Person or Puppet? The Role of Stimulus Realism in Attributing Emotion to Static Body Postures

Marco Pasch and Ronald Poppe[1]

Human Media Interaction Group, University of Twente
P.O. Box 217, 7500 AE Enschede, the Netherlands
{m.pasch, poppe}@ewi.utwente.nl

Abstract. Knowledge of the relation between body posture and the perception of affect is limited. Existing studies of emotion attribution to static body postures vary in method, response modalities and nature of the stimulus. Integration of such results proves difficult, and it remains to be investigated how the relation can be researched best. In this study we focus on the role of stimulus realism. An experiment has been conducted where computer generated body postures in two realism conditions were shown to participants. Results indicate that higher realism not always results in increased agreement but clearly has an influence on the outcome for distinct emotions.

Keywords: Nonverbal behavior, emotion recognition, body postures

1 Introduction

Recognizing a person's affective state is one of the big challenges within the field of affective computing [11]. In order to achieve truly intelligent Human-Computer Interaction, we need to know how humans perceive each other. We communicate our affective states in many ways, most obviously through the tones of our voices and our choice of words. But also nonverbal signals, such as facial expressions, gestures and body postures, give clues about one's affective state. Of these channels, especially facial expressions have received a great deal of attention. It has been researched how individual facial muscles contribute to an expression [13], and how certain expressions are perceived in terms of affect [6]. Body postures have received significantly less attention. However, the ability of the body to display affect has often been mentioned [1].

In this paper, we investigate how body postures are perceived by human observers in terms of affective attributions. This kind of research is not new, and dates back at least to James' study on the expression of body posture [8]. On an abstract level, perception research is characterized by human observers rating stimuli on a number of labels. From the various studies, we know that at least some emotions can be perceived with above-chance level agreement. However, proper consolidation of the findings of these studies is difficult due to the many factors involved while performing this kind of research. We discuss these factors subsequently.

---

[1] Corresponding Author

First, there is no general agreement on how to specify emotional affect, and this is reflected in the choice of emotion labels used throughout perception literature. Ekman's model of six basic emotions [4] is used widely (e.g. by Ekman and Friesen [5], and Coulson [2]), albeit sometimes with a lower number of labels (Kleinsmith et al. [9], De Silva and Bianchi-Berthouze [3]). Other studies use a more elaborate list of emotions (e.g. Wallbott [16], Kudoh and Matsumoto [10], Grammer et al. [6]).

The postures that are used in perception literature are another factor that is of influence. The human body is complex with a large number of degrees of freedom, usually represented by joint rotations. Even if each joint could assume only a few rotations, the total number of postures would be far too large to evaluate. Therefore, studies use only a small subset of all physically feasible postures. James [8] used a large number of body part positions, which he combined to generate more complex deformations. James did not choose the postures with a specific form of affect in mind. Similarly, Kudoh and Matsumoto [10] asked participants to describe postures that occur in everyday conversations. Pictures of spontaneously performed postures are used by Ekman and Friesen [5], who induced the emotional state, and Grammer et al. [6], who measured participants' self-reported affect. In contrast, studies by Kleinsmith et al. [9], and De Silva and Bianchi-Berthouze [3] used prototypical postures, each of which depicted a clearly defined emotion. These postures can be performed by actors (e.g. Wallbott and Scherer [17], Kleinsmith [9], Pitterman and Nowicki [12]), or defined manually (e.g. Coulson [2]).

The methodology also varies, according to the purpose of the study. James' study was investigative, and the responses to each stimulus were open-ended. Although these responses are more informative compared to a forced-choice methodology, there is clearly a degree of subjectivity in interpreting and analyzing the responses of multiple observers. Winters [18] has looked into the different kinds of response modality, and observed that the choice of methodology has a large effect on the outcomes of the perception agreement.

A final factor of influence is the type of stimulus that is used to portray the postures. The DANVA-POS set, as collected and described by Pitterman and Nowicki [12], consists of photographs of persons in various sitting and standing postures. To make sure facial expressions do not influence the perception, all faces have been erased using a black marker. James [8] also used photographs, but of a mannequin. This allowed him to have more control over the postures, and visual appearance between stimuli was guaranteed. Moreover, factors such as age, sex and ethnicity would not play a role in the attribution. Schouwstra and Hoogstraten [14] used drawings as stimuli, but it remains unclear how much detail was preserved. Computer-generated stimuli were recently used by Coulson [2], Grammer et al. [7] and De Silva and Bianchi-Berthouze [3]. These stimuli have the advantage that parameters such as visual appearance, posture, viewpoint, detail, and lighting, can be completely controlled. While stimulus control is important, it is also necessary to know how all these parameters influence the outcomes of perception research.

In this study, we investigate the effect of stimulus realism on the attribution of emotion to static body postures. To this end we replicated the experiment of Coulson [2], who used computer-generated stimuli of a mannequin. Elimination of the factors age, sex and ethnicity is useful to prevent possible biases. However, when using mannequins, the degree of realism and detail is minimal. Wallbott [15] observed that, when the spatial resolution of the stimuli is decreased, so is the affect recognition rate. The same might be the case when presenting mannequins instead of more detailed stimuli. More details give more clues towards the position of body parts, e.g. the angle of the head. Another factor is the rate of realism. In James' [8] experiment, observers occasionally experienced the emotion that was attributed to the postural expression. Sometimes, this effect was accompanied by mimicking the presented posture. We expect that the kinesthetic effect will be less when using mannequins. On the other hand, mimicking the posture might be more necessary when using the mannequin stimuli, since the observer has less clues about the depth of the body parts, and consequently of the precise posture.

To investigate the role of realism on the attribution, we add a realism condition to the experiment. We acknowledge that in performing the experiment, the specific choices for response modality, emotion labels and the posture set itself have a large influence of the outcome of the experiment. Coulson [2] mentions that some postures look unnatural, and the choice of postures is arbitrary. Also, as Winters [18] observes, the use of a forced-choice methodology is likely to introduce noise in the responses. However, Coulson's systematic description of the postures and his findings allow us to replicate his experiment and investigate the differences between the two realism conditions. Our study is therefore not aimed at investigating how postures, or posture features, define the attribution of emotion. We rather investigate if, and how, the level of realism influences the attribution. This way, we hope to be able to make suggestions on how to improve the current state of perception research.

The paper is organized as follows. In Section 2 we specify our research questions. Section 3 describes our method, and results are presented and discussed in Section 4. We summarize our contribution and give pointers to future research in Section 5.

2 Research Questions

We investigate if and how stimulus realism influences the way the affective state of an observed subject is perceived. Our initial assumption is that realism does play a role in the attribution of emotions to static body postures. A realistic figure contains more body features and shows them more detailed. It is thus possible that the viewer perceives more visual cues. Also, the kinesthetic effect will be larger when observing more realistic stimuli. Our first hypothesis is thus formulated:

H_1: *Realistic stimuli obtain a higher consensus level than abstract stimuli when attributing emotion to static body postures.*

It is important to note that the consensus level here is the level of agreement between the observed and rated stimuli, and the emotion label that was defined beforehand. This predefined label is not necessary the label that is most often reported. However, since we use prototypical postures, we expect this effect to be small.

Previous studies have found that different basic emotions are attributed with different levels of consensus (e.g. Coulson [2], Ekman and Friesen [5]). We expect that this also holds for different levels of realism. Some emotions will be perceived with the same accuracy, disregarding the realism condition. Others will be influenced by the realism, and difference in detail. Our second hypothesis is presented:

H_2: *Stimulus realism has an effect on the consensus levels for different emotion labels when attributing emotion to static body postures.*

3 Method

3.1 Participants

A total of 48 participants were recruited for the experiment (16 female, 32 male). All participants were university students or staff members, with an average age of 29 years (range 22 to 54 years). There was no gratification given.

3.2 Stimuli

In this study, we replicate the experiment of Coulson as reported in [2]. He uses a simplified model of the human body. For the lower body, only the weight transfer is modeled. Furthermore, six joint rotations are regarded in the upper body (head bend, chest bend, abdomen bend, shoulder adduction, shoulder swing, and elbow bend). The corresponding descriptions of body postures are given in Table 1.

Table 1. Joint rotations for each of the emotion labels (reprinted from Coulson [2])

	Abdomen twist	**Chest bend**	**Head bend**	**Shoulder ad/abduct**	**Shoulder swing**	**Elbow bend**	**Weight transfer**	**No. of postures**
Anger	0	20, 40	-20, 25	-60, -80	45, 90	50, 110	Forwards	32
Disgust	-25, -50	-20, 0	-20	-60, -80	-25, 45	0, 50	Backwards	32
Fear	0	20, 40	-20, 25, 50	-60	45, 90	50, 110	Backwards	24
Happiness	0	0, -20	0, -20	50	0, 45	0, 50	Forwards, Neutral	32
Sadness	0, -25	0, 20	25, 50	-60, -80	0	0	Backwards, Neutral	32
Surprise	0	-20	25, 50	50	-25, 0, 45	0, 50	Backwards, Neutral	24

We use two realism conditions, a realistic and an abstract condition. The latter one is our control condition, and contains all stimuli from Coulson's experiment. For both conditions, images of postures were generated with Poser 6 (e-Frontier), a 3D figure animation tool. For the realistic condition the default character "James" was used, a young male. To avoid the interference of facial expressions, all facial features were removed by replacing the face with a skin-textured sphere. For the control condition, Poser's mannequin figure was chosen in accordance with Coulson's study. We used the same three viewpoints: from the front, the left hand side, and from a position above and behind the left shoulder. Figure 1 illustrates our stimuli set by showing 6 identical postures depicting happiness in both realism conditions and seen from the three viewpoints.

Figure 1. The same posture in both realism conditions, and shown from the three viewpoints.

3.3 Procedure

For each realism condition, 176 postures were rendered from three viewpoints, resulting in a total of 528 stimuli images per condition. The images for each of the realism conditions were split into three stimulus sets of 176 images. Each set contained all postures, each viewed from exactly one angle, and each viewpoint occurring in one third of the stimuli. Within a subset, stimuli images were shown in a semi-random order, according to Coulson's study. Our experimental design is a 2 x 3 x 6 x 3 design, with realism condition and subset as between-subjects variables, and emotion label and viewpoint as within-subjects variables.

Participants were instructed to choose the emotion label they thought could be attributed best to the posture shown on screen. The realism condition and stimulus set that a participant had to judge were assigned at random. Upon clicking the start button, the participant was shown the first image. Judgments could be made by pressing one of the six labeled buttons below the image, each corresponding to one of the six emotion labels. These were ordered alphabetically and their location on screen did not change during the experiment. A click on one of the buttons advanced the experiment to the next image. There was no time limit imposed, and participants were told to take a break whenever they thought was necessary. The time between the first and last judgment was measured for verification purposes. Each participant processed a stimulus set of 176 images.

4 Results and discussion

First, we check whether fatigue affected the participants' judgments over the course of the experiment. A paired t-test between the performance of each participant in the first and second half of the experiment fails to reach significance ($t(48) = -0.036$, n.s.).

We conduct repeated measures ANOVA, with realism condition and stimulus subset as between-subjects variables, and viewpoint and emotion as within-subject variables. First we notice that there is no significant main effect for stimulus subset. However, there is a marginal interaction effect between viewpoint and subset, and the interaction between viewpoint, condition and subset is significant ($F(4, 42) = 2.811$, $p < .05$). These effects can be explained since realism condition, viewpoint and subset are correlated. This is an inconvenient result of our efforts to keep the number of stimuli for each participant manageable.

Table 2. Agreement scores broken down by realism condition, viewpoint and emotion label

	Realistic condition				**Abstract condition**			
	Front	**Side**	**Rear**	**Average**	**Front**	**Side**	**Rear**	**Average**
Anger	35%	30%	31%	32%	34%	43%	41%	39%
Disgust	7%	12%	7%	9%	23%	29%	20%	24%
Fear	35%	33%	39%	36%	18%	24%	27%	23%
Happiness	64%	53%	55%	57%	78%	56%	52%	62%
Sadness	64%	50%	59%	58%	28%	74%	59%	54%
Surprise	18%	42%	36%	32%	13%	22%	14%	16%
Average	**38%**	**37%**	**38%**	**38%**	**34%**	**43%**	**37%**	**38%**

To evaluate our first hypothesis, we look at the main effect for realism condition. We observe that this effect is not significant ($F(1, 42) = 0.203$, n.s.), which can be understood by looking at the average scores of both conditions in Table 2. The averages over all emotions and all viewpoints are 38% for both conditions. However, we clearly see different scores between the two realism conditions for the different emotions. Indeed, there is an interaction effect between realism condition and emotion, thus confirming our second hypothesis. We discuss the differences in scores between emotions later. First, we report the other significant findings in our ANOVA.

There is a significant main effect for emotion ($F(5, 210) = 39.080$, $p < .001$), which can be seen in Table 2 as well. This effect is in agreement with findings by, amongst others, Coulson [2]. We discuss this later.

Also consistent with Coulson's study is the significance of the main effect for viewpoint ($F(2, 84) = 7.471$, $p < .01$). Also, interestingly, there is an interaction effect for viewpoint and condition ($F(2, 42) = 10.347$, $p < .001$). In Table 2, we see that in the abstract condition the side viewpoint scores much better than in the realistic condition. Also, the front viewpoint has a slightly lower score.

The interaction between viewpoint and emotion is also significant ($F(10, 42) = 8.349$, $p < .001$), as well as the second order interaction between emotion, viewpoint and realism condition ($F(10, 42) = 8.949$, $p < .001$). Tables 4 and 5 show the consensus levels (i.e. level of agreement with the predefined emotion label) for the realistic condition and abstract condition, respectively. In Table 6 the difference in the consensus levels between the two conditions is presented.

Since the abstract condition was a replication of Coulson's [2] study, we check whether there are differences between the results. If we turn to Tables 5 and 7, overall we notice small differences. An exception is sadness from a frontal view where we can see a bigger difference. When taking a closer look at our results, we can observe that the postures of our abstract character depicting sadness from a frontal view were often perceived as happiness or surprise. This appears unusual as sadness and happiness/surprise can be seen as quite opposing emotions. Figure 2 shows 4 postures that are predefined to depict sadness. While the two leftmost postures were perceived by the majority of observers as sad, the two rightmost ones received a majority vote for happiness or surprise. A pattern that we can observe is that in all these postures the arms have a above-zero value for the shoulder abduction parameter.

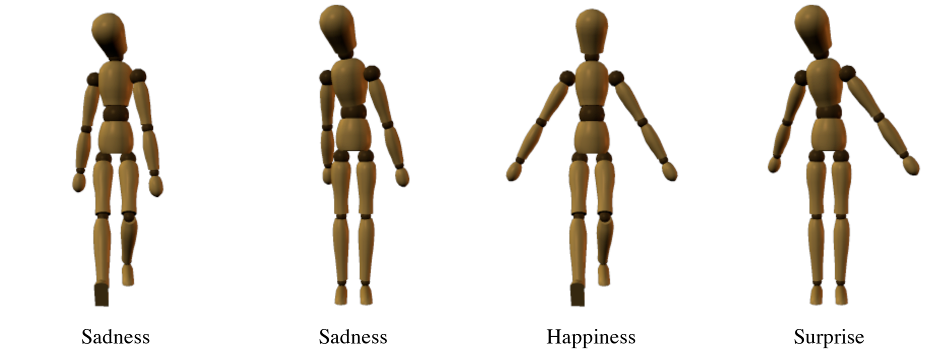

Figure 2. Postures with predefined emotion label sadness with corresponding majority votes

It is possible that our replicated posture set deviates from Coulson's original set. Coulson reports the best scoring postures for each emotion label. For sadness, the posture has a chest bend of 40 degrees, which is not within the specified range (see Table 1). The fact that we use 20 as the maximum results in a head that is effectively less bent down. This is less visible in the front view, which could explain the lower consensus levels for this view.

We now focus on the scores for the different emotion labels. Overall, we observe that all findings are above chance level ($F(1,42) = 350{,}709$, $p < .001$) when performing ANOVA with the scores corrected for chance (16,7% for each emotion). From here we look at each emotion separately. Anger shows good consensus levels in both conditions but scores better in the abstract condition as can be seen in Table 6. The same is true for disgust, though none of the postures for disgust in the realistic condition, and only few in the abstract condition, reach consensus levels over 50% (see Tables 4 and 5). The deviation between the realism conditions is also smaller here. Fear reaches high consensus in the realistic condition, but consensus is poor for abstract stimuli, so fear is clearly recognized better in the realistic condition. For happiness we find very high consensus levels in both conditions but still see a clear advantage towards the abstract condition. For sadness we have to distinguish the results for each viewpoint. When seen from the front, there is a clear advantage towards the realistic condition. Seen from the side, the abstract condition shows higher consensus levels. From the rear, the consensus levels of both conditions are almost identical. An example for the deviation between the viewpoints for sadness can be seen in Figure 3, which shows the same posture in both conditions seen from the front and the side with the corresponding consensus levels. In the side view of the abstract condition the right hand can be seen, while it is covered in the realistic condition. This excess in information is a possible explanation for the higher consensus level of the abstract condition.

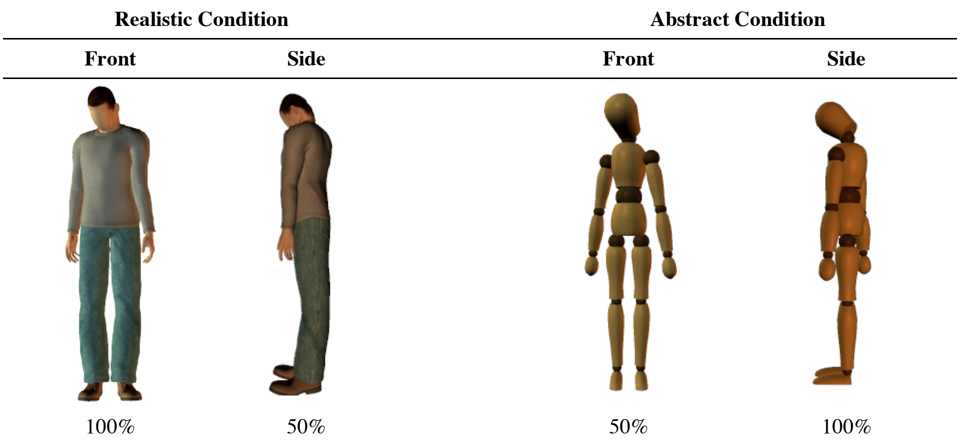

Figure 3. Example of deviation in agreement levels of a posture seen from different viewpoints

We expect that certain emotion labels are more confused than others. In Table 3, we summarized these confusions for both conditions. In general, happiness and sadness are often chosen, whereas especially disgust received a minority of the votes. These results are not surprising, and have been reported repeatedly in literature. The fact that disgust and surprise are often expressed with movement, rather than static body postures is a viable explanation.

If we focus on the difference in the two realism conditions, we see large differences in the attribution of postures that are predefined to express disgust and surprise. Disgust is often confused with happiness and surprise in the realistic condition. In the abstract condition, fear and happiness are often chosen, besides the correct label. These findings could be partly explained by the fact that the chest bend for disgust, happiness and surprise can be negative, which indicates a more rising posture. This could be more visible in the realistic condition.

We discussed the confusion between sadness, surprise and happiness earlier. Another interesting observation is the difference between the attributions for fear. Fear is recognized better in the realistic condition, and is often confused with anger in the abstract condition. If we look at Table 1, we notice that the postures for anger and fear are quite alike. The only differences are the head bend and the weight transfer. In the front view, it is difficult to distinguish between the different parameters. This effect is probably especially present in the abstract condition.

Table 3. Confusion matrix for both realism conditions

	Observed						
Predefined	Anger	Disgust	Fear	Happiness	Sadness	Surprise	**Recall**
Anger	**247 - 299**	56 - 74	209 - 166	24 - 49	197-159	35 - 21	**32 - 39%**
Disgust	91 - 72	**66 - 185**	82 - 134	189 - 154	34-54	306 - 169	**9 - 24%**
Fear	106 - 175	29 - 49	**205 - 132**	8 - 34	208-173	20 - 13	**36 - 23%**
Happiness	107 - 101	19 - 37	39 - 30	**439 - 476**	34-10	130 - 114	**57 - 62%**
Sadness	53 - 35	139 - 68	50 - 82	32 - 70	**443-412**	51 - 101	**58 - 54%**
Surprise	58 - 77	49 - 31	48 - 36	223 - 336	14-3	**184 - 93**	**32 - 16%**
Total	662 - 759	358 - 444	633 - 580	915 - 1119	930-811	726 - 511	
Precision	**37 - 39%**	**18 - 42%**	**32 - 23%**	**48 - 43%**	**48 - 51%**	**25 - 18%**	

First value is the realistic condition, second value is abstract condition. Recall values are percentage of the total number of samples (576 for fear and surprise, 768 for others)

We did not look at how distinct anatomical features can be used to explain the attribution of the posture to a certain emotion. Such an analysis is not within the scope of our research as reported here. The interested reader is referred to Coulson [2] who performed such an analysis. Attempts to describe the relation from posture to emotion label functionally are reported by Wallbott [16] and De Silva and Bianchi-Bertouze [3].

5 Conclusion and future work

Computer-generated body postures in two realism conditions were used to assess the role of stimulus realism for the attribution of emotion to static body postures. We replicated an experiment by Coulson [2], who used a mannequin character as stimulus and used this test set as abstract realism condition. We further added a realistic condition by using the same posture descriptions for a more realistic, human-like character, whose facial features were removed to avoid a bias through facial expressions.

We expected the realistic condition to result in higher agreement rates than the abstract condition as we expected that observers could perceive more visual cues and could identify with the figure more easily. Our results show that overall there is no difference between the realism conditions. However, there are differences for individual emotion labels. Anger, disgust, and happiness are recognized with a higher level of agreement when displayed by an abstract character, while fear and surprise are recognized better when displayed by a realistic character. For sadness, the realistic condition yields a higher consensus level in the front view while in the side view, the abstract condition shows higher agreement with the predefined emotion label. We can therefore conclude that realism does influence the perception and should therefore be taken into account when performing research into perception of affect from postures.

By introducing the realism condition, however, we also introduced other variables that are likely to have an effect on the attribution. For example, hiding the facial features is an arbitrary choice. Though not reported by participants, the lack of facial features makes the character less realistic and it is possible that the removed face makes the character look intimidating. It remains to be investigated how the interaction between facial and postural features in this kind of research affects the emotion attribution.

Former studies of body postures relied on abstract characters in an attempt to discard sex, age and ethnicity. By employing a realistic character, we bring these factors back into the equation. In this study we used a young male computer-generated character. It is possible that a different sex, age, and ethnicity of the character would have led to different scores. Investigating the precise role of these factors appears eligible. Also, research by Kudoh and Matsumoto [10] and Kleinsmith et al. [9] has demonstrated that differences in attributions exist between people of different cultures. Although the postures we used are prototypical, it should be analyzed whether ethnicity of the participants influences their perception.

We hope to fuel the discussion on how research into the perception of affect from postures can best be conducted. We have shown that realism plays an important role in the attribution, but there are clearly many more factors. Proper consolidation of our research is possible only if agreement is reached over methodology, emotion labels and postures. When advantage is taken of the multidisciplinary nature of the research, interesting results are to be expected.

Acknowledgments

This research was partly funded by the EU Project HUMAINE (IST-507422), and is part of the ICIS program. ICIS is sponsored by the Dutch government under contract BSIK03024. We thank Mark Coulson for providing the data which allowed us to rebuild the stimuli, and for the detailed information of his results. We further wish to thank Matthijs Poppe for his useful comments regarding the design and analysis of the experiment.

References

1. Cook, M. (1979): Perceiving others: the psychology of interpersonal perception. Methuen, London
2. Coulson, M. (2004): Attributing emotion to static body postures: recognition, accuracy, confusions, and viewpoint dependence. Journal of Nonverbal Behaviour, 28(2), pp. 117-139
3. De Silva, P.R., Bianchi-Berthouze, N. (2004): Modeling human affective postures: an information theoretic characterization of posture features. Computer Animation and Virtual Worlds 15(3-4), pp. 269-276
4. Ekman, P. (1999): Basic emotions. In T. Dalgleish & M. Power (Eds.): Handbook of Cognition and Emotion. John Wiley & Sons, Sussex
5. Ekman, P., Friesen, W.V. (1967): Head and body cues in the judgment of emotion: a reformulation. Perceptual and Motor Skills, 24(3), pp. 711-724
6. Ekman, P., Friesen, W.V., Ellsworth, P. (1972): Emotions in the human face: guidelines for research and an integration of findings. Pergamon Press, New York
7. Grammer, K., Fink, B., Oberzaucher, E., Atzmüller, M., Blantar, I., and Mitteroecker, P. (2004): The representation of self reported affect in body posture and body posture simulation. Collegium antropologicum 28 Suppl. 2, pp. 159-173
8. James, W.T. (1932): A study of expression of body posture. Journal of General Psychology 7, pp. 405-437
9. Kleinsmith, A., De Silva, P.R., Bianchi-Berthouze, N. (2006): Cross-cultural differences in recognizing affect from body posture. Interacting with Computers 18(6), pp. 1371-1389
10. Kudoh, T., Matsumoto, D. (1985): Crosscultural examination of the semantic dimensions of body posture. Journal of Personality and Social Psychology 48(6), pp. 1440-1446
11. Picard, R.W. (1997): Affective computing. MIT Press, Cambridge
12. Pitterman, H., Nowicki, S., Jr. (2004): A test of the ability to identify emotion in human standing and sitting postures: the diagnostic analysis of nonverbal accuracy-2 posture test (DANVA-POS). Genetic, Social, and General Psychology Monographs 130(2), pp. 146-162
13. Rinn, W.E. (1984): The neuropsychology of facial expression: a review of the neurological and psychological mechanisms for producing facial expression. Psychological Bulletin 95(1), pp. 52-77
14. Schouwstra S.J., Hoogstraten J. (1995): Head position and spinal position as determinants of perceived emotional state. Perceptual and Motor Skills 81(2), pp. 673-674
15. Wallbott, H.G. (1992): Effects of distortion of spatial and temporal resolution of video stimuli on emotion attributions. Journal of Nonverbal behavior 16(1), pp. 5-20
16. Wallbott, H.G. (1998): Bodily expression of emotion. European journal of Social Psychology 28(6), pp. 879–896
17. Wallbott, H.G., Scherer, K.R. (1986): Cues and channels in emotion recognition. Journal of Personality and Social Psychology 51(4), pp. 690-699
18. Winters, A. (2005): Perceptions of body posture and emotion: A question of methodology. The New School Psychology Bulletin 3(2), pp. 35-45

Appendix A: Consensus levels

Table 4. Consensus levels for the realistic condition

	Anger			Disgust			Fear			Happiness			Sadness			Surprise		
	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear
50%	10	8	10	0	0	0	13	6	8	26	20	19	23	19	24	0	15	8
60%	6	3	2	0	0	0	2	3	5	21	14	16	23	12	18	0	6	3
70%	5	0	1	0	0	0	1	0	2	15	11	10	17	5	11	0	2	0
80%	3	0	0	0	0	0	0	0	0	8	7	7	10	4	7	0	0	0
90%	0	0	0	0	0	0	0	0	0	3	1	2	4	1	1	0	0	0

Number of stimuli reaching consensus levels between 50% and 100% for the emotions across viewpoints

Table 5. Consensus levels for the abstract condition

	Anger			Disgust			Fear			Happiness			Sadness			Surprise		
	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear
50%	10	19	15	4	4	4	1	2	4	30	22	19	8	31	25	0	2	0
60%	8	7	9	0	2	1	1	1	0	27	16	15	2	28	15	0	0	0
70%	4	2	2	0	0	0	0	0	0	25	13	13	0	18	10	0	0	0
80%	1	0	0	0	0	0	0	0	0	16	8	5	0	13	5	0	0	0
90%	0	0	0	0	0	0	0	0	0	6	2	1	0	4	2	0	0	0

Number of stimuli reaching consensus levels between 50% and 100% for the emotions across viewpoints

Table 6. Deviation in consensus levels between realistic and abstract condition

	Anger			Disgust			Fear			Happiness			Sadness			Surprise		
	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear
50%	0	-11	-5	-4	-4	-4	12	4	4	-4	-2	0	15	-12	-1	0	13	8
60%	-2	-4	-7	0	-2	-1	1	2	5	-6	-2	1	21	-16	3	0	6	3
70%	1	-2	-1	0	0	0	1	0	2	-10	-2	-3	17	-13	1	0	2	0
80%	2	0	0	0	0	0	0	0	0	-8	-1	2	10	-9	2	0	0	0
90%	0	0	0	0	0	0	0	0	0	-3	-1	1	4	-3	-1	0	0	0

Deviation = Consensus levels of realistic condition minus consensus levels of abstract condition

Table 7. Consensus levels as reported by Coulson [2]

	Anger			Disgust			Fear			Happiness			Sadness			Surprise		
	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear	Front	Side	Rear
50%	18	12	10	0	0	0	0	4	2	49	28	24	25	43	36	4	4	1
60%	16	8	4	0	0	0	0	2	0	35	25	20	20	39	29	0	1	0
70%	10	3	1	0	0	0	0	0	0	24	16	12	12	26	18	0	1	0
80%	2	1	0	0	0	0	0	0	0	7	7	8	5	12	8	0	0	0
90%	1	0	0	0	0	0	0	0	0	1	2	2	0	3	1	0	0	0