universität wien

MASTERARBEIT

Titel der Masterarbeit

The relationship between affect and body posture in social encounters

verfasst von

Markus Monschein, BSc.

angestrebter akademischer Grad

Master of Science (MSc.)

Wien, 21.04. 2015

Studienkennzahl lt.	A 066 878
Studienrichtung lt.	Verhaltens-, Neuro- und Kognitionsbiologie
Betreut von:	Tit. A.o. Univ.-Prof. Dr. Karl Grammer

Table of content

Abstract

Body posture is crucial for the communication of internal states in social interactions. In this study we us modern anthropology to investigate how pleasure, arousal and dominance (PAD) are expressed in body posture and to what extent raters can classify features of posture to the typical level of PAD. The first study assimilates the body posture of participants via a hidden camera at the same time they report their affect at the moment of interaction with the interviewer. The second study gathers information about the accuracy of raters who were instructed to classify the affect of artificial avatars, which are results of the first study. Results coincide with earlier studies proving the factor pleasure as hard to classify out of body postures, however arousal and dominance were easier to classify. Arousal was classified correctly more often in female stimuli (artificial avatars) than in males, whereas dominance was clearly read out of female and male stimuli. The final conclusion states internal states do correlate with body posture, although there are sex differences in the way internal states are interpreted, however there are no sex differences in the angle data of posture which coincides with earlier studies.

1. Introduction

In social interactions we communicate for the most part through body language and nonverbal communication (Mehrabian 1972, Grammer et al 2004). Nonverbal behaviour expresses, even more emphatically than the verbal channel (Mehrabian 1972, Grammer et al. 2004), patterns such as social power relations (Hall et al. 2005), attitudes (Mehrabian & Ferris 1967, Mehrabian 1968), personality traits (Koppensteiner & Grammer 2010, Koppensteiner 2013) and emotional states (Wallbott 1998).

Early investigators described postures from illustrations (Darwin 1872/1965 and James 1932). Much focus was laid upon facial expression (Tomkins 1962; Ekman 1971; Izard 1971; Aranguren and Tonnelat 2014), but few on body posture (Grammer et al. 2004, Kleinsmith & Bianchi-Berthouze 2011). Research on body posture is done for a great deal concerning the qualitative approach, but quite rare among the field of low-level empirical data analysis (Grammer et al. 2002, Grammer et al. 2004). Behavioral studies have shown that posture can communicate both affective dimensions and discrete emotion categories (Coulson 2004; Kleinsmith et al. 2007). The investigation of body expressions is further used today in order to create affectively aware technologies (Kleinsmith and Bianchi-Berthouze in 2013).

Mehrabian and Russell (1974) created simple self-report measures of the emotional dimensions "pleasure", "arousal", and "dominance" (PAD) by using questionnaire studies in which subjects described a variety of situations using semantic differential type scales. They submitted a theory implying that physical or social stimuli in the environment directly affect the emotional state of an individual, thereby influencing his behaviors in it.

Since Darwin perceived the parallels between the erect bearing of proud, successful humans and the expansive appearance of dominant animals (Darwin 1872/1965), various additional parallels between man and other primates in the attributes of dominance hierarchies were found (Omark et al. 1980). The occurrence of submission displays is observed as indicative of dominance hierarchization (Strayer et al. 1980). Some of the alleged nonverbal expressions of agonism or dominance status that do survive in man do not seem to arise exclusively during dominance interactions (Weisfeld & Beresford 1982). Happiness and Sadness are communicated similarly via facial expressions in eight cultures (Ekman 1971), even so there seems to be no distinctive happy posture (Coan and Allen 2007, Flack et al. 1997, Flack et al. 1999).

Carney et al. conduct an endocrinological study in 2010 proving that "posing in high-power displays (as opposed to low-power displays) causes physiological, psychological, and behavioral changes consistent with the literature on the effects of power on power holders—elevation of the dominance hormone testosterone, reduction of the stress hormone cortisol, and increases in behaviorally demonstrated risk tolerance and feelings of power".
Posture communicates dominance to some extent through relaxation, which is characterized by asymmetrical arm positions, sideways lean, asymmetrical leg positions, hand relaxation, and backwards lean. The relaxed postural style is applied when confronted with a lower status counterpart, more often towards females than males, also more often towards a person of the opposite sex than a person of the same sex (Mehrabian 1969). However, to quite a number of psychologists, dominance is a personality characteristic involving a tendency to control others (Cashdan 1998).

Mehrabian investigated the communication of affect through body postures in 1969. He found openness of arms signaling a positive attitude only when expressed by females. Arms akimbo, meaning arms on hips were also found to signal a negative attitude, both for the sender and the receiver. It has been observed that interacting persons often adopt postures that are mirror images of each other. Whereby the distance between a communicator and his addressee was observed to be a decreasing linear function of the degree of liking of the addressee (Mehrabian 1969).

Open body postures (especially open arms) were observed to be correlated with toughness in women but not with sociometric status (popularity and being well-known). This indicates that open body postures in women, at least as measured in this study, are a power display rather than simply a by-product of relaxation accompanying high status (Cashdan 1998).

The investigation of head tilt and the perception of dominance and emotion was facilitated by 3-D models of faces. Results prove females to be more likely to be perceived as happy and as expressing inferiority emotions in comparison to males. Females are less likely to be perceived as angry and as expressing superiority emotions and are perceived as less dominant. Furthermore they prove the common lore relating dominance directly to head angle (Mignault & Chaudhuri 2003).

Collett and Marsh 1974 have used videotapes made from a powerful zoom lens from the seventh floor of a building overlooking a pedestrian crossing. Frozen images of pedestrians were coded and analyzed. In this study women were observed to cross their arms over their chest and avert their body when passing someone on the street. This could reflect the perceived need to protect the breasts or to be less physically vulnerable in general. Investigations of women's and men's gaits were found to differ from each other (Hall 1984).

Although emotion can be inferred from body posture, the underlying mechanisms facilitating this kind of nonverbal behaviour are still unclear. Postures may represent emotions, intentions, or requests, a distinction, which is theoretically important but difficult to disentangle and demonstrate empirically (Coulson 2004). The empirical analysis of static bodily postures was implemented by Grammer et al. in 2004. They were using a questionnaire containing PANAS-items (Positive-Affect-Negative-Affect-Scale by Watson et al. 1988) in order to record the participants' affect. Technological improvements enable the investigation between affect and body posture in an empirical way. This is implemented by using low-level data combined with the appropriate mathematical methods. This method views human postures as continuous vectors of body angles. The validation of this approach is established by letting observers decode affect from artificial body postures (Grammer et al. in 2004).

Hypotheses

The combination of angle data inferred from bodily postures of participants and the factors (PAD) inferred from a questionnaire give significant regressions.
Raters are able to correctly classify emotions categories out of body postures of artificial avatars.

2. Methods

2.1. First experiment

2.2. Material

First, a Sony Digital HD Video Camera Recorder HXR-MC2000E was used to quire the participant's posture. Second, a questionnaire was used to gather information about the internal states of the participant. The postures were reconstructed in Poser Pro 2014. The second experiment used artificial avatars and EmoSys (Dr. Karl Grammer) to establish a rating study.

2.3. Posture coding

125 students of the University of Vienna were recruited in the public space of the University (UZA). The first experimenter filmed 125 of the participants via a hidden camera (data used of - females: n = 59, mean age = 22.63 years, SD = 3.316 years; males: n = 49, mean age = 24.15 years, SD = 2.729 years), as they were approached by the second experimenter (interviewer). The interviewer was either of male or female sex and had to wear jeans and a black t-shirt to standardize conditions. Participants were approached randomly and asked to fill in a questionnaire containing 18 PAD items on its front and control variables (age, biological sex, rating of the interviewer, body height, practising sports, any injuries affecting posture, academic title, academic degree of parents, monthly income from parents and job, how monthly income is perceived) at its backside. Once the participants were done, they were informed about the study and asked to fill in a consent form.

The 18 items coding the affect of the participants were analysed using principal component analysis using IBM© SPSS© Statistics, yielding a limited number of factors (Pleasure, Arousal and Dominance). The participant's posture on the video was then transferred to a three dimensional avatar in *Poser Pro 2014* (Curios Labs, Santa Cruz) using a single video frame taken exactly at the moment when she/he came to rest in front of the interviewer (Figure 1). The avatar – a virtual imitation of *Homo sapiens* - was manipulated based on 60 joint angles (table 1). This allows us a close approximation of human anatomy and posture. The reconstruction of postures was a determined procedure, beginning at the hips, then up to the head and down to the feet. To establish the reliability of coding, two experimenters created every posture, then different authorities checked the resulting postures.

Table 1: List of physical limits set for the artificial avatar

Joint	Movement	Limits in degrees
Head	Extension-Flexion	-15 to 15
	Rotation	-25 to 25
	Abduction-Adduction	-35 to 25
Neck[1]	Extension-Flexion	-15 to 15
	Rotation	-35 to 35
	Abduction-Adduction	-35 to 18
Shoulder	Up-down	-12 to 50
	Rotation	-20 to 20
	Front-back	-30 to 30
Upper Arm	Extension-Flexion	-60 to 40
	Rotation	-75 to 55
	Abduction-Adduction	-70 to 35
Underarm	Extension-Flexion	-130 to 15
	Rotation	-85 to 65
Hand	Extension-Flexion	-20 to 20
	Rotation	-3 to 3
	Abduction-Adduction	-75 to 70
Chest	Extension-Flexion	-20 to 20
	Rotation	-20 to 20
	Abduction-Adduction	-20 to 27
Abdomen[1]	Extension-Flexion	-20 to 20
	Rotation	-25 to 25
	Abduction-Adduction	-15 to 30
Hip	X-Rotation	-360 to 360
	Y-Rotation	-360 to 360
	Z-Rotation	-360 to 360
Buttock	Extension-Flexion	-30 to 30
	Rotation	-30 to 30
	Abduction-Adduction	-30 to 5
Thigh[1]	Extension-Flexion	-65 to 30
	Rotation	-48 to 45
	Abduction-Adduction	-45 to 15
Lower Leg	Extension-Flexion	-3 to 150
	Rotation	-15 to 15
Foot	Extension-Flexion	-15 to 19
	Rotation	-30 to 30
	Abduction-Adduction	-25 to 35

[1] Kinematically chained to joint above

2.4. Regression of self-reported affect onto the avatar's joint angles

From all reconstructed postures the body angles were derived by *Python* (PSF) onto the factors of the PAD analysis. Afterwards the angle data were regressed onto the factors of the analysis of the questionnaire. The regression of the joint angles with the three factors (PAD) was six times exaggerated for female avatars and four times for male avatars. The exaggeration was done to enable the rating of the artificial avatars for the raters.

2.5. Second Experiment

2.6. Rating Study

104 participants were gathered facilitating the rating of artificial avatars. 48 women (mean age = 24.37 years, SD = 3.993 years) and 48 men (mean age = 24.09 years, SD = 3.242 years) were rating the postures in random order on PAD scales. 27 female and 27 male postures were created by *Python* (PSF) regressing the three principal components (PAD) on the angle data derived from *Poser Pro 2014* (Figure 3). These avatars (stimuli) represented the upper and lower end of the regression, were rated on a scale of 100 (slider initially resting at 50) and were presented in random order (Figure 2). This experiment was initiated to establish enhanced validity and accuracy for simulated body postures with respect to self-reported affect. The 27 female and 27 male stimuli were formed due to a formula p(a)a(a)d(a). So there was a clear code for what internal state was encoded in the stimulus (e.g. p(1)a(0)d(0)); p(1) was the code for pleasure, whereas p(-1) was the code for displeasure. All combinations together with the mean avatar in addition (p(0)a(0)d(0)) gave 27 stimuli for each sex.

2.7. Statistical analysis of the rating study

The statistical analysis of the rating study was done by SPSS and included interclass-correlations, paired t-tests in order to test the difference between two groups of stimuli. The 27 female and male stimuli were splitted into two groups for the analysis of the factors (PAD). To check pleasure, all stimuli coding pleasure (p(1)a(-1)d(0), p(1)a(0)d(1)..) were compared with all stimuli that did not code pleasure (p(0)a(-1)d(0), p(-1)a(0)d(1)..).

Fig. 1: A) shows the stop-motion image (video frame) taken at the moment, when the participant (on the left side) came to rest in front of the interviewer (on the right side), who is wearing the black t-shirt. B) shows the reconstruction of the participant's posture in *Poser Pro 2014* (Curious Labs, Santa Cruz).

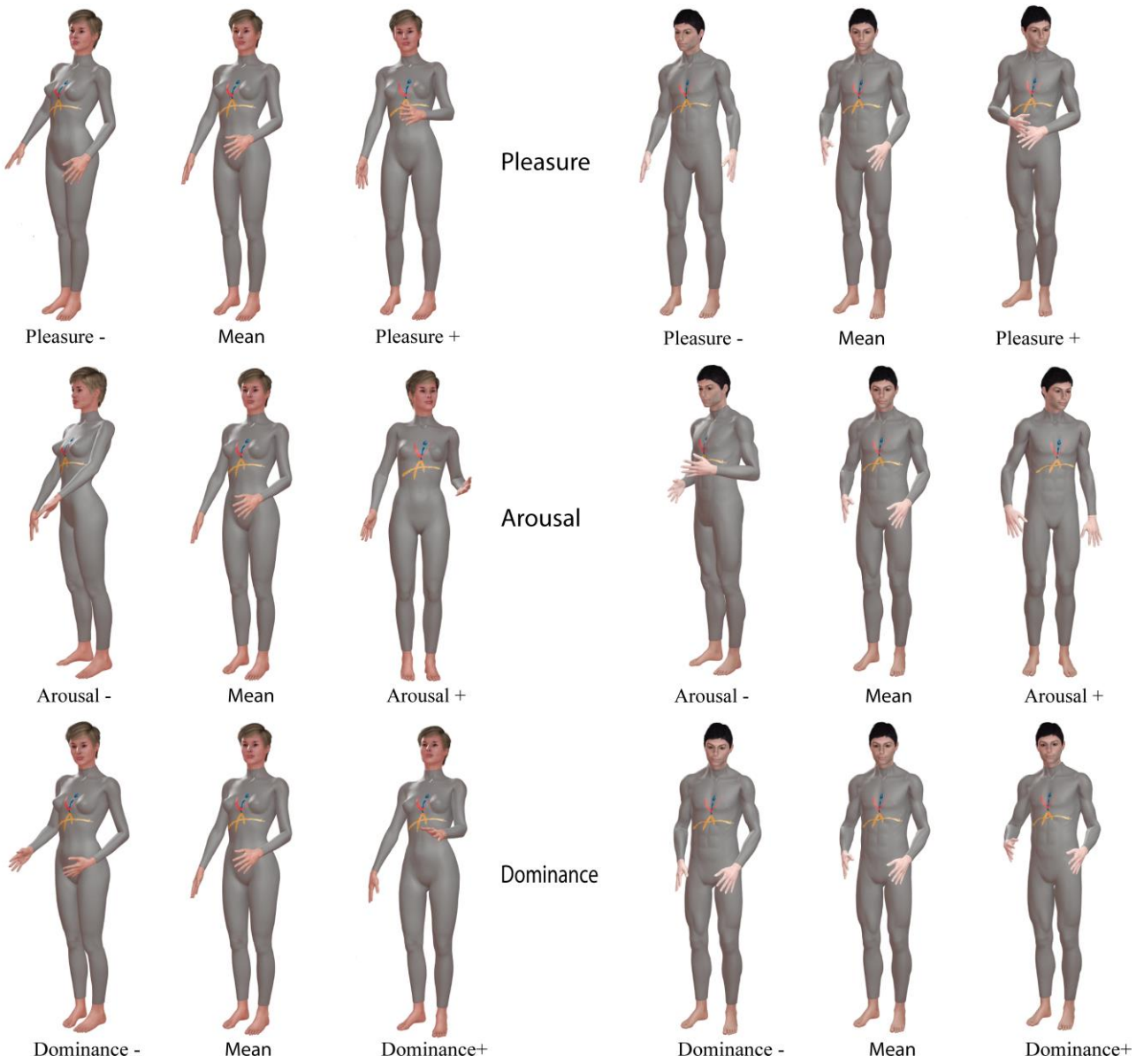

Fig. 2: Artificial avatars were created by *Python* (PSF) computing the results of the regression analysis of the PAD principal components on body angles inferred from *Poser Pro 2014* (Curious Labs, Santa Cruz). This method allows the construction of a rating study using exaggerated values for postures in each direction. The figure in the middle (female and male postures shown) illustrates the average for each factor. The figure on the left side indicates the negative exaggeration whereas the right figure indicates the positive exaggeration (each calculated with the slope and a distance of 1). The stimuli in this figure represent pure stimuli only(e.g. p(0)a(0)d(1) or p(0)a(-1)d(0)).

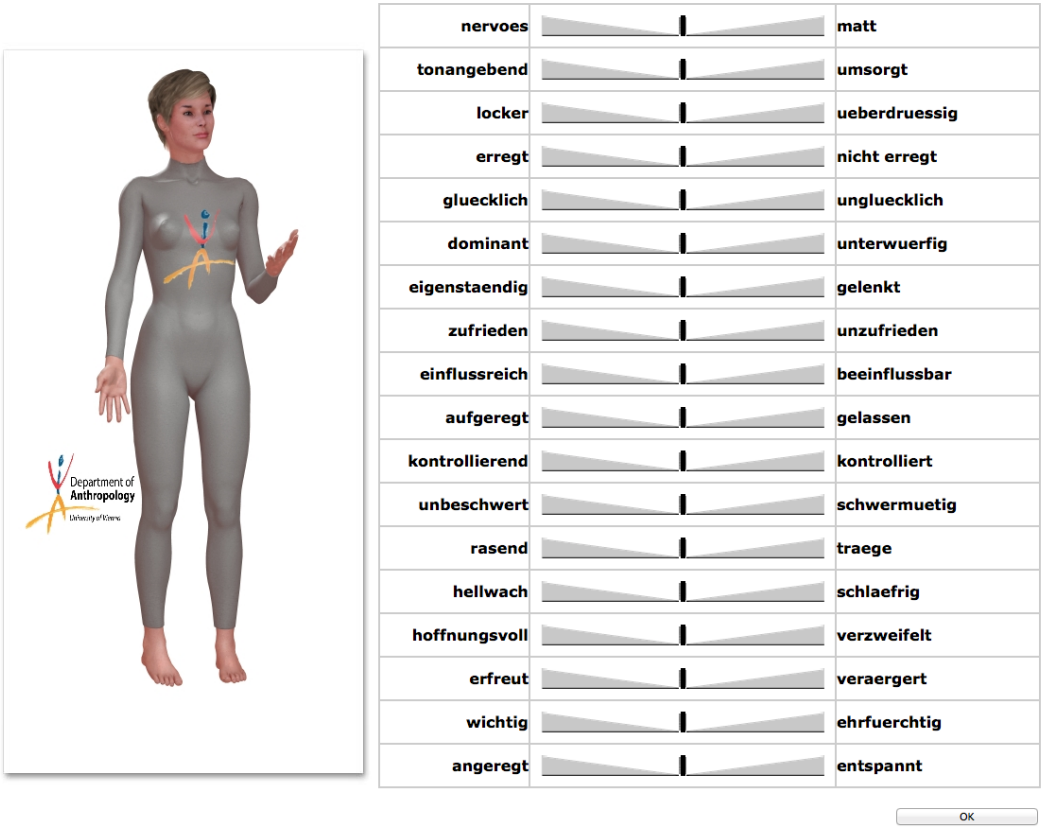

Fig. 3: The setup of the rating study shows a female or male avatar on the left side and the slide bars resting initially at the value of 50 which were manipulated within a range of 1-100. The right side shows the same 18 items which were used for the questionnaire.

3. Results

*Regression of postures and factor***s**

The regression of the angle data of the reproduced postures (avatars) together with the three factors of the principal component analysis (PAD) are partly significant.

Sex differences of postures

A multivariate test for sex differences (General Linear Model) in the joint angles revealed that female and male postures differ only marginally (F (1.887) = 1.589, p = 0.051). These results coincide with an earlier study investigating the relationship of static body postures and affect (Grammer et al. 2004).

Principal component analysis of the questionnaire

The adjectives from PAD questionnaire were submitted to a factor analysis. The factors are presented in Table 2. A forced three-factor solution explained 50 % of variance (after deleting "wichtig" and "hellwach" due to factor loadings beneath the limit of 0.4). The factors were labeled as follows: factor 1 = "Pleasure", ranging from "glücklich" to "eigenständig"; factor 2 = "Arousal", ranging from "angeregt" to "nervös"; factor 3 = "Dominance", ranging from "kontrollierend" to "tonangebend".

Table 2
Matrix of PAD items (N = 108)

	Factor		
	Pleasure	Arousal	Dominance
glücklich	**.890**	-.008	.075
erfreut	**.816**	.025	-.066
zufrieden	**.741**	-.222	.107
hoffnungsvoll	**.672**	.056	.022
unbeschwert	**.572**	-.161	.115
eigenständig	**.569**	-.129	.406
angeregt	-.074	**.858**	-.096
aufgeregt	-.036	**.832**	-.059
erregt	.016	**.650**	.157
locker	.331	**-.573**	.286
rasend	.015	**.462**	.251
nervös	-.260	**.409**	-.306
kontrollierend	.111	.032	**.697**
einflussreich	.107	-.036	**.623**
dominant	.153	-.040	**.622**
tonangebend	-.114	.073	**.554**

Factor Extraction Method: Principal Component Analysis; Varimax Kaiser Rotation. Total variance explained: 50%

As Table 3 shows our study participants established high inter-rater reliability, even if split into sexes. In order to test the inter-rater reliability an intra-class correlation was conducted by *IBM*©

SPSS© Statistics.

Principal component analysis of the rating study

The labels of the 18 items on the questionnaire were reused in the rating study (figure 3). However, the three-factor solution for the dimension reduction of the rating study's values explained 67% of the variance.

Table 3
Interrater reliability tested by Intra-Class Correlation (N = 96).

Dominance	Cronbach's Alpha	ANOVA (F-test)	ICC
All	.894	2.833 (< .001)	.894 (< .001)
Female	.860	3.909 (< .001)	.860 (< .001)
Male	.925	2.626 (< .001)	.925 (< .001)
Pleasure			
All	.789	4.543 (< .001)	.789 (< .001)
Female	.850	7.788 (< .001)	.850 (< .001)
Male	.749	2.550 (< .001)	.749 (< .001)
Arousal			
All	.886	5.628 (< .001)	.886 (< .001)
Female	.932	6.695 (< .001)	.932 (< .001)
Male	.820	5.001 (< .001)	.820 (< .001)

Tests for Intra-Class Correlation (ICC) reveal high reliability between female, male and all raters.

Table 4 shows the raters accuracy in categorizing the nonverbal channel of postures. The analysis includes the data of all female and male stimuli. Arousal and dominance were more precisely read out of the stimuli's posture, compared to pleasure.

Table 4: Differences in ratings including all raters of all stimuli (N = 96).

Factor	Picture	Mean Picture	SD	Mean control	SD	Expec.	Observ.	t	p
Pleasure	+	-0.056	0.969	0.028	1.014	>	<	-2.002	0.045
	-	0.089	1.062	-0.045	0.964	<	>	3.121	0.002
Arousal	+	0.119	0.997	-0.059	0.996	>	>	4.332	<0.001
	-	-0.109	1.028	0.055	0.981	<	<	-3.945	<0.001
Dominance	+	0.133	1.027	-0.066	0.979	>	>	4.795	<0.001
	-	-0.112	0.969	0.041	1.014	<	<	-3.734	<0.001

The rating study shows with the help of artificial avatars (Fig. 3) the validation for our approach. Independent sample t-Tests reveal accurate ratings of factors arousal and dominance. However pleasure was not correctly discerned out of the avatars postures. Correct classifications in the columns "expected" and "observed" are indicated by arrows pointing in the same directions.

Table 5 shows female pleasure to be wrongly interpreted as displeasure (arrows pointing in wrong directions) and vice versa. Both high and low arousal of female stimuli were classified

correctly (pos.: t=8.286, p<0.001; neg.: t=-7.414, p<0.001), whereas male arousal was not clearly identified. However, there was a clear consensus between male and female raters for the male and female avatars indicating dominance (pos.: t=4.534, p<0.001; neg.: t=-3.105, p=0.002), although male arousal was classified correctly with higher significance.

Table 5: Differences in ratings including all raters of female (N = 48) and male stimuli (N = 48)
Independent sample t-tests reveal the factor pleasure as not clearly observed in the avatars postures, which is true for female and male stimuli. Arousal was only read out correctly of female postures. Dominance was correctly interpreted for all stimuli with the exception that dominant female postures were not as significantly rated as dominant compared to dominant male postures. Correct classifications in the columns "expected" and "observed" are indicated by arrows pointing in the same directions.

Factor	Stimulus	Picture	Mean Picture	SD	Mean control	SD	Expec.	Observ.	t	p
Pleasure	M	+	0.0186	0.963	-0.009	1.018	>	>	0.475	0.635
	F	+	-0.129	0.972	0.065	1.008	>	<	-3.316	0.001
	M	-	0.007	1.069	-0.004	0.964	<	>	0.182	0.855
	F	-	0.171	1.050	-0.086	0.963	<	>	4.320	<0.001
Arousal	M	+	-0.063	1.074	0.031	0.960	>	<	-1.534	0.125
	F	+	0.302	0.878	-0.141	1.020	>	>	8.286	<0.001
	M	-	0.084	0.912	-0.042	1.039	<	>	2.249	0.025
	F	-	-0.303	1.099	0.151	0.909	<	<	-7.414	<0.001
Dominance	M	+	0.177	0.992	-0.088	0.993	>	>	4.534	<0.001
	F	+	0.088	1.059	-0.044	0.967	>	>	2.187	0.029
	M	-	-0.124	0.989	0.067	1.006	<	<	-3.105	0.002
	F	-	-0.101	0.949	0.019	1.017	<	<	-1.899	0.058

4. Discussion

Postures have generally been manipulated in much the same way as have been facial expressions and seem to produce approximately the same size of effects. Our results are consistent with literature, for example, there seems to be no distinctive happy posture, and attempts to produce happiness through postures have not been successful until today (Coan and Allen 2007, Flack et al. 1997, Flack et al. 1999). The same phenomenon can be observed in gait analysis (Karg et al. 2010). There are sex differences in the interpretation of postures, but not in the angle data of postures. Happiness seems to be harder to detect in female postures, compared to male postures (table 5), although results are not significant after bonferroni correction. Female arousal seems to be much easier to detect than male arousal (table 5). The analysis of the dataset of male and female postures together shows highly significant ratings for the postures indicating dominance (table 4), though male dominance seems to be easier to detect in postures compared to female postures (table 5).

The results of this study clearly emphasize the approach of using empirical analysis of angle data inferred from reconstructed postures to create virtual avatars in order to investigate

the relationship between affect and static body postures.

The analysis of female and male avatars separately reduces sample size giving less significant results for the ratings of the avatar's exaggerated postures indicating different internal states.

The negative postures of the rating study's avatars were constructed mathematically, they do not represent a natural posture per se. Ratings of these figures were found to be reliable and in most cases accurate for at least two of the three PAD factors (arousal and dominance). As shown by Grammer et al. in 2004 reported affect seems to be encoded in body posture and is understood by observers, even from reconstructed postures. The fact that even the reconstructed negative postures show a high degree of raters' reliability and accuracy signifies the signal quality of body angles as opposed to emotion categories (Grammer et al. 2004). So nonverbal communication through body posture seems to be a significant part of communication, even if not conscious most of the time.

Body postures can be seen as continuous vectors of body angles, which are vehicles for information about affect. The correct third party rating points to the conclusion that perceivers can correctly assess the affective value of body postures. So communication via mirror neurons is quite likely.

The main difference to the paper investigating affect before (Grammer et al 2004.) lies in the way the questionnaire is arranged and the factor extraction which is limited to three factors (pleasure, arousal and dominance) in contrast to the multiple factor solution of PANAS. The disadvantage for the forced factor solution of three lies in the low percentage of explained variance which is 50% in the first part of the study and 67% in the second part (rating study). The total variance explained by the factor extraction for PANAS was 73% in 2004.

Due to the restricted time frame only data of students staying in the university building were acquired which may affects the variation of postures and the representativeness of the sample.

Conclusion

Internal states do correlate with body posture. However, there are sex differences in the interpretation of artificial body postures. Dominance was classified correctly for both sexes, even if more significant in males. Arousal was classified correctly only in female postures, if female and male stimuli are separated for the statistical analysis. Pleasure was not significantly detected in both sexes after bonferroni correction.

5. References

Aranguren, M., & Tonnelat, S. (2014). Emotional transactions in the Paris subway: combining naturalistic videotaping, objective facial coding, and sequential analysis in the study of nonverbal emotional behavior. *Journal of Nonverbal Behavior*.

Carney, D. R., Cuddy, A., & Yap, A. J. (2010). Power posing: Brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science, 21*(10), 1363–1368.

Cashdan, E. (1998). Smiles, Speech, and Body Posture: How women and men display sociometric status and power. *Journal of Nonverbal Behavior, 22*(4), 209-228.

Collett, P., & Marsh, P. (1974). Patterns of public behavior: Collision avoidance on a pedestrian crossing. *Semiotica, 12*, 281–299.

Coulson, M. (2004). Attributing emotion to static body postures: Recognition accuracy, confusions, and viewpoint dependence. *Journal of Nonverbal Behavior, 28*, 117–139.

Darwin, C. (1965). *The expression of the emotions in man and animals* (Vol. 526). University of Chicago press.

Ekman, P. (1971). Universals and cultural differences in facial expressions of emotion. In *Nebraska symposium on motivation*. University of Nebraska Press.

Grammer, K., Fink, B., Oberzaucher, E., Atzmüller, M., Blantar, I., & Mitteroecker, P. (2004). The representation of self-reported affect in body posture and body posture simulation. *Collegium Antropologicum. 28* (2), 159–173.

Grammer, K., Fink, B., Renninger, L. (2002). Dynamic systems and inferential information processing in human communication. *Neuroendocrinology Letters Special Issue, 23*(4), 15-22.

Hall, J. A. (1990). *Nonverbal sex differences: Accuracy of communication and expressive style*. Johns Hopkins University Press.

Hall, J. A. (2006). Nonverbal behavior, status, and gender: How do we understand their relations? *Psychology of Women Quarterly*, *30*(4), 384-391.

Hall, J. A., Coats, E. J., & LeBeau, L. S. (2005). Nonverbal behavior and the vertical dimension of social relations: a meta-analysis. *Psychological bulletin, 131*(6), 898.

Izard, C. E. (1971). The face of emotion. Appelton-Century-Crofts, New York.

James, W. T. (1932). A study of the expression of bodily posture. *The Journal of General Psychology*, *7*(2), 405-437.

Karg, M., Kuhnlenz, K., & Buss, M. (2010). Recognition of affect based on gait patterns. *Systems, Man, and Cybernetics, Part B: Cybernetics, IEEE Transactions on*, *40*(4), 1050-1061.

Kleinsmith, A., & Bianchi-Berthouze, N. (2007). Recognizing affective dimensions from body posture. In *Affective computing and intelligent interaction* (pp. 48-58). Springer Berlin Heidelberg.

Kleinsmith, A., & Bianchi-Berthouze, N. (2013). Affective body expression perception and recognition: A survey.*Affective Computing, IEEE Transactions on*, *4*(1), 15-33.

Kleinsmith, A., De Silva, P. R., & Bianchi-Berthouze, N. (2006). Cross-cultural differences in recognizing affect from body posture. *Interacting with Computers*, *18*(6), 1371-1389.

Koppensteiner, M. (2013). Motion cues that make an impression: Predicting perceived personality by minimal motion information. *Journal of experimental social psychology*, *49*(6), 1137-1143.

Koppensteiner, M., & Grammer, K. (2010). Motion patterns in political speech and their influence on personality ratings. *Journal of Research in Personality*, *44*(3), 374-379.

Mehrabian, A. (1968). Inference of attitudes from the posture, orientation, and distance of a communicator. *Journal of consulting and clinical psychology*, *32*(3), 296.

Mehrabian, A. (1969). Significance of posture and position in the communication of attitude and status relationships. *Psychological Bulletin*, *71*(5), 359.

Mehrabian, A. (1977). *Nonverbal communication*. Transaction Publishers.

Mehrabian, A., & Ferris, S. R. (1967). Inference of attitudes from nonverbal communication in two channels. *Journal of consulting psychology*, *31*(3), 248.

Mehrabian, A., & Russell, J. A. (1974). The basic emotional impact of environments. *Perceptual and Motor Skills*, *38*(1), 283-301.

Mignault, A., & Chaudhuri, A. (2003). The many faces of a neutral face: Head tilt and perception of dominance and emotion. *Journal of Nonverbal Behavior*, *27*(2), 111-132.

Omark, D. R., Strayer, F. F., & Freedman, D. G. (1980). *Dominance relations: An ethological view of human conflict and social interaction*. New York: Garland.

Strayer, F. F., Strayer, J., & Chapeskie, T. R. (1980). The perception of social power relations among preschool children. In Omark, D. R., Strayer, F. F., & Freedman, D. G. (1980). *Dominance relations: An ethological view of human conflict and social interaction*. New York: Garland.

Tomkins, S. S. (1962). Affect, imagery, consciousness: Vol. I. The positive affects. Springer, New York.

Wallbott, H. G. (1998). Bodily expression of emotion. *European journal of social psychology*, *28*(6), 879-896.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of personality and social psychology*, *54*(6), 1063.

Weisfeld, G. E., & Beresford, J. M. (1982). Erectness of posture as an indicator of dominance or success in humans. *Motivation and Emotion*, *6*(2), 113-131.

Acknowledgements

Special thanks go to Prof. Dr. Karl Grammer, Anna Schaman, Msc. and the attendees oft he „Humanethologische Praktikum": Dominic Reichl, Anja Schrittwieser, Judith Suttner und Tamara Etlinger. Further thanks go to the CADDY project, an EU external funds project financing this study.

Appendix

Fragebogen

Teilnehmernummer:

Interviewer:
Datum:

Bitte kreuzen Sie an, wie Sie sich gefühlt haben, als Sie angesprochen wurden:
Wir bitten Sie weiters den Fragebogen zur Gänze und gewissenhaft auszufüllen.

zufrieden	O O O O O O O	unzufrieden
tonangebend	O O O O O O O	umsorgt
nervös	O O O O O O O	matt
hoffnungsvoll	O O O O O O O	verzweifelt
glücklich	O O O O O O O	unglücklich
eigenständig	O O O O O O O	gelenkt
erregt	O O O O O O O	nicht erregt
locker	O O O O O O O	überdrüssig
angeregt	O O O O O O O	entspannt
kontrollierend	O O O O O O O	kontrolliert
aufgeregt	O O O O O O O	gelassen
einflussreich	O O O O O O O	beeinflussbar
rasend	O O O O O O O	träge
wichtig	O O O O O O O	ehrfürchtig
erfreut	O O O O O O O	verärgert
hellwach	O O O O O O O	schläfrig
dominant	O O O O O O O	unterwürfig
unbeschwert	O O O O O O O	schwermütig

Fragebogen

Alter (Jahre): _____ Geschlecht: □ männlich □ weiblich

Wie haben Sie die Person erlebt, die Sie zur Teilnahme an der Studie eingeladen hat:

dominant	O O O O O O O	unterwürfig
sympathisch	O O O O O O O	unsympathisch
attraktiv	O O O O O O O	unattraktiv
unangenehm	O O O O O O O	angenehm
angeregt	O O O O O O O	entspannt

Körperhöhe (cm): _____

Üben Sie regelmäßig Sport aus?

□ Ja, _____ etwa _____ Mal monatlich □ Nein
Sportart

Sind Sie derzeit verletzt? (Verletzungen, die die Bewegung einschränken)

□ Ja, _____ seit _____ Wochen □ Nein
Verletzung

Studienrichtung: _____ Seit wie vielen Semestern studieren Sie: _____

Höchster akademischer Titel: _____

Höchster Bildungsgrad der Eltern:	Mutter	Vater
Volksschul- bis Hauptschulabschluss	□	□
Berufsbildende mittlere Schulen (Fachschule, Handelsschule)	□	□
Matura (AHS, HAK, HTL, HBLA)	□	□
BSc bzw. BA	□	□
Mag. bzw. MSc bzw. MA	□	□
Dr. bzw. PhD bzw. MD	□	□

Wie viel Geld steht Ihnen monatlich zur Verfügung (Euro): _____

Üben Sie einen regelmäßigen Nebenjob aus?

□ Ja, für durchschnittlich _____Euro monatlich □ Nein

Erhalten Sie finanzielle Unterstützung von Ihren Eltern?

□ Ja, durchschnittlich _____Euro monatlich □ Nein

Wie empfinden Sie Ihr monatliches Einkommen?

□ als mehr als ausreichend
□ als ausreichend
□ als unzureichend

VIELEN DANK FÜR IHRE MITARBEIT!

Zusammenfassung

Körperhaltung ist entscheidend für die Kommunikation der internen Zustände in sozialen Interaktionen. In dieser Studie haben wir mit Hilfe der modernen Anthropologie untersucht, wie Vergnügen, Erregung und Dominanz (Pleasure, Arousal and Dominance, PAD) sich in der Körperhaltung ausdrücken und inwiefern bewertende Versuchspersonen in der Lage sind die Merkmale der Körperhaltung den internen Zuständen auf PAD-Level zuzuordnen. Die erste Studie nimmt die Körperhaltung der Teilnehmer über eine versteckte Kamera auf, während sie ihren Affekt im Moment der Interaktion mit dem Interviewer selbst beschreiben. Die zweite Studie sammelt Informationen über die Genauigkeit der bewertenden Versuchspersonen, die angewiesen wurden, den Affekt von künstlichen Avataren zu klassifizieren. Die künstlichen Avatare sind Ergebnisse der ersten Studie. Die Resultate stimmen mit früheren Studien in dem Punkt überein, als dass der Faktor Vergnügen schwer aus Körperhaltungen zu klassifizieren ist, jedoch sind Erregung und Dominanz einfacher zu klassifizieren. Erregung wurde häufiger bei weiblichen, als bei männlichen Stimuli (künstliche Avatare), korrekt klassifiziert, während Dominanz klar bei weiblichen und männlichen Stimuli erkannt wurde. Die Conclusio stellt interne Zustände als korrelierend mit der Körperhaltung dar, obwohl es geschlechtsspezifische Unterschiede in der Art und Weise, wie interne Zustände interpretiert werden gibt, jedoch konnten keine Unterschiede zwischen den Geschlechtern die Winkeldaten der Körperhaltung betreffend gefunden werden, dies deckt sich mit früheren Studien.

Curriculum Vitae

Studies

Bachelor of Science in the field of *Biology*, University of Vienna (2012).

Bachelor Thesis: „ Neuromuscular Anatomy of the Planktonic Polychaete and Holopelagic Predator *Tomopteris*", Department of Integrative Zoology, University of Vienna.

Master of Science in the field of *Behaviour-*, *Neuro- and Cogniton biology*, University of Vienna (2015).

Master Thesis: „The relationship between affect and body posture in social encounters".

Work experience

Half-year employment in the FP7 EU project CADDY. Assignments in organisation, planning experiments and data collection. (2014)

Experience abroad

2 times 3 weeks of language learning courses of Language Learning International (LLI) in Dun Laoghaire, Ireland.