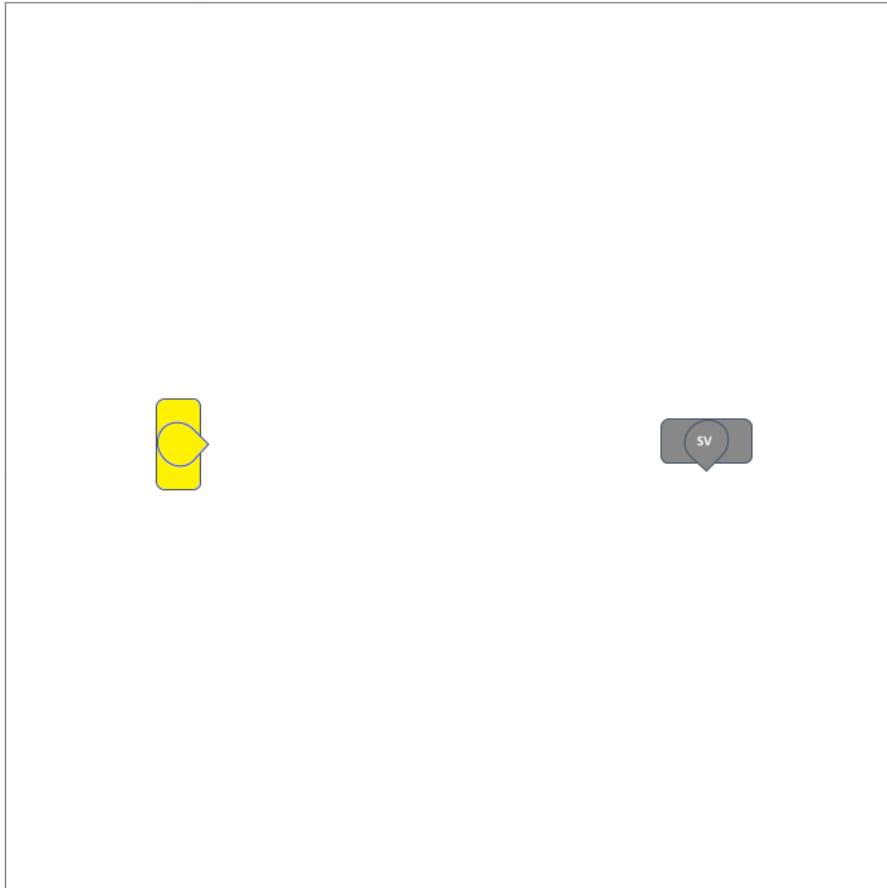
Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

Question 6

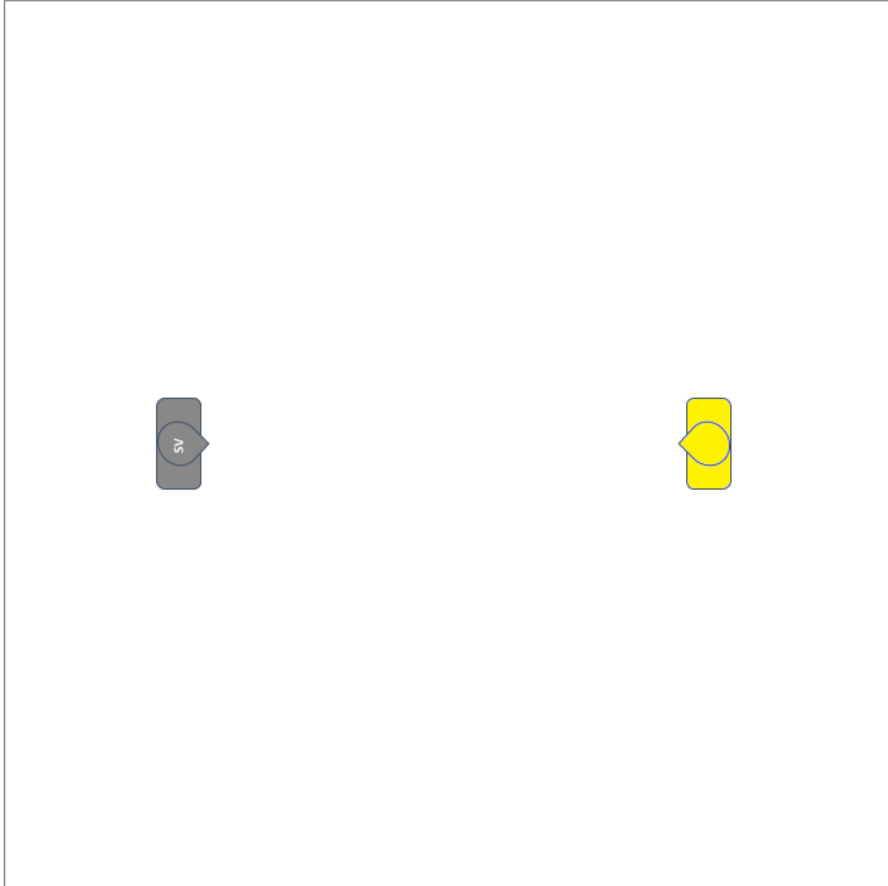
Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

Question 7

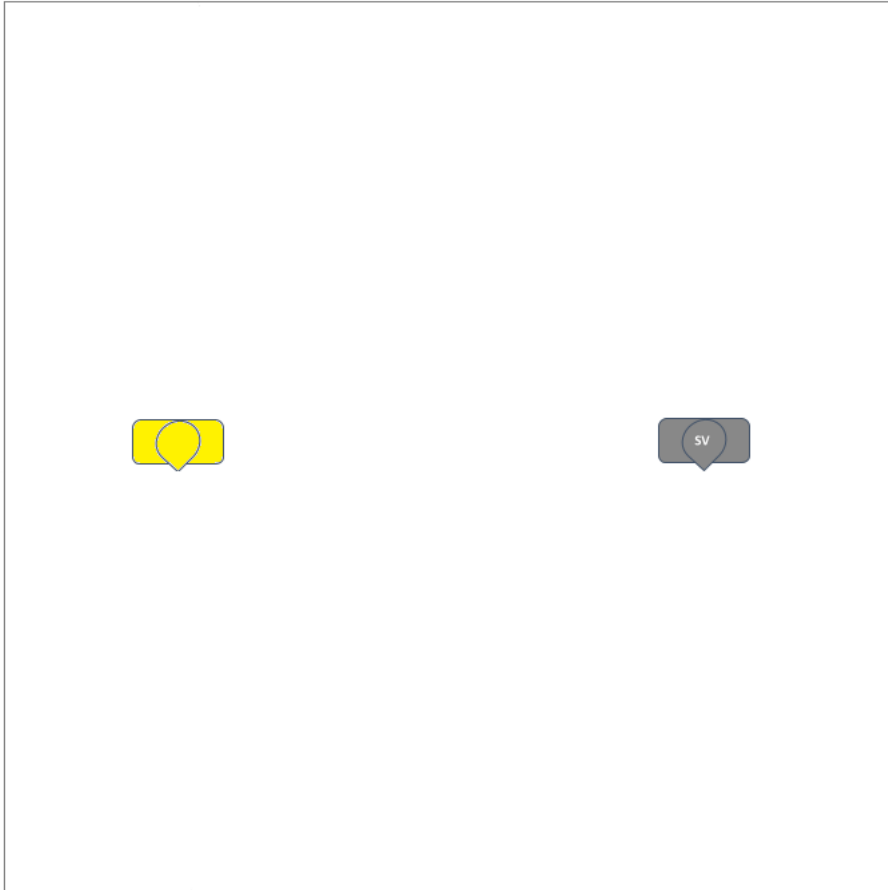
Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

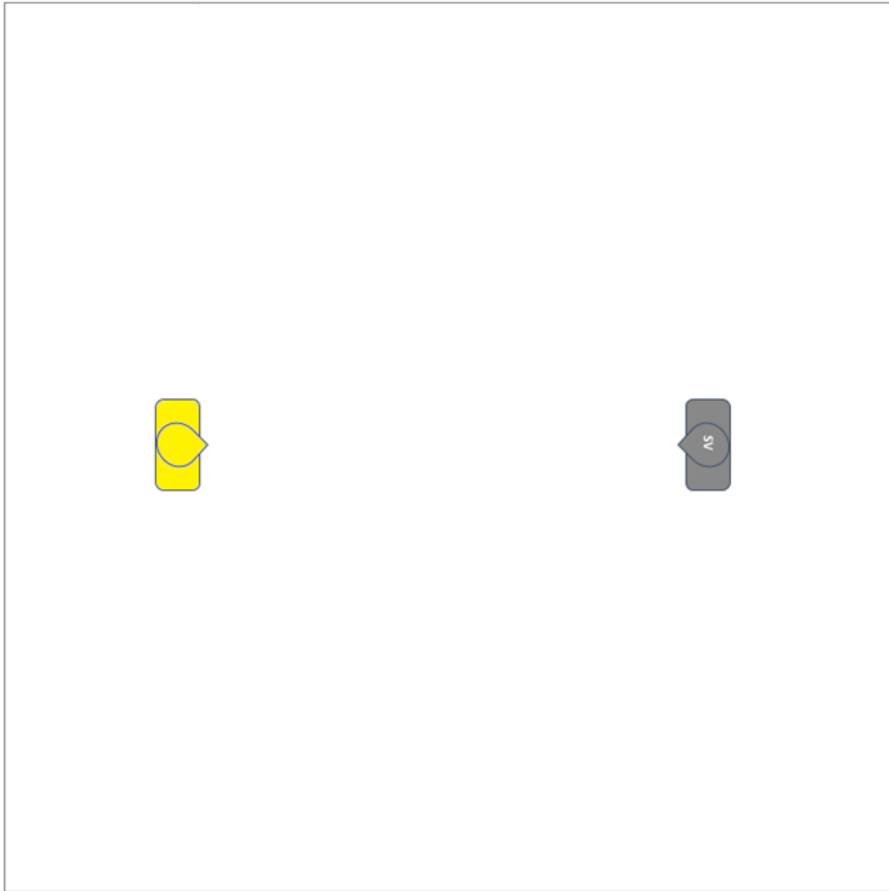
Question 8

Please look at the picture and answer the questions below. The grey figure represents the supervisor, indicated by 'SV'. The yellow figure represents the student.



- 1 What can you tell about the collaboration between the individuals from this picture?
<open text>
- 2 On a scale from 0-100 how successful do you think this collaboration is? 0 is regarded as 'not at all successful' and 100 is regarded as 'extremely successful'.
<slider 0 – 100>
- 3 On a scale from 0-100 how pleasant or joyful do you think this collaboration is for the student? 0 is regarded as 'not at all pleasant' and 100 is regarded as 'extremely pleasant'.
<slider 0 – 100>
- 4 Do you recognize the situation in the picture from your own life?
 - yes (1)
 - no (2)
 - maybe (3)
 - I don't know (99)

Please look at the final picture and answer the two questions below.



1 Disregarding the position of the two individuals, what do you think of the distance between the individuals in this picture?

<open text>

2 Can you guess the distance between the individuals in this picture (in meters)?

<open text>

Finally, we would like to ask you to answer a few questions about yourself.

1. What is your native language?

< choose >

- English (1)
- German (2)
- Spanish (3)
- French (4)
- Portuguese (5)
- Chinese (Mandarin) (6)
- Dutch (7)
- Arabic (8)
- Other, namely <open question> (9)
- I prefer not to say (999)

2. In which country were you born?

- <open text>

- I don't know or I prefer not to say (999)

3. How would you describe your national identity (for instance Dutch or German)?

- <open text>

- I don't know or I prefer not to say (999)

4. What gender do you identify with?

- Male (1)
- Female (2)
- Other (3)
- I prefer not to say (999)

5. What is your age?

- <open text>

- I prefer not to say (999)

6. What is the highest degree or level of education you have completed?

- Primary education (1)
- Secondary education (high school) (2)
- Trade/ technical/ vocational training (3)
- College or university: Bachelor's degree (4)
- College or university: Master's degree (5)

7. Have you ever supervised a student?

- Yes (1)
- No (2)

Thank you for taking the time to fill in the questionnaire and for your help with our research!

Please use this text box if you have any comments for the researchers:

<open text>

Appendix B

Codebook for the Open-ended Questions

Theme	Description	Code	Description	Example
Evaluation of the collaboration	The respondent evaluates or assesses the collaboration, without interpreting it further.	Good collaboration	The collaboration is evaluated as good or very good. The respondent may use words as ‘well organised’, ‘decent’, etc. to refer to a positive collaboration	"They are working together in a good way they will produce positive results, since they are even facing each other" "They can collaborate very well in this situation. "
		Ok/ sufficient collaboration	The collaboration is evaluated as sufficient. The respondent thinks that the collaboration is possible	"seems okay" "They are collaborating, but could be more"
		Little collaboration	The collaboration is evaluated as less than sufficient. There is collaboration possible to some extent	"There may be a collaboration between them, but it is not the closest one"

		Poor collaboration	The collaboration is evaluated as poor or bad	"It won't work" "This is a bad collaboration"
		No collaboration	The respondent indicated that there is no collaboration possible	"There seems to be no collaboration between the individuals" "There seems to be little relationship in this collaboration"
Interpretation of the relationship	The respondent interprets the relationship of the two figures, regardless of the collaboration or the success of the collaboration	Friendly/ comfortable/ they get along	The respondent evaluates the relationship as positive	"They seem to get along, so I think it would be a nice collaboration."

	Formal	The respondent indicated that the collaboration seems very formal or hierarchical. Or they indicate that the SV has a dominant position. Or unequal positions	"It looks as a bad, very formal collab." "The SV seems to be in a position of power"
	Distant	The respondent interprets the distance between the individuals	"they seem quite distant to each other." "The supervisor seems somewhat distant from the student"
	Uncomfortable/ awkward/ weird	The respondent evaluates the relationship as uncomfortable or awkward. The relationship does not have to be very negative and no indication of a conflict	"it might be a bit uncomfortable for the student very little personal space." "they are pretty close to each other, it looks uncomfortable and awkward"

	Not friendly/ they do not get along	The respondent evaluates the relationship as negative	"They cant really work together they don't like each other"
	Conflict/ arguing/ upset/ contemptuous	The respondent indicates that there is an argument or conflict. Or that they cannot reach agreement.	"Don't want to work together at all." "They are communicating but a part of me thinks they're arguing."
Interpretation of the attitude	The respondent gives an interpretation of either the student's attitude, the SV's attitude, or the attitude of both		
<i>Interpretation of the attitude of the SV (supervisor)</i>	The respondent gives an interpretation of the attitude of the SV, but not the student	SV is not interested/ motivated/ paying attention	"The supervisor doesn't seem very interested in collaboration" "The supervisor seems disinterested"

		SV is interested/ motivated/ paying attention	"SV is focused on the student. " "The supervisor seems to want the student's attention."
		SV is supervising the student	"seems like the supervisor is actually supervising the student and the student is doing is work " "The student is being coached, just like the other picture"
<i>Interpretation of the attitude of the student</i>	The respondent gives an interpretation of the attitude of the student, but not the SV	Student is not interested/ motivated/ paying attention	"the student doesn't pay attention" "The supervisor does not have the student's full attention."

		Student is interested/ motivated/ paying attention	"The student is getting to what he has to do"
		Student is supervising the SV	"The students seems to be the one that is supervising the SV"
<i>Interpretation of the attitude of both</i>	The respondent gives an interpretation of the attitude of both the student and SV, or the result of this attitude	Both are not interested/ motivated/ paying attention	"none are paying attention." "The two seem completely disinterested in each other"

<p>Both are interested/ motivated/ paying attention</p>	<p>"They seem they are paying attention to each other" "They are both interested in collaborating but are too far away"</p>
<p>Both are doing their own thing/ working separately/ in parallel</p>	<p>"They seem to be working separately." "the supervisor is just supervising, the student is looking the other way probably doing their thing, I don't think they are having conversation"</p>
<p>SV is motivated/ interested, student is not</p>	<p>"The sv is trying to take charge and direct the student but the student isn't really interested in the supervisors opinions."</p>

Student is
motivated/
interested, SV
is not

"The student may be a bit lost in the situation and the supervisor ignores him."
"Seems to me that the student is looking for a stronger collaboration than the one that the SV is giving, maybe a situation where the student is trying to get some answers and the supervisor is not being very helpful or interested."

Focused on
each other/ just
looking, no
work is being
done

"They are focused on each other, but they aren't focused in an objective maybe."

Description of the situation	The respondent only describes the figure, there is no interpretation.	Situation	<p>"They are both not looking at each other."</p> <p>"The student is facing away from the supervisor"</p> <p>"they stand next to each other, both looking in front of them, with a distance between them "</p>
Description of the activities	collaboration or the relationship	Activities	<p>"I think the supervisor is giving you a practical demonstration"</p> <p>"Casual conversation, maybe"</p> <p>"they move in the same direction"</p>
Nothing	The respondent indicates that they cannot say anything about the collaboration, or that they need more information	Nothing/ more context needed	<p>"I don't really know. I'm confused by this collaboration."</p> <p>"Not much to be honest."</p>

Unclear	It is not clear what the respondent meant by their answer, or their answer refers to a previous picture	Unclear	<p>"Same as before."</p> <p>"A bit spacer"</p> <p>"taking advantage of the support that is provided is essential to get something done. "</p>
Other	The response does not fit any of the other codes	Other	<p>"Romantic"</p> <p>Reference to communication</p>

Note. Themes are formatted in bold, subthemes are formatted in cursive.

Appendix C

Percentages of Responses for Each Code, per Picture

Code	Picture							
	1	2	3	4	5	6	7	8
Good collaboration	30.3	5	12	0	0.9	1.9	13.2	5.6
Ok/ sufficient collaboration	5.5	2.5	8.5	0	0	0.9	9.6	6.4
Little collaboration	0	1.7	5.1	1.8	0.9	3.7	1.8	4
Poor collaboration	0.9	6.7	2.6	15.3	9.8	8.3	2.6	7.2
No collaboration	0	8.4	1.7	24.3	5.4	5.6	0	10.4
Friendly/ comfortable/ they get along	7.3	0.8	2.6	0	0	0	1.8	0
Formal	0.9	3.4	3.4	0.9	0	0	1.8	0.8
Distant	0.9	34.5	18.8	2.7	0.9	0	19.3	7.2
Uncomfortable/ awkward/ weird	2.8	2.5	1.7	2.7	4.5	0.9	0.9	4
Not friendly/ they do not get along	0	1.7	0.9	2.7	1.8	0.9	0.9	0.8
Conflict/ arguing/ upset/ contemptuous	0.9	1.7	1.7	7.2	0.9	1.9	0.9	0
SV is not interested/ motivated/ paying attention	0	0	0	0	0	26.9	0.9	1.6

SV is interested/ motivated/ paying attention	0.9	0.8	0.9	0	1.8	0	0.9	0
SV is supervising the student	0	0.8	0.9	0	11.6	0	2.6	0
Student is not interested/ motivated/ paying attention	0	0	0	0	17.9	0	0	0
Student is interested/ motivated/ paying attention	0	0.8	0	0	0	1.9	0	0
Student is supervising the SV	0	0	0	0	0	1.9	0.9	0
Both are not interested/ motivated/ paying attention	0	0.8	0	9	0	0.9	0	4.8
Both are interested/ motivated/ paying attention	11.9	0	8.5	0	0	0	7	3.2
Both are doing their own thing/ working separately/ in parallel	0	1.7	0	5.4	0.9	0	0	16
SV is motivated/ interested, student is not	0	0	0	0	7.1	0	0	0
Student is motivated/ interested, SV is not	0	0	0	0	0	8.3	0	0
Focused on each other/ just looking, no work is being done	0.9	0	0.9	0	0	0	0.9	0

Situation	9.2	10.9	9.4	9.9	4.5	7.4	9.6	6.4
Activities	12.8	3.4	6.8	2.7	10.7	13	10.5	11.2
Nothing/ more information or context needed	0	1.7	0.9	0	4.5	0.9	2.6	1.6
Unclear	7.3	5	4.3	4.5	5.4	5.6	5.3	4.8
Other	7.3	5	8.5	10.8	10.7	9.3	6.1	4

Note. The highest percentage for each picture is formatted in bold.