



universität
wien

MASTERARBEIT

Titel der Masterarbeit

„Sex Differences in Gesturing and Gesticulation“

verfasst von

Daniela Bergmann, BSc

angestrebter akademischer Grad

Master of Science (MSc)

Wien, 2013

Studienkennzahl lt. Studienblatt:

A 066 878

Studienrichtung lt. Studienblatt:

Masterstudium Verhaltens-, Neuro- und Kognitionsbiologie

Betreut von:

Dipl.-Biol. Dr. Karl Grammer

TABLE OF CONTENTS

1 INTRODUCTION	5
2 METHODS	13
2.1 Participants	13
2.2 Material	13
2.3 Tasks	14
2.4 Experimental Procedure	15
2.5 Questionnaire	16
2.6 Coding of Behaviour	17
2.6.1 Feedback Words	17
2.6.2 Gestures	18
2.6.3 Reliability Check	18
2.7 Statistical Analysis	19
3 RESULTS	20
3.1 Descriptive Statistics	20
3.2 Comparison of Cartoon and Picture Group	20
3.3 Differences between Sexes	22
3.4 Differences between Group Compositions	22
3.5 Differences between Relationship Status	25
3.6 Differences between Attractiveness and Unattractiveness	26

4 DISCUSSION	27
4.1 Comparison of Cartoon and Picture Group	27
4.2 Differences between Sexes	28
4.3 Differences according to Group Compositions	29
4.4 Differences according to Relationship Status	29
4.5 Differences according to Attractiveness	30
4.6 Summary	30
REFERENCES	32
APPENDIX	35
Appendix A	35
Appendix B	38
ABSTRACT	47
ZUSAMMENFASSUNG	48
ACKNOWLEDGEMENTS	49
CURRICULUM VITAE	50

1 INTRODUCTION

Communication is an essential part of our life. As social beings it is important for us to establish and maintain contact with our environment. With the help of communication we can socially interact with other people by exchanging information, expressing our thoughts and revealing our emotional state.

Human interaction is multifaceted. It includes not only verbal components (e.g. speech) but also non-verbal elements, such as postures (for the display of attitude), facial expressions (for the display of emotions) and gestures. When we communicate with each other, it appears quite natural to us to use gestures. These spontaneous movements, mainly of the arms and hands, generally accompany our speech and are mostly used unconsciously (McNeill, 1992). Even though gestures are very diverse, they are ubiquitous – which means they are used from people in all cultures all around the world, although some gestures may have cultural variations (Feyereisen & De Lannoy, 1991). The "thumbs up" gesture for example is generally associated with approval, but in some middle east countries it may be considered as an insult.

Our speech and the corresponding gestures usually express the same meaning but in a different kind of way. According to McNeill (1992) language, which includes sign language as well, is segmenting and linearizing meaning. This means that every event (e.g. a simple sentence) is divided into smaller segments (words) which have to be organized in a specific manner (according to syntax). Gestures, on the other hand, are considered global and synthetic. The term "global" implies that the meaning of the parts is defined by the meaning of the whole gesture - unlike in language, where the meaning of the sentence is defined by the meaning

of the parts (words). Gestures are also synthetic because one gesture can have many different meanings, whereas one word mostly has only one distinct meaning.

During childhood we learn to gesture as soon as we learn how to talk. Acredolo and Goodwyn (1988) stated that gesturing emerges in young children at around the same time as the development of early words, with pointing gestures appearing at about 10 months of age. An early experience with gestures can also enhance the verbal development in children (Goodwyn et al., 2000). In a study from 2009, Xu and colleagues used functional MRI to examine which system in the human brain processes gestures. The participants watched one set of video clips of an actress performing certain gestures and a second set of video clips where the actress only said the words corresponding to these gestures. It has been shown that the gesture processing takes place in regions of the brain such as Broca's and Wernicke's areas. These are the same areas we use for speech and sign language, which suggests that gesturing is closely linked to speech.

But which mental mechanisms underlie gesture production? One theory is that gestures are a kind of embodiment. The concept of embodiment suggests that the mind does not only influence the body's movement, but the way how our body interacts with the environment also influences the abilities of the mind. Goldin-Meadow and Beilock (2010) stated that "our internal representations of objects and events are not grounded solely in amodal propositional code, but are also linked to the sensorimotor systems that govern acting on these objects and actions" (p. 664). The sensorimotor experiences we gain from different objects by acting on them changes the way we think about these objects. In respect of gestures this could mean that they "emerge from the perceptual and motor simula-

tions that underlie embodied language and mental imagery" (Hostetter & Alibali, 2008, p. 502).

As mentioned before, gestures usually accompany speech. As communicator we can use gestures to pass on information to the listener and emphasize important parts of our speech. Gestures can either provide additional information that makes a verbal expression more precise or they can contribute substantive content and even replace spoken words (McNeill, 2000).

Interestingly, we do not stop using gestures when the listener is not able to see us. Nowadays a great part of our communications takes place via telephones, and even if the person we talk to is not present, we can still observe ourselves making gestures. We also continue to use gestures when we are talking to blind people, and even blind people themselves gesticulate. A study from Iverson and Goldin-Meadow (1998) showed that children who are blind since birth spontaneously use gestures when talking to sighted or other blind children and their rate of using gestures is not strikingly different from children who can see. This suggests that gesturing does not require a model to learn from and it might as well not only benefit the listener, but also the speaker. The usage of gestures could support our own thinking process. Moreover, gesture production may be connected with fluent word production, as there have been reports that our speech is not as smooth when we are forbidden to use gestures. Rimé and colleagues (1984) compared the speech performance of subjects who had their arms, head, legs, and feet immobilized and subjects who could move their bodies freely. The results of this study illustrate that participants who could not move their limbs made more pauses during talking and even changed the content of their speech: they made less use of words that describe movements or actions.

There are three major theories that try to explain how gestures can support the speaker itself: the Image Activation Hypothesis, the Lexical Retrieval Hypothesis and the Information Packaging Hypothesis. According to the Image Activation Hypothesis, gestures help to keep a mental image activated, which is then strongly connected to the corresponding word (Freedman, 1977). The Lexical Retrieval Hypothesis states that gestures facilitate the access to lexical terms in the mental lexicon and therefore support the speaker in the preparation of his speech (Krauss et al., 2000). The Information Packaging Hypothesis on the other hand claims that gestures help to pack information into units that are suitable for speech (McNeill, 2000).

In summary, it can be stated that there is a lot of interest in research of gesturing as it seems to play a role for the comprehension of the listener (Kendon, 1994; Goldin-Meadow, 2003), but it may be even more important for the speaker itself (Freedman, 1977; Frick-Horbury & Guttentag, 1998; Iverson & Goldin-Meadow, 1998; Krauss et al., 2000; McNeill, 2000).

McNeill (1992) classified gestures into two main categories: beat gestures and representational gestures. Beat gestures are motorically simple, rhythmic gestures and do not convey semantic content. Representational gestures on the other hand are more complex and depict semantic content with the shape, placement and motion trajectory of the hands. Representational gestures can be further divided into four different subtypes (Alibali et al., 2001):

- iconics, which are gestures that depict concrete referents (e.g. a throwing motion with the hand)
- metaphorics, which are gestures that depict abstract referents metaphorically (e.g. making a circular hand movement to represent “continuing”)

- spatial deictics, which are gestures that convey the direction of a movement (e.g. pointing upward)
- literal deictics, which are gestures that indicate concrete objects in order to refer to those objects or to similar ones (e.g. pointing to a specific person)

According to McNeill (2000) there is another category of gestures called "emblems", which are gestures that have a conventional form and meaning (e.g. the victory sign). These gestures, however, are not considered as part of the representational gestures. To make the distinction easier, David McNeill lined up the different terms (which were first defined by Adam Kendon) along a continuum named "Kendon's continuum". This ordering reads as follows: gesticulation → pantomime → emblem → sign language. McNeill arranged these categories according to their relation to speech, linguistic properties, conventions and their semiotic differences. For "real" gestures, the presence of speech is obligatory, whereas in emblems it is optional but not necessary, and in pantomime and sign language it is obligatory absent. Gestures have no linguistic properties - they cannot be combined with other gestures to form a syntax and they are non-morphemic. There are also no specific rules on how to make certain gestures, means they are not unified in their appearance. Emblems may show some linguistic properties and since there is a more or less precise structure of these gestures (e.g. the victory sign can only be formed by the index and middle finger), they show some form of convention. As mentioned before, the semiotic character of gestures is considered to be global and synthetic. Emblems are synthetic as well. Even though they are conventionalised, they can have different meanings in different cultures. An example may be the emblem made by forming a ring shape with the thumb and index finger. In most countries this emblem may be referred to as "ok sign",

whereas in some parts of southern Europe, Mediterranean countries or South America it may be considered as an offensive or vulgar expression. The difference between emblems and gesticulations is, that emblems are not global, but rather segmented. The victory sign can only be understood if certain "segments" are used, namely the index and middle finger.

Although McNeill put emblems and representational gestures into two different categories, their basic temporal structure is the same. Both gesture types consist of three phases called preparation, stroke and retraction (McNeill, 1992). Preparation is the phase where the hands are moved away from the neutral resting position into the gesture space. Here we can start the stroke, which is the gesture phase that delivers the meaning. It is usually synchronous with the speech, but it can also precede the speech a bit (Nobe, 2000; Valbonesi et al. 2001). Retraction is the phase where the hands return back to the resting position, however, this final resting position does not always have to be the same position as the one before the start. Also, the retraction phase can be missing completely, e.g. if the speaker immediately moves into a new stroke. The only exception from this three-phased structure are the beat gestures, since they consist of only two movements (e.g. up/down, back/forth, etc.).

As said before, gestures are used from people in all cultures and even blind people gesticulate. But are there any differences in the usage of gestures among people? Dickerson (1971, cited in Thies, 2003) observed that the speech of non-native speakers tends to be more disfluent and hesitant than those of native speakers. Wexelblat (1995), on the other hand, couldn't find any difference in the amount of produced gestures between second language and native speakers. Moreover, according to his study, the gender of the speaker seems to be an unre-

liable predictor of gesture frequency, even though Poling (1978) found that women and high dominant people tend to use more emblems.

The goal of this study is to take a closer look at the gesturing of men and women and to examine whether there is a difference in their gesture production or not. According to a study from 2008 by Schmitt et al. where the big five personality traits of men and women were compared across 55 cultures, women had significantly higher levels of neuroticism, extraversion, conscientiousness and agreeableness than men. Extraverted people are considered to be more sociable and talkative, and a higher agreeableness level can lead to more cooperative and trusting behaviour (Barrick & Mount, 1993). A higher level in these personality traits could lead to an overall increase in the gesturing. In addition, due to the parental investment theory, males have to compete over females as they are usually the limiting resource regarding population growth and females need to be selective in choosing their mates as they invest more in offspring than males (Trivers, 1972). Nonverbal behaviour seems to be an important factor for the judgment of attractiveness (LaCrosse, 1975), and therefore men could use more or different gestures when talking to women than talking to other men.

In his study, Wexelblat (1995) asked the subjects to retell a short film clip to the experimenter while being videotaped. He couldn't find any difference in the amount of produced gestures between men and women. In the following study, participants will be asked to accomplish one of two retelling tasks (retelling a short animated film clip or describing the picture of a house) and they will be recorded while talking to other participants instead of the experimenter. The gestures of the participants will be analysed and compared to reveal possible differences.

The following hypotheses were set for this experiment:

1. Differences in the task groups

Due to the distinct content of the two tasks, I expect differences in the gesture categories used by the participants.

2. Differences between men and women

Differences in the overall amount of gestures between men and women may be explained by the differences in personality traits, or more specifically the openness, extroversion and dominance of the participants.

3. Differences regarding the group compositions

Differences in the quantity and quality of gestures of men when speaking to women compared with speaking to other men may support the theory that men use gestures to impress women and signal attractiveness to take the lead in the competition for females.

4. Differences between strangers and friends

A conversation with friends includes less anxiety and more positive expectations than with acquaintances or strangers (Gudykunst & Shapiro, 1997). Therefore I expect an overall higher gesture frequency between friends than between strangers.

5. Differences according to attractiveness

As stated before, gestures are an important factor for judgement of attractiveness. Therefore I expect participants to do more gestures when they are talking to an attractive person to signal attractiveness themselves.

2 METHODS

To achieve the study objectives, a video-chat experiment was conducted. This particular experimental design was chosen to make the recording of the participants' behaviour easier and more discrete. Due to the characteristics of the set-up, two subjects were always tested simultaneously and therefore a second experimenter assisted in the process of data collection. All data was recorded from May to June 2012 at the biocentre Althanstraße in Vienna, Austria.

2.1 Participants

A total number of 176 participants had been recruited. Due to technical difficulties in the recording and unexpected behaviour of the subjects, only data from 152 participants was used for the analysis. The subjects had a mean age of 23.5 years ($SD = 4.5$, range = 16 - 42), yet one person did not make a specification of his age. All participants were native German speakers and recruited at the biology university centre Althanstraße in Vienna, Austria. To ensure that our subjects are unaware of the study goal and therefore do not restrict themselves in their gesturing, we asked them to participate in a study about memory differences in men and women. The subjects were divided into three groups consisting of two same-sex groups with 23 female-female and 25 male-male pairs and one mixed-sex group with 28 pairs.

2.2 Material

To establish a video-chat between our participants, we used an Apple Computer (Mac Mini) and a Notebook (Dell Inspiron N5110) with the free video-calling

software Skype 5.7. For the video transmission we used an external USB webcam for the Mac and the built-in webcam of the Notebook. The chat was recorded with the Apple computer using the Skype add-on Ecamm Call Recorder, which made it possible to save the video and the sound on two separate channels for each participant. The audio was captured with the webcam's built-in microphone at 44 kHz with 2 : 1 compression and the video was recorded in QuickTime format with a resolution of 320 x 240 pixels at 14 frames per second and H.264 compression.

For the experiment, two different rooms of approximately the same size were used at the biology university centre. To ensure the correct distance of the subjects to the webcam, a seat was placed 80 cm away from the monitor. This setting allowed us to capture the whole upper part of the participants' bodies. Two spotlights were used - one in each room - to enhance the illumination and thereby the video chat quality. The participants were wearing headsets during the whole experiment to ensure a good sound quality.

2.3 Tasks

There were two different tasks for every subject pair. Participant A was asked to describe the picture of a modern style house shown in Figure 1, whereas participant B had the task to retell a short cartoon clip during the chat. This film clip was an extract of the Swiss stop-motion claymated television series "Pingu" (for a screenshot see Figure 2). The cartoon extract shows the main character - a penguin - trying to build a catapult with his friend out of red braces. As his attempt goes wrong, he gets flung back and forward on the ice and eventually winds up around a table.



Figure 1: Picture of the house used in the retelling task.



Figure 2: Screenshot of the cartoon clip used in the retelling task.

2.4 Experimental Procedure

Prior to each experimental session, the settings of the computer and every software used were checked. We recruited two participants at the university centre and placed them in separate rooms in front of a computer/notebook. We ensured that they took off their backpacks and jackets to be able to move freely, and afterwards we explained the experimental procedure. Before launching Skype, one subject watched a short animation film clip (duration: 41 seconds) and was asked to retell this film to his/her communication partner in the course of the video chat. At the same time the other participant had to memorize the picture of a house (for 41 seconds as well) and was asked to describe this image to the other person later. Then the video chat was established between the participants using Skype. After a short check of the connection and functionality of microphone, webcam and headset, we started two stopwatches simultaneously with the help of the video transmission. The subsequent leaving of the two experimenters and shutting of the doors was the starting signal for the participants. Both of them had two minutes for the completion of their task. The person with the house description task started, and the switching was signalled with a knocking at the door after two

minutes. After finishing the experiment, both subjects filled out a questionnaire (see Appendix A) and signed an informed consent, which informed them about the video recording. The duration of the whole experiment was around 20 minutes.

2.5 Questionnaire

The questionnaire was divided into six different sections. The first section consisted of a short PANAS (Positive and Negative Affect Schedule). We offered our participants 12 different words which described emotional states and they had to indicate how much each word matched with their current mood. The rating was done using the Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The second section was task related. We either showed our subjects pictures of 10 different houses and asked them to recognize the one that has been described to them, or they had to retell what they remember of the explained cartoon in short sentences. The third part of the questionnaire was about the conversation quality. The subjects were asked if they are familiar with computers and video chatting, if the audio and video quality of the chat was good and if the conversation was comprehensible and interesting. Section four consisted of questions about acquaintance and attractiveness. We asked the subjects if they knew each other before this experiment and how attractive and likeable they consider their conversation partner. The fifth part was about the relationship status where participants were asked about their sexual orientation and if they are living in a relationship right now or searching for a partner. For female participants there was a sixth section in the questionnaire where we asked about the menstrual cycle and possible hormonal contraceptives.

2.6 Coding of Behaviour

For the data analysis I used the free java-based video annotation tool ANVIL 5.1.2 (Kipp, 2001). I created three tracks for each subject including a "feedback words" track, a "beat gesture" track and a "representational gestures" track (for a screenshot of the software see Figure 3). Every ANVIL file contained the data from two participants as the videos were shown in split-screen mode.

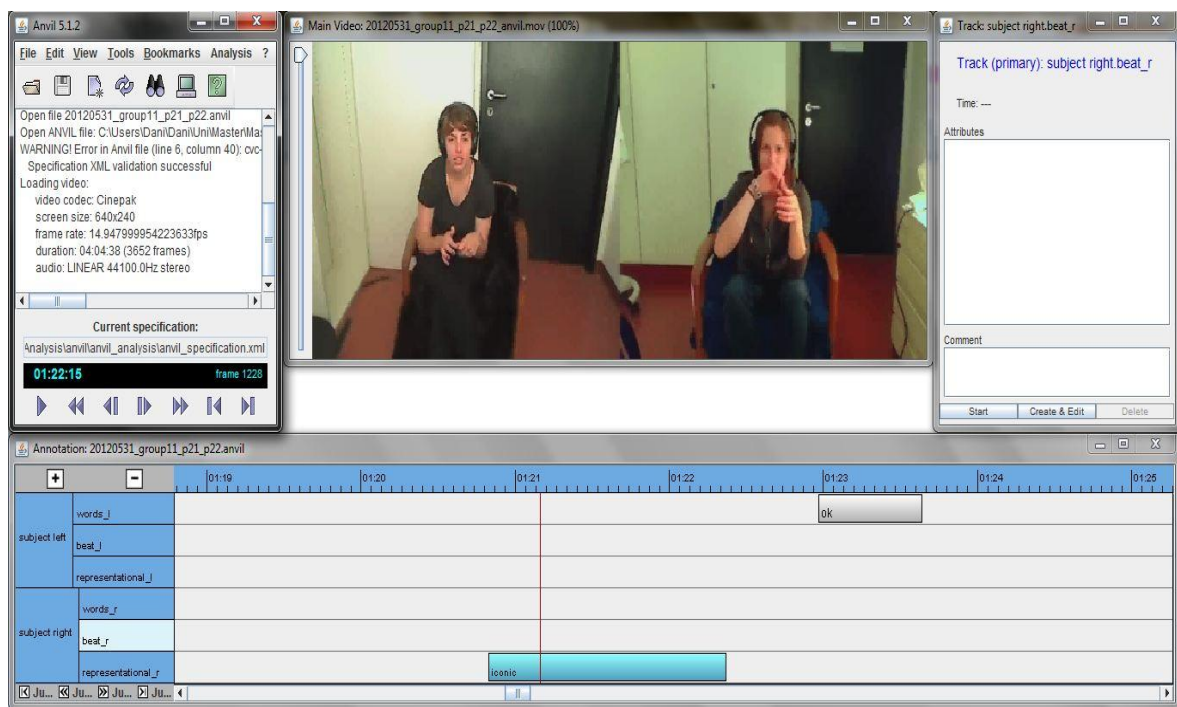


Figure 3: Screenshot of the video annotation software ANVIL.

2.6.1 Feedback Words

A transcription of short feedback words was done. These are words like "okay", "I see" or the short nasal sound "Mm-hmm" and are used from the listener to inform the speaker about the willingness to continue the conversation, the perception and understanding of information and the feelings and attitude of the listener (Allwood, 1988).

2.6.2 Gestures

The gestures were classified into beat gestures and representational gestures. Beat gestures were considered as gestures with just two types of movement and without semantic content. A single beat consisted of a pair of opposing movements (e.g. one up and down movement equals one beat).

Representational gestures were divided into six groups:

- iconics (gestures that describe features, e.g. the size or shape of objects)
- metaphors (gestures that describe metaphors, e.g. moving the hand in a circular way to describe "ongoing")
- spatial deictics (gestures that show directions, e.g. pointing to the left)
- literal deictics (gestures that show concrete objects, e.g. pointing to the listener)
- emblems (gestures that show symbols, e.g. the ok sign)
- mimetics (gestures that describe actions, e.g. the throwing of a ball).

The action gestures were separated from the iconics as I expected a strong difference in these two categories according to the task group. Mimetics may appear mainly during retelling of the cartoon, whereas iconics may appear mainly during picture retelling. I also added the emblems in the list of representational gestures to make the analysis easier. For the duration of the gestures only the stroke part was coded.

2.6.3 Reliability Check

After coding all videos, I recoded five of the first videos. For the reliability check I used a built-in function of the ANVIL annotation software, which calculated the Cohen's kappa for the representational and beat gestures separately. The cor-

rected kappa was in all cases above 0.90 for the representational and above 0.83 for the beat gestures (see Table 1).

Table 1: Results of a reliability check using the ANVIL annotation software. The table is showing the overall coding agreement (considering segmentation and categories).

Group/Participant No.	Representational Gestures		Beat Gestures	
	Percentage	Corrected Kappa	Percentage	Corrected Kappa
g2/p3	91.35	0.90	95.67	0.91
g2/p4	92.85	0.91	97.34	0.95
g3/p5	96.90	0.96	94.61	0.89
g3/p6	97.71	0.97	96.73	0.93
g5/p9	93.03	0.91	95.69	0.91
g5/p10	91.87	0.90	97.68	0.95
g6/p11	94.77	0.93	97.55	0.95
g6/p12	93.63	0.92	92.65	0.85
g10/p19	96.40	0.95	91.65	0.83
g10/p20	94.76	0.93	95.09	0.90

2.7 Statistical Analysis

For the statistical analysis I exported the ANVIL data into a text file (.txt) containing the sum and duration of all gestures and feedback words, and I transcribed the questionnaire data into an Excel spreadsheet. Afterwards I transferred both files to SPSS 21 and merged them, resulting in one data sheet for all participants. A one-sample Kolmogorov-Smirnov-test was conducted to check for normal distribution. I split the data into two groups, which I analysed separately - the cartoon group, consisting of participants who had to retell the short film clip, and the picture group consisting of participants, who had to describe the image of a house. For all tests, statistical significance was set at $p < 0.05$.

3 RESULTS

3.1 Descriptive Statistics

152 participants, 78 men and 74 women, were coded. There were two different groups distinguished by the task they had to fulfil during the chat. The cartoon group consisted of 37 men and 39 women, the picture group of 41 men and 35 women. 57 participants stated to be good friends with their conversation partner, 16 stated to be acquaintances and 79 never saw their conversation partner before. 76 participants were at the time of the experiment in a relationship, 75 were single and one person did not make a statement for the relationship status. The duration of the participants' relationship was between 0,5 and 156 months (mean: 30,94; SD 26,53; data from three people missing).

3.2 Comparison of Cartoon and Picture Group

Several variables of the two task groups showed significant differences when compared with either a t-test or a Mann-Whitney test. Table 2 and 3 show the results for the sum and duration of the feedback words and gestures.

Table 2: Results of a t-test comparing sum and duration of gestures and feedback words of the two task groups.

	Cartoon (n =76)		Picture (n = 76)		t	p
	mean	SD	mean	SD		
Feedback Words Duration	4.28	2.53	4.59	3.69	-0.610	0.543
Beats Sum	26.43	13.39	21.58	14.25	2.164	0.032*
Beats Duration	16.18	8.58	13.18	8.05	2.225	0.028*
Representationals Sum	27.93	12.25	26.29	14.75	0.748	0.456
Representationals Duration	30.86	12.93	26.27	14.44	2.062	0.041*
Spatial Deictics Sum	14.47	6.73	10.24	7.51	3.661	0.000***
Spatial Deictics Duration	17.51	8.07	8.95	6.44	7.219	0.000***

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 3: Results of a Mann-Whitney U-test comparing sum and duration of gestures and feedback words of the two task groups.

	Cartoon (n =76)		Picture (n = 76)		U	z	p
	mean rank		mean rank				
Feedback Words Sum	77.09		75.91		2843.00	-0.166	0.868
Iconics Sum	56.24		96.76		1348.00	-5.687	0.000***
Iconics Duration	54.01		98.99		1178.50	-6.300	0.000***
Metaphorics Sum	74.69		78.31		2750.50	-0.676	0.499
Metaphorics Duration	74.55		78.45		2740.00	-0.724	0.469
Literal Deictics Sum	82.13		70.88		2460.50	-1.810	0.070
Literal Deictics Duration	82.86		70.14		2405.00	-2.018	0.044*
Emblems Sum	79.60		73.40		2652.50	-1.027	0.305
Emblems Duration	78.98		74.02		2699.50	-0.817	0.414
Mimetics Sum	107.11		45.89		562.00	-8.886	0.000***
Mimetics Duration	107.47		45.53		534.50	-8.967	0.000***

* p < 0.05; ** p < 0.01; *** p < 0.001

3.3 Differences between Sexes

There are no sex differences in the sum or duration of feedback words and gestures for both task groups (see Appendices Tables B1 and B2 for details).

3.4 Differences between Group Compositions

To analyse the influence of the sex of the conversation partner, I conducted a t-test or Mann-Whitney test separately for both task groups (cartoon and picture) with three conditions: groups of two men, groups of two women or a mixed sex group. Only the gestures made by the talking participant were taken into account. The result showed that there was no significant difference in the gesturing of women whether they talk to another woman or a man in the cartoon group as well as in the picture group (see Appendices Tables B3 and B4). For men there was a significant difference in two variables concerning the group composition (see Table 4 and 5).

Table 4: Results of a t-test comparing sum and duration of gestures and feedback words of men talking to other men or to women.

Cartoon Group	Men x Men (n =25)		Men x Women (n = 12)		t	p
	mean	SD	mean	SD		
Feedback Words Sum	9.00	5.20	6.33	2.96	1.979	0.056
Feedback Words Duration	4.53	2.66	3.07	1.34	2.206	0.034*
Beats Sum	24.28	12.46	26.67	17.73	-0.474	0.638
Beats Duration	14.18	8.17	17.57	13.24	-0.960	0.344
Representationals Sum	27.24	10.72	31.25	12.07	-1.023	0.313
Representationals Duration	29.36	11.43	35.49	8.69	-1.640	0.110
Iconics Duration	6.08	3.62	9.21	4.14	-2.349	0.025*
Spatial Deictics Sum	13.88	6.65	15.08	7.37	-0.498	0.622
Spatial Deictics Duration	16.76	8.47	19.80	7.09	-1.077	0.289
Mimetics Sum	4.80	3.19	4.83	3.83	-0.028	0.978
Mimetics Duration	4.95	3.41	5.08	4.60	-0.093	0.927
Picture Group	Men x Men (n = 25)		Men x Women (n = 16)		t	p
	mean	SD	mean	SD		
Feedback Words Duration	4.51	4.37	4.08	2.69	0.355	0.725
Beats Sum	24.60	13.40	19.63	14.05	1.138	0.262
Beats Duration	13.81	6.49	11.60	7.54	0.995	0.326
Representationals Sum	28.76	15.41	24.75	16.51	0.791	0.434
Representationals Duration	27.64	13.67	25.16	17.59	0.507	0.615
Iconics Sum	14.56	8.66	14.69	10.45	-0.042	0.966
Iconics Duration	15.88	8.49	15.99	11.28	-0.033	0.974
Spatial Deictics Sum	12.08	7.65	8.63	6.64	1.482	0.146
Spatial Deictics Duration	10.23	6.39	7.88	6.88	1.116	0.271

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 5: Results of a Mann-Whitney U-test comparing sum and duration of gestures and feedback words of men talking to other men or to women.

Cartoon Group	Men x Men (n = 25)	Men x Women (n = 12)	U	z	p
	mean rank	mean rank			
Iconics Sum	16.62	23.96	90.50	-1.944	0.052
Methaphorics Sum	18.20	20.67	130.00	-0.867	0.386
Methaphorics Duration	18.06	20.96	126.50	-1.013	0.311
Literal Deictics Sum	18.80	19.42	145.00	-0.181	0.856
Literal Deictics Duration	18.92	19.17	148.00	-0.072	0.943
Emblems Sum	19.28	18.42	143.00	-0.257	0.797
Emblems Duration	19.44	18.08	139.00	-0.402	0.688
Picture Group	Men x Men (n = 25)	Men x Women (n = 16)	U	z	p
	mean rank	mean rank			
Words Sum	20.40	21.94	185.00	-0.403	0.687
Methaphorics Sum	21.58	20.09	185.50	-0.486	0.627
Methaphorics Duration	21.68	19.94	183.00	-0.565	0.572
Literal Deictics Sum	21.60	20.06	185.00	-0.503	0.615
Literal Deictics Duration	21.54	20.16	186.50	-0.449	0.654
Emblems Sum	22.52	18.63	162.00	-1.214	0.225
Emblems Duration	22.42	18.78	164.50	-1.123	0.261
Mimetics Sum	20.80	21.31	195.00	-0.163	0.871
Mimetics Duration	20.66	21.53	191.50	-0.275	0.783

* p < 0.05; ** p < 0.01; *** p < 0.001

3.5 Differences between Relationship Status

There were three categories that defined the relationship status: strangers, passing acquaintances and good friends. As only six people in the cartoon group and 10 people in the picture group stated to be acquaintances, I excluded this group from the following analysis.

It has been shown that in the cartoon group good friends make a higher amount of spatial deictic gestures ($M = 17.03$, $SD = 7.07$) than strangers ($M = 12.95$, $SD = 6.36$), $t(68) = -2.534$, $p = 0.014$ (see Appendices Tables B5 and B6 for more details). There are also significant differences in the amount and duration of several types of gestures between strangers and friends in the picture group (see Table 6 and 7).

Table 6: Results of a t-test comparing sum and duration of gestures and feedback words of good friends and strangers in the picture group.

	Good Friends (n = 27)		Strangers (n = 39)		t	p
	mean	SD	mean	SD		
Feedback Words	4.40	2.81	4.97	4.40	0.587	0.559
Duration						
Beats Sum	21.33	13.73	19.36	12.12	-0.616	0.540
Beats Duration	12.69	7.85	12.45	7.60	-0.125	0.901
Representational Sum	30.81	17.37	21.72	12.23	-2.348	0.024*
Representational Duration	30.35	16.61	21.95	12.13	-2.374	0.021*
Iconics Sum	16.15	8.65	11.49	7.78	-2.285	0.026*
Iconics Duration	17.75	9.83	12.97	8.31	-2.130	0.037*
Spatial Deictics Sum	12.63	9.67	8.51	5.60	-1.992	0.054
Spatial Deictics Duration	11.05	8.12	7.52	4.81	-2.026	0.050

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 7: Results of a Mann-Whitney U-test comparing sum and duration of gestures and feedback words of good friends and strangers in the picture group.

	Good Friends (n = 27)	Strangers (n = 39)	U	z	p
	mean rank	mean rank			
Feedback Words Sum	34.13	33.06	509.50	-0.222	0.824
Methaphorics Sum	35.33	32.23	477.00	-0.827	0.408
Methaphorics Duration	35.24	32.29	479.50	-0.781	0.435
Literal Deictics Sum	33.78	33.31	519.00	-0.118	0.906
Literal Deictics Duration	33.52	33.49	526.00	-0.008	0.994
Emblems Sum	33.48	33.51	526.00	-0.008	0.993
Emblems Duration	33.37	33.59	523.00	-0.058	0.954
Mimetics Sum	35.72	31.96	466.50	-1.023	0.306
Mimetics Duration	35.41	32.18	475.00	-0.874	0.382

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

3.6 Differences between Attractiveness and Unattractiveness

To assess the subjective judgement of the attractiveness of the conversation partner I asked the participants to rate this factor using the Likert scale ranging from 1 (very unattractive) to 5 (very attractive). It turned out that the grades 1 and 2 were used only from a maximum of eight people within both task groups. Therefore I pooled the data from the ratings 1 to 3 for each task group.

Subsequent analysis using a one-way ANOVA and Kruskal Wallis test revealed that there are no significant differences between the remaining rating groups within both tasks (see Appendices Tables B7 - B10).

4 DISCUSSION

The aim of this study was to investigate possible differences in the gesturing of men and women. For this purpose a video chat experiment was conducted with two different task groups (picture and cartoon) and the amount and duration of the gestures and feedback words of the participants was analysed.

4.1 Comparison of Cartoon and Picture Group

A comparison of the two task groups showed several significant differences in the amount and duration of gestures used by the participants. Subjects who where describing the picture of a house used significantly more iconic gestures and did that for a longer amount of time. This is not surprising as iconic gestures show characteristics of objects (size, shape, etc.) and are therefore useful for describing the geometric shapes of a building.

The group of participants who had to retell the short cartoon clip used significantly more beat gestures, spatial deictics and mimetics. Beat gestures are used to underline certain words (McNeill, 1992) and are also connected with verbal stress (McClave, 1994). As there is a lot of information in the video clip in a short amount of time, it is more difficult to memorize all details. This can make it more difficult to retell the content in a fluid speech, which can lead to stress among the subjects. Spatial deictics are used to show the direction of a movement and mimetic gestures show a specific action. Both gesture categories are more useful for describing the dynamic processes of a film clip rather than the static characteristics of a house. Therefore it is not surprising either that these types of gestures appear more frequently in the cartoon group.

4.2 Differences between Sexes

There were no significant sex differences in the sum or duration of feedback words or any gesture category for both task groups. These results support the findings of several former studies. Wexelblat (1995) analysed the gestures of subjects who were retelling short film clips to the experimenter and could not find any significant differences between the sexes. Frances (1979) recorded conversations between men and women and analysed their nonverbal behaviour. Out of 14 variables in the hand movement category, only one significant difference was found between the sexes: The duration of the longest gesture exhibited was longer in females than in males.

However, the results of the present study showed that there are many variations within the participants. Some subjects tend to do a lot of gestures, whereas other participants did not gesture at all during the whole video chat. A possible reason for this variation may lie in the experimental setup itself. Even if most of the participants stated to be familiar with video chatting, it is still considered as an uncommon and artificial situation, which might have caused a certain discomfort. Each participant wore headphones to enhance the sound quality and listening comprehension. A possible side-effect of the usage of this technical equipment could be that the gesturing was not as pronounced because verbal communication was considered as more reliable as the video transmission. Furthermore, the participants took a seat in rather comfortable sofa chairs. The leaned back position which the subjects obtained that way could have impaired their gesturing.

4.3 Differences according to Group Composition

Women showed no significant differences in their gesturing and feedback words whether they were talking to other women or men. Men, on the other hand, made significantly longer feedback words when talking to other men, and longer iconic gestures when talking to women. This significant result only appeared in the cartoon group. The gesture frequency was not influenced by the sex of the conversation partner.

A study from Klein and Willerman (1979) showed that in their experiment, female participants were more talkative when placed in a group of men than in a group of only women. However, in the present study I measured feedback words instead of total talking time. As the name implies, feedback words are used from the listener to give the speaker feedback about the understanding of information and the willingness to continue the conversation (Allwood, 1988). There was no difference in the total amount of feedback words, although one could consider a p-value of 0.056 as a slight trend. The same applies for the iconic gestures, where the frequency between the two sex groups gave a p-value of 0.052.

4.4 Differences according to Relationship Status

The results showed that friends made significantly more and longer iconics and had an overall higher frequency and duration in the representational gestures than strangers. This can be explained by a previous finding of Gudykunst and Shapiro (1997), who claimed that a dialogue between friends induces less anxiety, a higher communication satisfaction and more positive expectations than talking with a stranger. Less anxiety leads to a more relaxed environment and therefore possibly enhances the talkativeness and gesture production.

4.5 Differences according to Attractiveness

The results in this section do not support the hypotheses that men and women make more or longer gestures when talking to an attractive person than talking to an unattractive person.

The ratings of the participants regarding the attractiveness of the conversation partner were overall very high. Although the questionnaire was anonymous and the participants were reassured that none of the results will ever be linked to their name, it could be that most of the subjects still felt uncomfortable to rate the attractiveness of another person and therefore tend to choose higher ratings. These would explain the small number of subjects in the rating groups 1 and 2 in the question about the attractiveness of their conversation partner. Also the artificial video chat situation where they had to talk to a screen instead of the "real" person in front of them could have altered the influence of attractiveness. Furthermore, due to the experimental setup, there was no transfer of pheromones which could have influenced the gesture production overall.

4.6 Summary

The present study shows that neither sex nor attractiveness is a valuable predictor for the frequency or duration of gestures and feedback words. Also the group composition, a conversation between two people of the same or different sex, did not have a strong influence on the gesturing. Only the specific retelling task and the relationship status seem to affect the amount and duration of gestures. If the participant has to retell a static picture with many geometrical shapes, he tends to use more iconic gestures. The retelling of a film clip with a lot of actions and movements increases the usage of spatial deictics and mimetics. Furthermore,

talking to friends elicits more representational gestures in general than talking to strangers.

In this study there were many factors that had a possible influence on the gesturing of the participants. A possible next step would be to reduce these influencing factors, for example to recruit only participants who do not know each other to reduce the effect of relationship. A bigger sample size in each group composition may be able to give clearer results for sex differences. Furthermore it should be considered to change the experimental setup. Particular attention should be paid to the position of the participants, as the leaned back position in the chair may have influenced their gesturing. This was especially apparent as many of the subjects leaned back in their chair as long as their conversation partner was talking, but they slid forward to the edge of the chair as soon as they started their retelling task themselves. An experimental setup where the participants would be standing the whole time could be also possible. Even though a conversation using webcams might be a kind of unnatural setting, the recording of the participants' gestures is yet easier with the help of the video chat.

In this study I focussed only on native German speaking students from the University of Vienna. A further investigation could also take a closer look at the sex differences of gesturing in other countries and cultures. As stated before there can be cultural differences in the gesturing of people (Feyereisen & De Lannoy, 1991). Therefore it would be also interesting to compare men and women from other cultural backgrounds and countries.

REFERENCES

- Acredolo, L., & Goodwyn, S. (1988). Symbolic gesturing in normal infants. *Child development*, 450-466.
- Alibali, M. W., Heath, D. C., & Myers, H. J. (2001). Effects of visibility between speaker and listener on gesture production: Some gestures are meant to be seen. *Journal of Memory and Language*, 44(2), 169-188.
- Allwood, J. (1988). Om det svenska systemet för språklig återkoppling. *Svenskans beskrivning*, 16, 89-106.
- Barrick, M. R., & Mount, M. K. (1993). Autonomy as a moderator of the relationships between the Big Five personality dimensions and job performance. *Journal of Applied Psychology*, 78(1), 111.
- Feyereisen, P., & de Lannoy, J. D. (1991). *Gestures and speech: Psychological investigations*. Cambridge University Press.
- Frances, S. J. (1979). Sex differences in nonverbal behavior. *Sex Roles*, 5(4), 519-535.
- Freedman, N. (1977). Hands, words and mind: On the structuralization of body movements during discourse and the capacity for verbal representation. *Communicative structures and psychic structures: A psychoanalytic approach*, 109-132.
- Frick-Horbury, D., & Guttentag, R. E. (1998). The effects of restricting hand gesture production on lexical retrieval and free recall. *The American journal of psychology*, 43-62.
- Goldin-Meadow, S. (2003). *Hearing gesture: How our hands help us think*. Belknap Press.
- Goldin-Meadow, S., & Beilock, S. L. (2010). Action's influence on thought: The case of gesture. *Perspectives on Psychological Science*, 5(6), 664-674.
- Goodwyn, S. W., Acredolo, L. P., & Brown, C. A. (2000). Impact of symbolic gesturing on early language development. *Journal of Nonverbal Behavior*, 24(2), 81-103.
- Gudykunst, W. B., & Shapiro, R. B. (1997). Communication in everyday interpersonal and intergroup encounters. *International Journal of Intercultural Relations*, 20(1), 19-45.

- Hostetter, A. B., & Alibali, M. W. (2008). Visible embodiment: Gestures as simulated action. *Psychonomic bulletin & review*, 15(3), 495-514.
- Iverson, J. M., & Goldin-Meadow, S. (1998). Why people gesture when they speak. *Nature*, 396(6708), 228-228.
- Kendon, A. (1994). Do gestures communicate? A review. *Research on language and social interaction*, 27(3), 175-200.
- Kipp, M. (2001) Anvil - A Generic Annotation Tool for Multimodal Dialogue. *Proceedings of the 7th European Conference on Speech Communication and Technology (Eurospeech)*, 1367-1370.
- Klein, H. M., & Willerman, L. (1979). Psychological masculinity and femininity and typical and maximal dominance expression in women. *Journal of Personality and Social Psychology*, 37(11), 2059.
- Krauss, R. M., Chen, Y., & Gottfexnum, R. F. (2000). 13 Lexical gestures and lexical access: a process model. *Language and gesture*, 2, 261.
- LaCrosse, M. B. (1975). Nonverbal behavior and perceived counselor attractiveness and persuasiveness. *Journal of Counseling Psychology*, 22(6), 563.
- McClave, E. (1994). Gestural beats: The rhythm hypothesis. *Journal of psycholinguistic research*, 23(1), 45-66.
- McNeill, D. (1992). *Hand and mind: What gestures reveal about thought*. University of Chicago Press.
- McNeill, D. (Ed.). (2000). *Language and gesture* (Vol. 2). Cambridge University Press.
- Nobe, S. (2000). Where do most spontaneous representational gestures actually occur with respect to speech. *Language and gesture*, 186-198.
- Poling, T. H. (1978). Sex differences, dominance, and physical attractiveness in the use of nonverbal emblems. *Psychological Reports*, 43(3f), 1087-1092.
- Rimé, B., Schiaratura, L., Hupet, M., & Ghysselinckx, A. (1984). Effects of relative immobilization on the speaker's nonverbal behavior and on the dialogue imagery level. *Motivation and Emotion*, 8(4), 311-325.
- Schmitt, D. P., Realo, A., Voracek, M., & Allik, J. (2008). Why can't a man be more like a woman? Sex differences in Big Five personality traits across 55 cultures. *Journal of Personality and Social Psychology*, 94(1), 168.

- Thies, A., & Staatsprüfung, E. (2003). *First the hand, then the word: On gestural displacement in non-native English speech*. Bielefeld: SII thesis, Universität Bielefeld.
- Trivers, R. L. (1972). *Parental investment and sexual selection*. In B. Campbell (Ed.), *Sexual selection and the descent of man* (pp. 139-79). Chicago: Aldine.
- Valbonesi, L., Ansari, R., McNeill, D., Quek, F., Duncan, S., McCullough, K. E., & Bryll, R. (2001). *Multimodal signal analysis of prosody and hand motion: temporal correlation in speech and gestures* (Master's thesis, University of Illinois at Chicago).
- Wexelblat, A. (1995). An approach to natural gesture in virtual environments. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 2(3), 179-200.
- Xu, J., Gannon, P. J., Emmorey, K., Smith, J. F., & Braun, A. R. (2009). Symbolic gestures and spoken language are processed by a common neural system. *Proceedings of the National Academy of Sciences*, 106(49), 20664-20669.

APPENDIX A

Questionnaire

ID: _____

Datum: _____

Uhrzeit: _____

Alter: _____

Geschlecht: ☐ Männlich ☐ Weiblich

Beruf bzw. Studienrichtung: _____

Bitte kreuzen Sie an, was Ihrem momentanen Zustand am ehesten entspricht.

	trifft nicht zu			trifft sehr zu	
	1	2	3	4	5
fröhlich	0	0	0	0	0
aufmerksam	0	0	0	0	0
entspannt	0	0	0	0	0
traurig	0	0	0	0	0
müde	0	0	0	0	0
unsicher	0	0	0	0	0
glücklich	0	0	0	0	0
verärgert	0	0	0	0	0
trübsinnig	0	0	0	0	0
schüchtern	0	0	0	0	0
nervös	0	0	0	0	0
selbstsicher	0	0	0	0	0

	trifft nicht zu			trifft sehr zu	
	1	2	3	4	5
Ich bin mit Computern im Allgemeinen vertraut	0	0	0	0	0
Ich bin mit Video-Chatten vertraut	0	0	0	0	0
Ich habe das Gefühl, dass mir mein Gesprächspartner den Inhalt verständlich mitgeteilt hat	0	0	0	0	0
Ich musste oft nachfragen	0	0	0	0	0
Ich habe das Gefühl, dass ich meinem Gesprächspartner den Inhalt verständlich mitgeteilt habe	0	0	0	0	0
Ich hatte das Gefühl, dass mein Gesprächspartner während der Unterhaltung viel gestikuliert hat	0	0	0	0	0

	trifft nicht zu			trifft sehr zu	
	1	2	3	4	5
Die Audioqualität des Video-Chats war gut	0	0	0	0	0
Die Videoqualität des Video-Chats war gut	0	0	0	0	0
Ich empfand die Unterhaltung als angenehm	0	0	0	0	0
Ich empfand die Unterhaltung als interessant	0	0	0	0	0

Specific Part for the Picture Group:

Welches Bild wurde Ihnen beschrieben? _____ (Bitte Bildnummer einsetzen)

	trifft nicht zu			trifft sehr zu	
	1	2	3	4	5
Es war einfach für mich anhand der Beschreibung meines Gesprächspartners das richtige Bild auszuwählen	0	0	0	0	0

Specific Part for the Video Group:

	trifft nicht zu			trifft sehr zu	
	1	2	3	4	5
Ich habe das Gefühl das mir beschriebene Video auf Anhieb erkennen zu können	0	0	0	0	0

Beschreiben Sie den Inhalt des Videos in kurzen Sätzen.

Ich kannte meinen Gesprächspartner schon vor dem Gespräch.

☐ noch nie gesehen ☐ flüchtiger Bekannter ☐ guter Freund

	trifft nicht zu			trifft sehr zu	
	1	2	3	4	5
Ich schätze meinen Gesprächspartner als attraktiv ein	0	0	0	0	0
Ich schätze meinen Gesprächspartner als sympathisch ein	0	0	0	0	0
Ich würde mit meinem Gesprächspartner einen Kaffee trinken gehen, wenn er/sie mich danach fragen würde	0	0	0	0	0
Ich würde meinem Gesprächspartner meine Telefonnummer geben, wenn er/sie danach fragen würde	0	0	0	0	0

Wenn weiblich:

Wie lange dauert Ihr durchschnittlicher Zyklus? (Bitte ankreuzen)

Weniger – 20 – 21 – 22 – 23 – 24 – 25 – 26 – 27 – 28 – 29 – 30 – 31 – 32 – 33 – 34 – 35 – mehr Tage

Wann hat Ihre letzte Menstruation begonnen (Datum)? _____

Nehmen Sie hormonelle Verhütungsmittel (Pille)?

☐ Ja ☐ Nein

Oder andere Hormonpräparate?

☐ Ja ☐ Nein

Sexuelle Orientierung: ☐ Heterosexuell ☐ Homosexuell ☐ Bisexuell

Haben Sie derzeit eine Beziehung?

☐ Ja ☐ Nein

Wenn ja, wie lange dauert Ihre Beziehung? _____

	unzufrieden			sehr zufrieden	
	1	2	3	4	5
Wie zufrieden sind Sie mit Ihrer Beziehung?	0	0	0	0	0

Sind Sie derzeit auf der Suche nach einem Partner?

☐ Ja ☐ Nein

APPENDIX B

Results Tables

Table B1: Results of a t-test comparing sum and duration of gestures and feedback words of men and women.

Cartoon Group	Men (n = 39)		Women (n = 37)		t	p
	mean	SD	mean	SD		
Feedback Words Sum	8.97	5.08	8.14	4.73	-0.745	0.459
Feedback Words Duration	4.49	2.65	4.05	2.40	-0.745	0.459
Beats Sum	27.74	12.65	25.05	14.17	-0.874	0.385
Beats Duration	17.03	6.96	15.28	10.04	-0.888	0.377
Representational Sum	27.36	13.32	28.54	11.17	0.418	0.677
Representational Duration	30.39	14.74	31.35	10.89	0.322	0.748
Iconics Duration	6.38	5.19	7.09	4.02	0.667	0.507
Spatial Deictics Sum	14.67	6.74	14.27	6.81	-0.255	0.799
Spatial Deictics Duration	17.28	8.17	17.75	8.08	0.250	0.804
Mimetics Sum	4.49	3.62	4.81	3.36	0.404	0.688
Mimetics Duration	5.47	4.90	5.00	3.77	-0.473	0.638
Picture Group	Men (n = 35)		Women (n = 41)		t	p
	mean	SD	mean	SD		
Feedback Words Duration	4.88	3.63	4.34	3.77	-0.635	0.527
Beats Sum	20.31	14.96	22.66	13.71	0.712	0.478
Beats Duration	13.45	9.30	12.95	6.91	-0.268	0.789
Representational Sum	25.23	13.61	27.20	15.77	0.584	0.561
Representational Duration	25.80	13.78	26.67	15.15	0.260	0.796
Iconics Sum	13.51	7.17	14.61	9.27	0.568	0.571
Iconics Duration	15.50	9.21	15.92	9.54	0.194	0.847
Spatial Deictics Sum	9.66	7.72	10.73	7.39	0.619	0.538
Spatial Deictics Duration	8.53	6.32	9.31	6.60	0.525	0.601

* p < 0.05; ** p < 0.01; *** p < 0.001

Table B2: Results of a Mann-Whitney U-test comparing sum and duration of gestures and feedback words of men and women

Cartoon Group	Men (n = 39)	Women (n = 37)	U	z	p
	mean rank	mean rank			
Iconics Sum	36.14	40.99	629.50	-0.962	0.336
Methaphorics Sum	37.82	39.22	695.00	-0.379	0.704
Methaphorics Duration	37.63	39.42	687.50	-0.484	0.628
Literal Deictics Sum	38.65	38.34	715.50	-0.069	0.945
Literal Deictics Duration	39.65	37.28	676.50	-0.509	0.610
Picture Group	Men (n = 35)	Women (n = 41)	U	z	p
	mean rank	mean rank			
Words Sum	40.84	36.50	635.50	-0.857	0.391
Methaphorics Sum	37.61	39.26	686.50	-0.419	0.675
Methaphorics Duration	38.13	38.82	704.50	-0.175	0.861
Literal Deictics Sum	40.03	37.20	664.00	-0.675	0.500
Literal Deictics Duration	39.80	37.39	672.00	-0.568	0.570
Emblems Sum	37.90	39.01	696.50	-0.267	0.789
Emblems Duration	37.47	39.38	681.50	-0.455	0.649
Mimetics Sum	37.69	39.20	689.00	-0.368	0.713
Mimetics Duration	37.79	39.11	692.50	-0.320	0.749

* p < 0.05; ** p < 0.01; *** p < 0.001

Table B3: Results of a t-test comparing sum and duration of gestures and feedback words of women talking to other women or to men.

Cartoon Group	Women x Women (n = 23)		Women x Men (n = 16)		t	p
	mean	SD	mean	SD		
Feedback Words Sum	8.00	4.93	10.38	5.11	-1.459	0.153
Feedback Words Duration	3.88	2.46	5.37	2.75	-1.772	0.085
Beats Sum	29.35	13.04	25.44	12.12	0.948	0.349
Beats Duration	18.39	7.24	15.08	6.24	1.487	0.145
Representational Sum	28.00	14.18	26.44	12.36	0.356	0.724
Representational Duration	30.60	15.09	30.09	14.69	0.105	0.917
Iconics Duration	6.66	5.22	5.98	5.29	0.400	0.691
Spatial Deictics Sum	14.91	6.77	14.31	6.91	0.270	0.788
Spatial Deictics Duration	17.09	8.03	17.55	8.63	-0.171	0.865
Mimetics Sum	4.52	4.03	4.44	3.05	0.071	0.944
Mimetics Duration	5.51	5.44	5.41	4.18	0.060	0.952
Picture Group	Women x Women (n = 23)		Women x Men (n = 12)		t	p
	mean	SD	mean	SD		
Feedback Words Duration	4.14	3.13	6.31	4.21	-1.724	0.094
Beats Sum	21.61	16.37	17.83	12.07	0.703	0.487
Beats Duration	14.51	9.83	11.40	8.20	0.936	0.356
Representational Sum	27.70	15.00	20.50	9.24	1.512	0.140
Representational Duration	27.91	14.88	21.76	10.81	1.265	0.215
Iconics Sum	14.70	7.42	11.25	6.34	1.366	0.181
Iconics Duration	16.42	9.00	13.74	9.75	0.815	0.421
Spatial Deictics Sum	10.52	8.68	8.00	5.39	0.915	0.367
Spatial Deictics Duration	9.36	6.97	6.95	4.69	1.072	0.292

* p < 0.05; ** p < 0.01; *** p < 0.001

Table B4: Results of a Mann-Whitney U-test comparing sum and duration of gestures and feedback words of women talking to other women or to men.

Cartoon Group	Women x Wo- men (n = 23)	Women x Men (n = 16)	U	z	p
	mean rank	mean rank			
Iconics Sum	21.41	17.97	151.50	-0.935	0.350
Methaphorics Sum	19.22	21.13	166.00	-0.731	0.465
Methaphorics Duration	19.26	21.06	167.00	-0.688	0.492
Literal Deictics Sum	22.17	16.88	134.00	-1.577	0.115
Literal Deictics Duration	21.59	17.72	147.50	-1.121	0.262
Emblems Sum	20.35	19.50	176.00	-0.268	0.789
Emblems Duration	20.46	19.34	173.50	-0.349	0.727
Picture Group	Women x Wo- men (n = 23)	Women x Men (n = 12)	U	z	p
	mean rank	mean rank			
Words Sum	16.43	21.00	102.00	-1.256	0.209
Methaphorics Sum	18.63	16.79	123.50	-0.686	0.493
Methaphorics Duration	18.57	16.92	125.00	-0.614	0.539
Literal Deictics Sum	20.00	14.17	92.00	-1.873	0.061
Literal Deictics Duration	20.11	13.96	89.50	-1.944	0.052
Emblems Sum	17.83	18.33	134.00	-0.175	0.861
Emblems Duration	17.70	18.58	131.00	-0.305	0.760
Mimetics Sum	17.63	18.71	129.50	-0.373	0.709
Mimetics Duration	17.70	18.58	131.00	-0.305	0.760

* p < 0.05; ** p < 0.01; *** p < 0.001

Table B5: Results of a t-test comparing sum and duration of gestures and feedback words of good friends and strangers in the cartoon group.

	Good Friends (n = 30)		Strangers (n = 40)		t	p
	mean	SD	mean	SD		
Feedback Words	9.30	4.71	7.95	5.15	-1.125	0.264
Feedback Words Duration	4.46	2.30	4.09	2.77	-0.593	0.555
Beats Sum	26.60	11.00	26.00	15.45	-0.181	0.857
Beats Duration	15.78	6.99	16.47	9.98	0.322	0.748
Representational Sum	31.37	11.15	26.03	13.31	-1.778	0.080
Representational Duration	34.25	12.59	31.37	11.15	-1.551	0.125
Iconics Duration	6.80	4.09	6.70	5.24	-0.086	0.932
Spatial Deictics Sum	17.03	7.07	12.95	6.36	-2.534	0.014*
Spatial Deictics Duration	19.64	8.81	16.49	7.72	-1.594	0.116
Mimetics Sum	5.27	3.76	4.45	3.36	-0.957	0.342
Mimetics Duration	6.22	4.87	4.87	4.06	-1.272	0.208

* p < 0.05; ** p < 0.01; *** p < 0.001

Table B6: Results of a Mann-Whitney U-test comparing sum and duration of gestures and feedback words of good friends and strangers in the cartoon group.

	Good Friends (n = 30)	Strangers (n = 40)	U	z	p
	mean rank	mean rank			
Iconics Sum	37.00	34.38	555.00	-0.538	0.591
Methaphorics Sum	37.93	33.68	527.00	-1.245	0.213
Methaphorics Duration	37.92	33.69	527.50	-1.232	0.218
Literal Deictics Sum	38.40	33.33	513.00	-1.148	0.251
Literal Deictics Duration	37.90	33.70	528.00	-0.932	0.351
Emblems Sum	38.30	33.40	516.00	-1.144	0.253
Emblems Duration	38.22	33.46	518.50	-1.104	0.270

* p < 0.05; ** p < 0.01; *** p < 0.001

Table B7: Results of a one-way ANOVA comparing sum and duration of gestures and feedback words of attractive and unattractive conversation partners in the cartoon group.

	Sum of Squares	df	Mean Square	F	p
<i>Feedback Words Sum</i>					
Between Groups	116.36	2	58.18	2.528	0.087
Within Groups	1680.31	73	23.02		
Total	1796.67	75			
<i>Feedback Words Duration</i>					
Between Groups	22.60	2	11.30	1.809	0.171
Within Groups	455.84	73	6.24		
Total	478.44	75			
<i>Beats Sum</i>					
Between Groups	393.07	2	196.54	1.099	0.339
Within Groups	13059.60	73	178.90		
Total	13452.67	75			
<i>Beats Duration</i>					
Between Groups	86.41	2	43.20	0.580	0.562
Within Groups	5437.14	73	74.48		
Total	5523.55	75			
<i>Representationals Sum</i>					
Between Groups	68.95	2	34.47	0.225	0.799
Within Groups	11189.73	73	153.28		
Total	11258.68	75			
<i>Representationals Duration</i>					
Between Groups	127.72	2	63.86	0.376	0.688
Within Groups	12409.86	73	170.00		
Total	12537.58	75			
<i>Iconics Duration</i>					
Between Groups	57.70	2	28.85	1.352	0.265
Within Groups	1557.95	73	21.34		
Total	1615.65	75			
<i>Spatial Deictics Sum</i>					
Between Groups	242.18	2	121.09	2.800	0.067
Within Groups	3156.77	73	43.24		
Total	3398.95	75			
<i>Spatial Deictics Duration</i>					
Between Groups	220.31	2	110.16	1.723	0.186
Within Groups	4667.32	73	63.94		
Total	4887.63	75			
<i>Mimetics Sum</i>					
Between Groups	0.34	2	0.17	0.014	0.986
Within Groups	905.07	73	12.40		
Total	905.41	75			
<i>Mimetics Duration</i>					
Between Groups	9.12	2	4.56	0.234	0.792
Within Groups	1420.88	73	19.46		
Total	1430.00	75			

Table B8: Results of a Kruskal Wallis test comparing sum and duration of gestures and feedback words of attractive and unattractive conversation partners in the cartoon group.

	N	Mean Rank	Chi-Square	df	p
Iconics Sum					
3	34	39.32	3.874	2	0.144
4	30	42.00			
5	12	27.42			
Methaphorics Sum					
3	34	36.57	0.906	2	0.636
4	30	39.85			
5	12	40.58			
Methaphorics Duration					
3	34	36.91	0.639	2	0.726
4	30	39.47			
5	12	40.58			
Literal Deictics Sum					
3	34	36.57	0.578	2	0.749
4	30	40.18			
5	12	39.75			
Literal Deictics Duration					
3	34	37.19	0.267	2	0.875
4	30	39.77			
5	12	39.04			
Emblems Sum					
3	34	40.56	1.381	2	0.501
4	30	35.30			
5	12	40.67			
Emblems Duration					
3	34	40.79	2.165	2	0.339
4	30	34.50			
5	12	42.00			

Table B9: Results of a one-way ANOVA comparing sum and duration of gestures and feedback words of attractive and unattractive conversation partners in the picture group.

	Sum of Squares	df	Mean Square	F	p
<i>Feedback Words Duration</i>					
Between Groups	43.52	2	21.76	1.625	0.204
Within Groups	977.71	73	13.39		
Total	102.24	75			
<i>Beats Sum</i>					
Between Groups	333.09	2	166.55	0.816	0.446
Within Groups	14897.43	73	204.07		
Total	15230.53	75			
<i>Beats Duration</i>					
Between Groups	151.68	2	75.84	1.176	0.314
Within Groups	4707.01	73	64.48		
Total	4858.68	75			
<i>Representational Sum</i>					
Between Groups	21.35	2	10.67	0.048	0.9653
Within Groups	16294.29	73	223.21		
Total	16315.63	75			
<i>Representational Duration</i>					
Between Groups	239.70	2	119.85	0.568	0.569
Within Groups	15409.14	73	211.08		
Total	15648.84	75			
<i>Iconics Sum</i>					
Between Groups	86.14	2	43.07	0.613	0.544
Within Groups	5125.02	73	70.21		
Total	5211.16	75			
<i>Iconics Duration</i>					
Between Groups	243.60	2	121.80	1.415	0.250
Within Groups	6285.42	73	86.10		
Total	6529.01	75			
<i>Spatial Deictics Sum</i>					
Between Groups	49.01	2	24.51	0.428	0.654
Within Groups	4184.72	73	57.33		
Total	4233.74	75			
<i>Spatial Deictics Duration Sum</i>					
Between Groups	27.42	2	13.71	0.324	0.724
Within Groups	3084.95	73	42.26		
Total	3112.38	75			

Table B10: Results of a Kruskal Wallis test comparing sum and duration of gestures and feedback words of attractive and unattractive conversation partners in the picture group.

	N	Mean Rank	Chi-Square	df	p
Feedback Words					
3	42	34.46	3.206	2	0.201
4	18	42.69			
5	16	44.38			
Methaphorics Sum					
3	42	38.46	0.088	2	0.957
4	18	39.36			
5	16	37.63			
Methaphorics Duration					
3	42	38.45	0.007	2	0.997
4	18	38.78			
5	16	38.31			
Literal Deictics Sum					
3	42	39.14	0.150	2	0.928
4	18	37.17			
5	16	38.31			
Literal Deictics Duration					
3	42	38.79	0.087	2	0.957
4	18	37.39			
5	16	39.00			
Emblems Sum					
3	42	41.48	2.630	2	0.268
4	18	33.94			
5	16	35.81			
Emblems Duration					
3	42	41.19	2.175	2	0.337
4	18	34.14			
5	16	36.34			
Mimetics Sum					
3	42	37.76	0.289	2	0.866
4	18	40.44			
5	16	38.25			
Mimetics Duration					
3	42	37.88	0.277	2	0.871
4	18	40.44			
5	16	37.94			

ABSTRACT

Gestures are part of the nonverbal behavior and therefore an important component of human communication. We use gestures to add additional information, to replace spoken words or to emphasize parts of our speech. Gestures appear in every culture, linguistic background and even among blind people. But is there a difference in the quality and/or quantity of gestures between men and women?

This study tried to examine potential differences in the gesturing between men and women using a video chat conversation. The participants had to retell a short animated film clip or describe the picture of a house to another participant of either the same gender or different gender. All subjects filled out a questionnaire giving information about the relationship with the conversation partner and rating his/her attractiveness. Gestures have been analyzed using the ANVIL annotation software and were divided into seven different categories (beat, iconics, metaphorics, spatial deictics, literal deictics, emblems, mimetics). Furthermore, feedback words have been transcribed. A comparison of the total amount and duration of gestures as well as the distribution of gesture categories was conducted to reveal gender differences as well as a possible influence of the group composition, relationship with and attractiveness of the conversation partner.

The results show that there are no significant differences in the frequency and duration of gestures or feedback words between men and women. Furthermore there is no significant difference in the gesture production when talking to an attractive or unattractive person. Men used significantly longer feedback words when talking to men and longer iconic gestures when talking to women. Only the content of the retelling task and the relationship status had a clear significant effect on the gesturing of men and women, resulting in more shape-based gestures in the picture retelling and more action-based gestures in the film-retelling task and an overall higher frequency of representational gestures between friends than strangers.

ZUSAMMENFASSUNG

Gesten sind Teil des nonverbalen Verhaltens und deshalb eine wichtige Komponente in der zwischenmenschlichen Kommunikation. Wir verwenden Gesten um zusätzliche Informationen zur Verfügung zu stellen, Wörter zu ersetzen oder bestimmte Teile unserer Rede hervorzuheben. Gesten können bei allen Menschen beobachtet werden unabhängig von Kultur oder sprachlichem Hintergrund und sogar Blinde verwenden Gesten. Aber gibt es einen Unterschied in der Qualität und/oder Quantität von Gesten zwischen Männern und Frauen?

Die vorliegende Studie hatte das Ziel mögliche Unterschiede in der Gestik von Männern und Frauen aufzudecken. Hierfür wurde ein Videochatexperiment entwickelt, in dem die Versuchsteilnehmer entweder einen kurzen Videoclip oder das Bild eines Hauses einem anderen Teilnehmer vom selben oder unterschiedlichen Geschlecht erklären mussten. Alle Versuchspersonen wurden gebeten einen Fragebogen auszufüllen, um Informationen über das Beziehungsverhältnis mit dem Gesprächspartner bereitzustellen und die Attraktivität des Gegenübers zu bewerten. Die Gesten wurden mit der Annotation Software ANVIL analysiert und hierfür in sieben verschiedene Kategorien eingeteilt (beat, iconics, metaphors, spatial deictics, literal deictics, emblems, mimetics). Darüber hinaus wurden sogenannte Feedback Wörter transkribiert. Ein Vergleich der Gesamtmenge und -dauer der Gesten, sowie der Verteilung der verschiedenen Kategorien wurde durchgeführt, um sowohl mögliche geschlechtsspezifische Unterschiede als auch Einflüsse von Beziehungsverhältnis, Gruppenzusammensetzung und Attraktivität des Gesprächspartners aufzudecken. Die Ergebnisse zeigen, dass es keinen signifikanten Unterschied in der Frequenz oder Dauer der Gesten und Feedback Wörter zwischen Männern und Frauen gibt. Ferner ist die Attraktivität des Gesprächspartners kein Einflussfaktor in der Gestik des Sprechers. Männer zeigten längere Feedback Wörter in Konversationen mit anderen Männern und längere iconic Gesten bei Gesprächen mit Frauen. Allein der Inhalt des Gesprächs und das Verhältnis zum Gesprächspartner hatten einen klaren signifikanten Einfluss auf die Gestik der Versuchsteilnehmer.

ACKNOWLEDGEMENTS

First, I would like to express my gratitude to Prof. Dr. Karl Grammer and Dr. Elisabeth Oberzaucher, my research supervisors, for their patient guidance, enthusiastic encouragement and useful critiques of this research work.

I would also like to thank Mia Maleš who supported me throughout the data collection.

Thanks to all the members of this department (especially the "jour fixe team") for the friendly and familiar atmosphere.

Finally, I wish to thank my parents and friends for their support and encouragement all through my study.

CURRICULUM VITAE

Personal Information

Name: Daniela Bergmann
Nationality: Austria

Education

1995 - 1999 HS Ziersdorf
1999 - 2004 Commercial highschool Hollabrunn; passed with distinction
2004 - 2008 Diploma study „Veterinary Medicine“ at the University of Veterinary Medicine, Vienna
2008 - 2010 Bachelor study „Biomedicine and Biotechnology“ at the University of Veterinary Medicine, Vienna
2010 - 2013 Master study „Behaviour, Neurobiology and Cognition“ at the University of Vienna

List of positions

May - September 2008 Temp at the public library in Vienna
March - December 2012 Data clerk at the ABCSG in Vienna

Internships

WS 2007 "Immortalisierung von ABC Minizellen beim Schwein mittels SV40 Large T Antigen" - Institute of Immunology, University of Veterinary Medicine, Vienna

WS 2008 "Erweiterung der "molecular tools" für die Mykoplasma-Forschung" - Institute of Bacteriology, Mycology and Hygiene, University of Veterinary Medicine, Vienna

WS 2009 "Arbeiten mit und rund um Versuchstiere und Arbeiten im Versuchstierdienstbetrieb inkl. Vet Services" - Lab Animal Service, F. Hoffmann – La Roche Ltd., Basel, CH

- SS 2009 "Detektion von Aspergillus und Candida spp. mittels real-time PCR und Serologie im Blut" - Institute for Hygiene and Applied Immunology of the Centre for Pathophysiology, Infectiology and Immunology, Medical University, Vienna
- SS 2011 "Cross-modal transfer of predator recognition: Do pigeons have a concept of predators?" - Department of Cognitive Biology, University of Vienna

Conference posters

Indre Pileckyte, Ruben Perellón-Alfonso, Anna Ensberger, Christoph Weinlinger, Karin Schloffer, Anna Griebel, Judith Suttner, Daniela Bergmann, Karl Grammer, Alexandra Mühlhauser, Elisabeth Oberzaucher (2012). VISUAL ATTENTION, DECISION MAKING AND SCENE DESCRIPTION REVEALED BY BEE SWARM ANALYSIS. Presented at the XXI Biennial Conference on Human Ethology in Vienna, Austria.

Mia Maleš, Daniela Bergmann, Elisabeth Oberzaucher, Karl Grammer (2012). GESTURE SYNCHRONISATION IN A VIDEO CHAT CONVERSATION. Presented at the XXI Biennial Conference on Human Ethology in Vienna, Austria.