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Express Yourself: The Effects of Body Position on Non-verbal Communication of Emotions

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EXPRESS YOURSELF: THE EFFECTS OF BODY POSITION ON NON-VERBAL COMMUNICATION

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Abstract

Recent research has documented that we tend to use the face to express some emotions, but use the body to express other emotions. To understand the contributions of the body to non-verbal emotional communication, we compared the performance of able-bodied participants who were allowed to express emotions naturally (standing) to able-bodied participants who were confined to a wheelchair. Theories of embodied emotion would predict that restraining the use of the body should change emotion production and communication confidence, especially for body-related emotions. Participants expressed six different emotions in three conditions: 1) naturally, 2) face only, and 3) body only. After each trial, they indicated their confidence that they effectively communicated the emotion. Results indicated that for emotion production, both groups used primarily the face to express happiness and disgust. We predicted that participants in the wheelchair group would use the face more to express body-related emotions, but our findings show that the extinction of body occurs with specific emotions. Like the standing group, wheelchair participants used their bodies to express submissive emotions of embarrassment and fear. In contrast, they showed a distinct lack of body use for emotional displays expressing higher status or dominant emotions--pride and anger. Nonetheless, confidence in communication did not differ across groups despite production differences. These findings suggest that current body states affect how emotions are expressed. In terms of embodied emotion theory, body restrictions may make a person feel less pride or anger. From an evolutionary standpoint, it might be that displaying pride or anger when one is less physically able reduces one's chance for survival.

Express Yourself: The Effects of Body Position on Non-Verbal Communication of Emotions

Looking across the room, we can often tell what a person is feeling merely by examining their face and body posture, without even speaking to them. In this study we examine non-verbal emotional expression to understand how the face and body communicate emotions. We also investigate how one's current ability to use the body affects emotional communication. Specifically, what happens to people's production of emotions and their confidence in their own successful communication of these emotions when their ability to use their body is reduced or taken away? By comparing the production and confidence of able-bodied individuals in natural, full body use (standing) group and in restrained, sitting in a wheelchair (wheelchair restricted) group we can determine how current bodily inputs, in the form of postural support and movement, influences people's ability to express emotions.

To address this issue and whether the use of the body affects the expression of some emotions more than others, we modified a paradigm developed by App, McIntosh, Reed, and Hertenstein (2010). App and colleagues found that the expression or production of specific emotions were associated with specific non-verbal channels; the face, the body and both face and body. Happiness and disgust were primarily expressed by the face, pride and embarrassment by the body, and anger and fear by both the face and the body. Confirming these findings, App et al., found that when asked which non-verbal channel would be optimal in conveying each emotion, participants' verbal response matched their actual production. App et al. provides the framework for this particular study which examines the question, to what extent is the expression of specific emotions related to the face, the body, and the ability to incorporate the body into bodily expression? In other words, is there an interaction

between the ability to use your body to communicate and the specific emotions to be communicated?

Background and Significance

Emotional expression has been a crucial part of human survival. Studies on the nature of emotion in humans and animals began with the father of the natural selection, Charles Darwin. In his work, The Expression of the Emotions in Man and Animals, Darwin (1872) reported the results of his world-wide survey that included questions on emotional expression as well as photographs of men, women and children producing expressions. Darwin proposed the principle of serviceable associated habits: Actions are in response to various sensations or desires and with the same state of mind comes the parallel type of movements (Darwin, 1872). Thus, he concluded that physical action in humans and animals is spurred on by emotional response. One such example of an emotion leading or preceding the physical action is the raising of eyebrows in people who were trying to remember something, as if they were trying to "see" what they remembered (Darwin, 1872). Emotional expression prepares a human or an animal to react in various situations.

Although Darwin's claims about emotional expression were not readily accepted by the scientific community, a century later Ekman (1994) tested Darwin's observations on emotion and his results supported Darwin's observation that emotions aid humans in survival situation. Ekman writes that the quick onset of emotions in humans and animals allows them to react to a certain situation in a timely manner. In some cases, it is clear that emotion corresponds to a physical manifestation. For example, anger, which can ultimately lead to fighting in humans, has been found to increase blood flow to the hands. As evidenced in

Darwin's and Ekman's work, humans use non-verbal channels such as the face and the body to express themselves emotionally in order to survive. Additionally, he describes common elements in production of emotions of people of different cultures and backgrounds.

Facial expressions have been studied extensively by Ekman and other researchers. In *What the Face Reveals*, Ekman writes that, "the face is seen as a potential new source of information about an important problem, or as a diagnostic marker of a certain trait or state" (Ekman & Rosenberg, 2005)." To understand non-verbal emotional expression, Ekman and his colleagues developed a quantifiable coding system for facial expressions called FACS or the Facial Action Coding System (Ekman & Rosenberg, 2005). FACS includes most of the observed changes in facial expressions and systematically categorizes anatomical facial movements for specific emotions. The coding scheme is based on "action units," which are numbers corresponding to individual movements of facial muscles involved in identifying the type of emotion. For example, "4" corresponds to the lowering of the brow and "5" corresponds to opening the eyes wide. The coding system provides a framework for quantifying non-verbal, facial expression of emotion in humans.

To date, many studies have used the FACS coding system to identify facial emotions. One such study combines the action units as outlined in FACS and participants ability to identify four emotions (happiness, sadness, fear and anger) from posed photographs (Kohler, Turner, Stolar, Bilker, Brensinger, Gur & Gur, 2004). Happy expressions were identified by participants as having raised cheeks, lid tightening and raised outer brow; sad expressions were identified by participants as having lower brow and raised cheeks; angry expressions were found to present lowered eyebrows, raised upper lids and lower lip depression; and fear

was identified as having raised upper lip and nostril dilation (Kohler et al., 2004). Although participants identified the emotions, they did not necessarily indicate the presence of every action unit associated with each emotion. Instead, fewer characteristics were found to be instructive of emotion identification, suggesting that different characteristics may be more informative than others. Further, there is some evidence that facial movements to produce emotions are somewhat universal across cultures. The FACS system was employed in a cross-cultural study that showed that people from the US, Japan, Britain as well as international students in the US can reliably identify emotions based on dynamic emotional responses of Olympic judo athletes (Matsumoto, Olide, Schug, Willingham & Callan, 2009). Although agreement rates across cultures for dynamic facial expressions was lower than for studies using posed facial expressions, other muscle movements may have contributed to confusion on emotion identification.

In addition to just receiving visual input regarding the facial expressions of others, it appears that people also use their own faces to help understand other's emotions. Evidence of facial mimicry, or rapid facial responses (RFRs), has been found when minute muscular responses are recorded from electrodes placed on perceiver's facial muscles when they view static photographs of facial emotions (Moody & McIntosh, 2006). People also respond when presented with a series of dynamic facial expressions (Sato & Yoshikawa, 2006). When presented with static and dynamic facial expressions, participants were videotaped showing externally visible facial mimicry, even without the use of EMG. In both cases, people moved their own facial muscles in response to the stimuli, as if they were matching the emotional response in the stimulus with their own face. Specifically, there was brow lowering in response to angry faces and the "pulling of lip corners" in response to happy faces. Studies

of autistic adults indicate that these socially impaired individuals do not demonstrate facial mimicry to emotional stimuli (Beall, Moody, McIntosh, Hepburn, & Reed, 2008; Stel, van den Heuvel & Smeets, 2008). Together, these results suggest that facial mimicry is essential for people to process the emotion being presented to them as well as understand what is being communicated to them. In other words, what the person does with his or her own face affects emotional processing.

Body Expression in Emotion

Although facial expressions are a major source of non-verbal emotional information, body postures and bodily movement have been found to be powerful communicators of emotions. Darwin's work states that emotional expression stems from its ability to communicate an animal's inward state (Darwin, 1872). Darwin's evolutionary explanation of emotions is consistent with the association of specific body movements to certain emotions. One study examining non-verbal communication of emotion had actors act out scenarios to convey a specific emotional state (surprise, joy, sadness, or anger) with the constraint that they had to use the line "I can't believe it" at the climax of the scenario (Wallbott & Giessen, 1986). The video was edited to create three different conditions: audio-visual intact, just the audio intact, just the video intact. When participants had to determine what emotion was communicated, the video condition, as opposed for audio only condition, was better for decoding the emotional expression. Anger was recognized with the greatest accuracy, followed by sadness, and then sadness and joy and surprise (Wallbott & Giessen, 1986).

Further, particular body movements have been associated with particular emotions. Wallbott (1998) explored the body's ability to communicate the quantity as well as the

quality of emotion. Actors were asked to produce a series of emotions while being videotaped, which was then coded for body movements as well as postures. When the actor's movements were coded for different movement categories, 66% of the movement categories distinguished between emotions and subclasses of emotions. Elated joy, hot anger, and terror were associated with the most movement activity. Despair, interest, shame, and cold anger were associated with less movement activity. Finally, fear, pride, disgust and happiness were associated with the least movement activity. A particular movement, such as a collapsed body posture was often used when producing shame, sadness or boredom. Lifting of the shoulders as well as lateralized hand and arm movements were associated with hot anger. Shoulders moving forward were characteristic of disgust, fear and despair. Also, a moving of the head backward and crossing of the arms was used when producing pride (Wallbott, 1998). One of the more complex emotions—pride—is more associated with body expression than facial expression. Cross-cultural expressions of pride include a head tilt as well as an expanded chest (Tracy & Matsumoto, 2007). Pride is also associated with a low intensity smile and a variety of different body components including expanded posture, arms akimbo on hips or arms raised straight above the head with the hands (Tracy & Robins, 2007).

Bodily expression is even more important for decoding emotional displays when facial expression is ambiguous. Den Stock, Righart, and de Gelder (2007) created a set of body expressions with the face blurred and participants were asked to identify the body expression emotion in a series of forced-choice answers. For static displays, anger was more poorly recognized than fear, happiness and sadness; fear was the most difficult bodily expression to identify. They then combined facial and body expressions and participants had to categorize the viewed facial expressions. Results showed that a happy face on a happy

body was more frequently identified as happy compared to when a happy face was on a fearful body.

Emotion identification based on static bodily expression is also examined in a study using body postures of mannequin figures on a computer program (Coulson, 2004). Different angles of body postures associated with specific emotions were presented to participants and they were asked to choose among six basic emotions (anger, disgust, fear, happiness, sadness and surprise) (Coulson, 2004). Participants were able to associate a large number of postures to anger, happiness and sadness. Fear and surprise were associated with fewer postures. Of interest, disgust was not identified as having a particular posture by over 50% of the sample. In examining the literature on the nature of body movements, the difference between production and identification of emotion in both static and dynamic situations presents some conflicting findings. In the case of happiness, Walbott (1998) found that actors produced happiness with the least amount of movement, yet Coulson (2004) finds that happiness is more readily identified when presented with a postural component. The disparity among these findings suggests that the situations in which emotions are expressed may make a difference.

Body-based emotional displays do not explicitly need an explicit body form to convey emotion. Point-light (in which only moving points of light on an actor's joints are visible) and full-light displays (in which the whole actor is seen) are capable of communicating of body expressions (Atkinson, Dittrich, Gemmell, & Young, 2004). A series of actors were asked to express five different emotions (anger, disgust, fear, happiness, and sadness), but with three different levels of exaggeration of the emotion with their faces

hidden. The digital images were then placed in point-light and full-light displays, as were the photographed stills (i.e., just light dots on a black background). The results indicated that participants were better at identifying emotions in the dynamic body conditions than in the static conditions. Additionally, some emotions were identified in full light displays more readily than point light. Disgust, anger, and fear were better identified in the full light condition, than the point light conditions. One interesting result from such study is the significantly lower percentage of disgust identification in the body expression as compared to the other emotions in the study. This will be revisited later in the hypotheses.

In summary, bodily expression is associated with specific emotions. The very idea we can attribute body movements with certain emotions begs the question of why this could be the case. One idea is that these movements have been the most effective in conveying specific emotions to the receiver of the emotion. The above studies examine the full use of the body in emotional expression. They indicate that we not only recognize other people's emotions from their non-verbal face and body emotional displays, but also use our own bodies to perceive these emotions. This present study restricts the use of the body to investigate the extent to which the body is used for effective emotional communication as well as to examine what people actually do when they are unable to fully use their body to express themselves. Bodily constraints may prevent or at least affect our ability to understand the emotions of others.

Embodied Emotion and Consequences Not Being Able to Use One's Body

This study has implications for the concept of embodied emotion. Embodied emotion is theorized to be a re-experiencing of the somatic responses produced in one's own body in

response to a concept describing the emotion or an actual expression of emotion (Niedenthal, 2007; Halberstadt, Winkielman, Niedenthal & Dalle, 2009). A theory of embodied emotion would suggest that if people are unable to use their bodies to reenact emotional expression, then their production of emotion and their confidence in production of emotion would be affected. For example, Niedenthal, Winkielman Mondillion & Vermeullen (2009) associated concrete and abstract words with three different emotions: joy, anger, and disgust and a series of neutral words; using electromyography (EMG)), they measured the somatic responses of their participants as they determined whether the concept had to do with an emotion or not. A letter task, with no emotional concepts involved, was included in the experiment to have a baseline comparison for potential facial movement in response to the emotion concepts trial. When presented with concrete (e.g. feces and sun) and abstract emotional concepts (e.g. joyful and furious) on a computer screen, participants moved their facial muscles in response, but only when participants were asked to judge the word on its emotional meaning, as opposed to the letter task did the facial movement occur.

The above experiment established a correlation between embodiment and emotional understanding, but not a direct connection. In a follow-up experiment, the same group of researchers addressed this issue by restricting facial expressions (Niendenthal et al., 2009). These restrictions allowed them to determine whether people could identify the emotional concept as "related to emotion." The participants were placed in two groups, one where their face was free to move and the other was asked to keep a pen in their mouths to prevent facial expression. Results showed that relative to participants in the free movement condition, the participants in the restricted movement group were less accurate at identifying joy and

disgust emotion words as “related to an emotion”. By preventing the facial muscles, actual understanding of emotions was impaired.

This use of the body to perceive others’ emotions brings up the question as to whether the prevention of body movement might affect emotional expression and confidence in ability to express emotion. Research examining populations of individuals who have social and emotional processing disorders as well as individuals who are unable to move their bodies provides some insight into this issue. One of the hallmark characteristics of autism is a deficit in processing social and emotional information (Stel, van den Heuvel, & Smeets, 2008). Research indicates that individuals with autism tend not to use their bodies to perceive others nor do they understand what the emotional facial expressions in other people mean. For example, individuals with autism do not produce facial mimicry automatically, but they can voluntarily if they are asked to match their face to another person’s expression (McIntosh, Reichmann-Decker, Winkielman, & Wilbarger, 2006.) Also, Baron-Cohen, Wheelwright, and Jolliffe, (1997) examined the ability of autistic individuals to attribute mental states to people depicted in photographs in which they were expressing emotions but just the eyes were visible. Compared to typically developing adults, individuals with autism had difficulties identifying complex mental states in this forced-choice “mind-in-the-eyes” task (i.e. guilt, arrogant flirting and thoughtful.) These findings suggest that individuals with autism may not fully comprehend the emotions expressed by other people (McIntosh, Reichmann-Decker, Winkielman, & Wilbarger, 2006).

Individuals who are paralyzed or who have difficulty moving their body may also provide insights into embodied emotional processing. Patients with lesions to the motor

system exhibit impairments in understanding the bodies of others. When these patients view the apparent motion of another person moving their limb from one position to another, they have difficulties in perceiving the action because their corresponding arm is impaired (Serino, De Filippo, Casavecchia, Coccia, Shiffrar, & Ladavas, 2009). In other words, paralyzed individuals have difficulty perceiving the actions of others if they are unable to perform the same action presented.

In addition to individuals with lesions, patients experiencing phantom limb syndrome-- as feeling sensation in an arm that no longer exists-- present an example that perception of body movement in others is dependent on the observer's own ability to perform the same movement. Two patients, one experiencing phantom sensations and the other not, were compared to normal individuals in a task that involved them to identify in a beginning and end photograph of a man twisting his arm the trajectory of the movement of the arm (Funk, Shiffrar, & Brugger 2005). The patient experiencing phantom limb syndrome matched the perceptions of normal adults, yet the patient without the sensations did not. Visual perception of bodies in those who do not possess any phantom sensations suggests that one's own body plays a crucial role in understanding the body of others.

Current Study

In the current study, we investigated the role of current body input in emotional communication. Specifically, we examined how people produce emotions and whether they perceive any changes in their effectiveness of emotional communication when they can no longer use their body for expressive purposes. The current study modifies a paradigm developed by App, McIntosh, Reed, and Hertenstein (2010) that examined how different

channels of communication (e.g., face, body and touch) were used to communicate different emotions non-verbally. In experiment 1 of that study, participants communicated 11 different emotions to a mannequin in naturalistic conditions, or restricted conditions in which they could only use their face or their body to communicate; participants were also asked to indicate verbally what they would optimally use to communicate specific emotions. App et al. found that specific channels were used to express specific emotions. For example, the face was used primarily to express disgust and happiness; the body was used to express pride and embarrassment, and both the face and the body were used to express anger and fear. We used a similar paradigm for these six emotions to investigate whether the production and the confidence in communicating those emotions would change if the body were no longer able to be used.

As in the App et al. study, this study was divided into three parts to examine how emotional communication changed as a function of channel availability. In part 1, participants expressed six emotions naturally, without restrictions. They were videotaped and asked for their confidence ratings regarding how successful they were in communicating each emotion. In part 2, participants were asked what channel they would use to optimally communicate each emotion. In part 3, participants again expressed the six emotions non-verbally and rated their confidence in communication, but they were restricted to only use their face or only use their body. This design will allow us to replicate the findings of the App et al. study and create a reliable baseline for performance.

To address how current body inputs influence emotional production, we compared able-bodied individuals' ability to use their bodies when communicating emotions non-

verbally. Participants were assigned to one of two groups that differed in their mobility restrictions: a "natural" group in which participants stood while communicating emotions and a "wheelchair" group in which participants sat in a wheelchair with an elastic band around torso limiting trunk movement. Preference scores for both groups would show no differences because responses would not be affected by current body inputs. Able-bodied individuals will call upon their past experiences to indicate their channel preferences for each emotion. However, if current body inputs play an important role in actual emotional communication, then we would expect that the wheelchair group may over-rely on the face for non-verbal communication.

Method

Participants

Participants included 49 undergraduate college students (male and female, age range 18-22). Forty-nine participants were recruited through Sona Systems. Data collection began with the standing group in the spring semester 2008 and was completed that same semester. Collection of the wheelchair restricted group began during the fall semester of 2010 after the decision was made to study the differences between standing and wheelchair restricted participants. 21 participants were collected in the standing group and 28 participants in the wheelchair restricted group. All the participants completed all three parts of the experiment, but the specified channel trials of part 3 alternated the order of the face and the body conditions across participants to account for possible order effects.

Stimuli

Two video cameras were used to film the facial and body expressions of the participants from side and front orientations relative to the participant (see Figure 1 for photographs). To collect the confidence ratings, a program for the computer called "E-Prime" was employed for each emotion of the 3 trials (face, body and natural condition) as well as the section of verbally indicating preference of channel for each of the emotions.

Participants focused their emotions toward a life-size mannequin with a soft gray fabric exterior (see Figure 2 for a photograph). The face had no definitive features, but had facial contours. The mannequin was dressed in a casual, gender neutral outfit including a sweatshirt and baseball hat and it was seated in a chair in front of the participants. The neutral facial expression of the mannequin was crucial in order to present the participant with a stable and consistent "reaction" to their emotions, so that the recipient of the emotions did not react differently from trial to trial. Before the experiment, participants were asked to think of someone they knew and address the mannequin as if it were that person, whether it was a friend, relative or romantic partner. The mannequin was addressed as the chosen person throughout the experiment.

Design and Procedure

The design of the experiment is between subjects for the standing and wheelchair restricted groups and within subjects for channel (face, body and natural) as well as emotion (6 different emotions). After participants were tested individually identifying the mannequin as a familiar person, the participant either stood or sat in a wheelchair approximately 3 feet from the mannequin. A camera was placed behind the mannequin to provide a face-front

view of the participant and another camera was placed to the side of the participant in order to gain a side-body view when they presented the emotions. For the wheelchair restricted group, participants were asked to sit in the chair and their chest was strapped into the chair by a stretch athletic band so their trunk was stabilized on the chair. For the standing group, they were simply asked to stand in front of the mannequin.

Part 1: Natural production of emotions: Part 1 indicated which channel people tend to use in communicating each emotion. From the computer, the experimenter told the participant to non-verbally communicate the emotion as naturally as possible for 4 seconds so the person representing the mannequin could understand the emotion (see Figures 3 and 4 for photographs of the standing and wheelchair restricted participants). Participants were given the opportunity to practice producing an emotion to the mannequin not in the set of emotions in the actual experiment. For example, the participant was asked to produce "surprise" for 4 seconds to the mannequin. After the practice trials, participants were asked if they have any questions. The experimenter then went to another room with the computer and the trials began. Each emotion word was randomly presented on the computer. The participant had a neutral affect in between each emotion word prompt. Following each emotion, the participant was asked to rate on a scale of 0 to 4 how confident they thought they communicated that emotion to the mannequin. The scale was defined as 0 being "not confident at all" and 4 being "very confident." The ratings were recorded in the computer program "E-prime" by the experimenter.

Part 2: Channel preference selection: Participants were asked to say which single channel (face or body) they would feel most comfortable using to accurately convey each

emotion. Participants were not told about the face or body conditions until this point of the study in order to not influence their thinking during emotion performance in Part 1. With each single emotion word, the participant identified their preference for each channel, which was recorded by the "E-Prime" program. In the standing group, participants were asked to come to the computer and indicate which channel they prefer for each emotion. The wheelchair restricted participants were asked to remain in the chair and indicate verbally whether they would use their face or their body for each emotion.

Part 3: Production of emotions with a single channel: The final section is similar to Part 1. Participants were asked to convey emotion using a single channel (face or body). Participants were asked in one trial to express emotions only using the face and another trial using only their body, while keeping their facial expression or body movement neutral. As in the first section, the participants indicated their confidence on the effectiveness of each emotion they presented towards the mannequin on a scale from 0 to 4.

Results

Preference Data

Chi-square tests were conducted to determine channel preferences for each of the six emotions. The standing group replicated the results from App et al. (2010). Participants preferred to use their bodies to express pride (face = 2, body = 19; $\chi^2 = 13.762$, $p < .0001$). They preferred to use their face to express disgust (face = 19, body = 2; $\chi^2 = 13.76$, $p < .0001$), and happiness (face = 20, body = 1; $\chi^2 = 17.19$, $p < .0001$). Participants were equally divided to whether they would use their face or their body to express anger (face = 13, body

= 8; χ^2 = 1.19, p =.28), fear (face = 11, body = 10; χ^2 = 13.76, p = .827), and embarrassment (face = 13, body = 8; χ^2 = 1.19, p = .28) (see Figure 5 for a graph of results).

The wheelchair restricted group produced a similar pattern of preferences. Participants preferred to use their bodies to express pride (face = 5, body = 23; χ^2 = 11.57, p <.001), and their face to express disgust (face = 26, body = 2; χ^2 = 20.57, p< .0001), and happiness (face = 26, body = 2; χ^2 = 20.57, p< .0001) Participants were equally divided to whether they would use their face or their body to express anger (face = 18, body = 10; χ^2 = 2.29, p =.131), fear (face = 14, body = 14; χ^2 = 0.000, p = 1.000), and embarrassment (face = 16, body = 12; χ^2 = 0.57, p = 0.45) (see Figure 6 for a graph of results).

Video Coding Data

To quantify the video data, we developed a coding scheme to identify the degree of emotion-related movement in the face and the body when expressing emotions in the natural expression conditions. The scale ranged from 0 (no intentional movement) to 1 (some intentional movement) to 2 (a lot of intentional movement). Scores were given for movement in the face, in the body, or in both face and body at the same time. A mixed factorial ANOVA with factors 2 (group: standing and wheelchair restricted) x 3 (channel use: face, body and both) x 6 (emotions) was conducted for the video coding data. Overall, the standing group replicated the results of App et al. (2010); the wheelchair restricted group tended to follow a similar pattern but with additional use of the face, as predicted, but notably did not use the body to express aggression (i.e., anger) or high-status (i.e., pride) emotions. A main effect was found for channel ($F(2, 46) = 84.39$, $p < .0001$) showing that the face was used more than the body and concurrent face and body. However, this main effect was

mediated by the channel by group interaction ($F(2, 46) = 4.64$, $p < .015$) which indicated that the wheelchair restricted group used the face more than the standing group, which was consistent with predictions. No other effects were found for group ($F(1, 47) < 1$), emotion ($F(5, 43) = 1.30$, $p = .283$), or their interaction ($F(5, 43) = 1.30$, $p = .281$.). The interaction between emotion and channel ($F(10, 38) = 7.55$, $p < .0001$) confirmed that happy and disgust were primarily expressed by the face, pride and embarrassment were primarily expressed by the body, and that anger and fear were expressed by both the face and body (see Figures 7 & 8).

Of particular interest was the three-way interaction for emotion, channel and group ($F(10, 38) = 3.04$, $p < .006$). Disgust and happiness, emotions associated with facial expression, were expressed primarily by the face for both groups (see Figures 9 & 10). The standing group used the face to express happiness ($M = 1.95$, $SE = .044$) more than the body ($M = .95$, $SE = .19$) or both the face and body ($M = .91$, $SE = .18$) and the wheelchair restricted group showed a similar pattern (face: $M = 1.96$, $SE = .04$; body: $M = 1.04$, $SE = .16$; both $M = 1.04$, $SE = .158$). The standing group also used the face more to express disgust (face: $M = 1.86$, $SE = .08$; body: $M = 1.0$, $SE = .18$; both: $M = 1.33$, $SE = .14$). The wheelchair restricted group also used the face the most but with even less use of the body (face: $M = 1.86$, $SE = .07$; body: $M = .86$, $SE = .16$; both: $M = .75$, $SE = .12$).

The standing group used primarily the body to express pride and embarrassment, emotions associated with body expression, but the wheelchair restricted group showed a different pattern, especially for the status-conveying emotion of pride. To express embarrassment, the standing group used the body ($M = 1.43$, $SE = .15$) more than the face

(M = 1.24, SE = .14) and the face and body together (M = 1.00, SE = .14). The wheelchair restricted group also used the body most to express embarrassment (M = 1.46, SE = .13) relative to the face (M = 1.32, SE = .12) or both (M = 1.00, SE = .12). To express pride, the standing group used the body (M= 1.52, SE = .16) more than the face (M= 1.29, SE = .13) or both (M = 1.14, SE = .15). In contrast, the wheelchair restricted group used the body proportionately less (M = 1.11, SE = .14) and the face proportionately more (M = 1.36, SE = .11) than the standing group (see Figures 11 & 12).

To express anger and fear, emotions associated with face and body use, the standing group used both the face and body. For fear, the standing group used the face (M = 1.48, SE = .14), body (M = 1.29, SE = .16) and both (M = 1.29, SE = .15), but the wheelchair restricted group used slightly more face (M = 1.57, SE = .12) than the body (M = 1.29, SE = .14) or both (M = 1.07, SE = .13). To express anger, the standing group used both the body and the face (body: M = 1.52, SE = .15; face: M = 1.48, SE = .13; both: M = 1.29, SE = .16). In contrast, the wheelchair restricted group used the face (M = 1.79, SE = .11) more than the body (M = 1.25, SE = .13) or both (M = 1.18, SE = .14) to express anger. People in the wheelchair restricted group did not just use their face more to express all emotions. Instead, it appears that they still used their body to express emotions that express lower status (i.e., embarrassment and fear). However, they showed a distinct lack of body use for emotional displays expressing higher status or dominant emotions (i.e., pride and anger) (see Figures 13 & 14). I will discuss this further it the General Discussion.

For the interaction between emotion and channel, anger presented more usage in the face (M = 1.65, SE = .08) than the body (M = 1.37, SE = .10) and ultimately in both (M =

1.23, SE = .10). Disgust also presented more face (M = 1.86, SE = .05) than body (M = .92, SE = .12) and both (M = 1.00, SE = .09). Following a similar pattern, happiness used the face (M = 1.96, SE = .03) more than the body (M = 1.00, SE = .12) and both (M = .9796, SE = .12). The results for pride showed similar usage for both the face (M = 1.33, SE = .09) and the body (M = 1.32, SE= .11) and a little less for both (M = 1.00, SE = .10). On the other hand, embarrassment showed more usage in the body (M = 1.45, SE = .10) versus the face (M = 1.29, SE = .09) and both the face and the body (M = 1.00, SE = .09). Scared presented that participants used their face (M = 1.53, SE = .09) more than the body (M = 1.29, SE = .10) and both (M = 1.16, SE = .10). The face related emotions, disgust and happiness followed a similar pattern of more face usage. Additionally, fear and anger tended to use more face than the body, but both emotions used more body than the primarily face emotions. The primarily body emotion, pride did not present more body than face, but did indicate more equal means for both face and body. Embarrassment used more body than the face.

Confidence Ratings for Each Emotion

A mixed 2 (position: standing and wheelchair restricted) x 3 (channel: body, face and natural) x 6 (emotions) ANOVA was conducted on confidence rating data to examine if a person's current position influenced their choice of channel for expressing different emotions. Results showed main effects for channel ($F(2, 1) = 63.68$, $p < .000$) and emotion ($F(5, 1) = 10.67$, $p < .000$), but not for group ($F(10, 1) = .027$, $p = 1.000$) (see Figure 15 & 16). Of interest was the interaction between channel and emotion ($F(10, 1) = 14.330$, $p < .000$). People were more confident communicating specific emotions using preferred channels. Our results replicated those found in App et al. (in press). In the natural condition,

for combined wheelchair restricted and standing groups (see Figure 17), participants were most confident that they had communicated happiness (M=3.51), disgust (M = 3.49), and anger (M = 3.00). Similar to App et al., we found that when forced to use the body channel to produce each emotion, participants rated fear (M = 2.53), anger (M = 2.31), embarrassment (M = 2.27), and pride (M = 2.24) with the highest confidence ratings. In the case of the face only condition, participants rated happiness (M = 3.47), disgust (M = 3.29) and anger (M = 3.24) with the highest confidence rating. The primary face emotions found in App et al. were both happiness and disgust, which falls in line with the current findings in face only condition confidence ratings. Additionally, the primary body emotions found in App et al, pride and embarrassment received high confidence ratings in the body-only condition. Fear and anger, primarily used with both the face and the body were found to be highly rated in both conditions. The three-way interaction was not significant ($F(10,1) = .027$, $p = 1.000$), indicating that current body position does not influence people's confidence in communicating emotions.

General Discussion

We tend to use specific channels to communicate certain emotions (App et al., 2010; Tracy & Matsumoto, 2007; Wallbott, 1998). For example, we use our face to express happiness and disgust, our bodies to express pride and embarrassment, and both the face and body to express emotions such as anger or fear. In this study, we investigated whether restraining the use of one channel, namely the body, would influence emotional expression and confidence in emotional communication. Also, to what extent is the face, the body and both the face and the body used in the expression of particular emotions? We also examined verbal preferences of channel use in either the face or the body for each of the emotions. To

achieve this, we compared preferences, the production of emotions, and confidence ratings of an able-bodied standing group with that of an able-bodied wheelchair restricted group. During the experiment, the participants in both groups were initially asked to produce 6 emotions as naturally as possible and rate their confidence after each emotion. The second block of the experiment asked the participant to verbally indicate their channel preferences for each emotion. And finally, they were then asked to produce the 6 emotions in a face only condition and in a body only condition and rate their confidence after each emotion.

For both the standing and the wheelchair restricted groups, as expected in our hypotheses, preferences for channel use to express specific emotions showed no differences, suggesting that channel preference is based on memory and past experiences, rather than current body input. Participants preferred to use their face to express happiness and disgust, their body to express pride, and either or both the face and the body to express anger fear, and embarrassment. Preference responses in App et al. (2010) for embarrassment showed equal responses for face and body. This suggests that participants find it difficult to conceptualize embarrassment and verbally identify exactly what channel they would prefer to use, even though actual production showed that they used their bodies to express embarrassment.

However, differences between standing and wheelchair restricted groups did emerge when participants physically expressed or produced the specified emotions. The wheelchair restricted group as compared to the standing group used more of the face channel than the standing group overall, as predicted in the hypothesis. However, the extent of the body use for anger, pride, embarrassment and fear followed an unexpected pattern. In the wheelchair

restricted group, participants used relatively less body to express the dominant emotions, pride and anger than for the subordinate emotions, embarrassment and fear, which used more face. This suggests that current body inputs affect production in a very particular way and that restrictions on body influence expression of dominant emotions.

For those people who are relegated to wheelchairs, being rendered unable to fully express dominant emotions such as anger and pride puts them at a disadvantage if they were to take on positions of leadership. One study conducted on the perceptions of non-verbal behavior of people in positions of high and low power asked participants to indicate what they understand as more appropriate behavior for people in positions of dominance versus subordination (Carney, Hall & LeBeau, 2005). Perceptions of non-verbal behavior of people in positions of high power included erect and open posture, upward tilt of the head, touching behavior (Carney et al., 2005). Therefore, without this ability to effectively express with an erect body posture, those relegated to wheelchairs may have difficulties in commanding a presence while in positions of high power.

Despite differences in production between groups, they were equally confident that they had successfully communicated each emotion whether they expressed it standing or restricted in a wheelchair. For both groups, overall higher confidence ratings were attributed to the natural condition when no restrictions to channel use were made, which was to be expected. However, a trend of higher ratings was attributed to emotions when they were produced with the preferred channels of face and body. Happiness and disgust had higher ratings with the face, pride and embarrassment with relatively higher scores in body and anger and fear with both the face and the body. It appears that current body inputs do not

influence participants' perceptions of emotional competency. Instead, it appears that like their verbal preferences, their confidence ratings appear to be based on past experiences. This suggests that people are not aware of the non-verbal changes that they experience when they are placed in a seated position versus a standing one.

Embodied emotion states that current inputs of the receiver of emotions, whether it is emotional expression or emotional concepts from another individual are reproduced and re-experienced in the receiver. In the context of this study, the concept can be generalized to a person's current position (i.e. the wheelchair), which implicitly alters the receivers ability to express emotion. According to embodied emotion theory, body restrictions should alter the way people experience emotions in general and body-related emotions in particular. The dichotomy between what wheelchair users want to express and their ability to express has implications for the emotional communication ability of individuals confined to wheelchairs. The inability to use the body makes it difficult for wheelchair users to communicate. Actual wheelchair users give accounts as to their lack of ability to express dominant emotions, particularly anger while in a wheelchair (Cahill & Eggleston, 1994). One woman, relegated to a wheelchair, was so angry she expressed that she wanted to jump out of her chair and shake the person she was directing her anger towards, but all she did was remain seated and "grit her teeth" (Cahill et al. 1994). Her frustration stems from her inability to completely embody the emotion she wishes to express. This is consistent with what we found in this study.

It is evident that implications of these initial findings contribute to the developing literature on leadership. How should able-bodied individuals display leadership in a group?

Our study suggests that if one wants to successfully communicate emotions that indicate dominance and higher status, one should stand and not sit. In most cases, we stand up when we present to a group, however there are cases in which people sit down to speak in a group setting. For example, a meeting in the corporate world that requires input from the group, such as a brainstorming session, sitting down is appropriate for someone facilitating discussion because it equalizes everyone's opportunity to communicate their ideas. However, when there is a need for pointed attention on one person, such as a presentation that they have prepared for the group, standing up appears to be necessary in order for the individual to display a commanding presence in the room. With that, people in leadership positions must be made aware of how they are being perceived by others. The study showed that there is a breakdown between what people are actually doing and how they think they are doing, which suggests that people in positions of power need to become aware of how other people perceive them. Even though one may think they are presenting themselves in a certain way, their actual body may not be presenting the same story.

Limitations and Future Directions

The results of the present study give rise to a number of issues that should be addressed in future studies. First, we found that despite differences in production, participants were equally confident that they had expressed the emotions successfully. To determine whether they were actually correct or whether they were unaware of their relative reduction in emotional communication, we need to test emotion identification in a study made from the actual production videos collected in this study. The question would be whether the standing group emotions could be as readily identified as the wheelchair restricted emotions by able-bodied people as well as paraplegics. The natural and wheelchair

emotion videos from this study may produce overall differences in identification accuracy. Further, these emotional identification differences may also be accentuated depending on whether the viewer is able-bodied and disabled. Embodied emotion theory would predict that disabled individuals may be relatively better at identifying emotions in other disabled individuals because they share body capabilities.

Thus, one limitation of the present study and one important future study is to include the target population of people of either acquired or congenital disabilities. The comparison to the standing group would potentially provide differing results in preferences, actual use, and confidence. Able-bodied participants who do not have long-term experience in a wheelchair do not have the past social context or the constant sensation of moving in a wheelchair. Wheelchair users have been found to believe that perceived attitudes against them by able-bodied individuals is more negative than how able-bodied individuals actually believe in the Attitudes Towards Disabled Persons (Furnham & Thompson, 1994) measure. This result could have been attributed to the fact that wheelchair-users constantly interact with people who are able-bodied as opposed to able-bodied people who are not necessarily exposed to disabled people. Therefore, able-bodied people would indicate how they potentially would react to a disabled person as opposed to actually knowing how they would react. With differences in perceived attitudes towards one another, able-bodied and wheelchair individuals could present differences in emotional expression. Other studies examining the perception of wheelchair users by able-bodied people showed that able-bodied individuals associate more negative emotions (e.g. depression and guilt) with the disabled person (Vilchinsky, Werner, & Findler, 2010). With this social context and their experiences

in social interaction, wheelchair users may experience feelings of inferiority to people who are able-bodied.

One additional analysis that can be added to this study is the coding of individual subcomponents of body and facial movements and their uses in each emotion. For both the standing and wheelchair group, the video tapes of their movements could have been observed more specifically in terms of the face whether they move their eyebrows, mouth, eyes etc. In addition to the face, the use of the subcomponents of the body for legs, arms, hands etc. Observations of the subtle movements would potentially provide a specialized understanding of non-verbal emotional expression in the face and the body for specific emotions.

Finally, we should also investigate differences between intentional and spontaneously generated emotional displays. The current study only examined intentional emotional displays. Studies presented in the introduction dealt with spontaneous emotional displays (Matsumoto et al. 2008) as well as intentional displays (Wallbott, 1998) by actors. The use of actors to express emotion versus people who are spontaneously producing emotion, like athletes after a match may present differences in subtlety of movement and degree of emotional expression. Actors are trained to portray emotions as naturally as possible, but to a certain extent. The actual speed and presentation of emotions is considered superficial. The superficiality comes from the nature of the stage itself, a large audience cannot perceive subtle emotional displays, and instead an actor must be “larger than life” for an audience to really understand how the character played by the actor is feeling. The use of the hands, arms, legs, and even the face is exaggerated in performance. Therefore, spontaneous emotional display may present different usage in the face and the body than in intentional

production. Even within the experiments using intentional displays of emotion, the use of a static body figures versus dynamic actors also presented different findings. This limitation was referred to in the introduction with the disparity between expressions happiness and its amount of body use in two different studies. Walbott (1998) found that actors produced happiness with the least amount of movement and Coulson (2004) found that happiness was identified with a postural component using mannequin displays. The difference can be attributed to the differing mediums used in the experiments; movement may discourage identification of happiness, but a static image of happiness with the body only may be readily identified by participants. Further exploration of this topic would be prudent for emotion identification studies.

Use of the body in emotional expression is connected to successful non-verbal communication. By restricting able bodied people in wheelchairs, we saw that the actual production of emotions changed, but their perception of communication and their actual preference for non-verbal channels did not. More studies must be done to understand this disconnect between confidence in production of emotion and actual non-verbal communication. The altered production of channel use in the wheelchair restricted group versus the standing group begs the question of what more can be done to understand the nature of non-verbal expression in people who are unable to fully use their bodies. It is evident that more must be done to understand the mechanisms at work in non-verbal communication, particularly in individuals who cannot use their bodies to express themselves.

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Figure 1. Side Body View of the Participant and Mannequin

Figure 2. Mannequin Face

Figure 3. Participant in wheelchair restricted group performing experiment in the natural condition

Figure 4. Participant in standing group performing experiment in natural condition

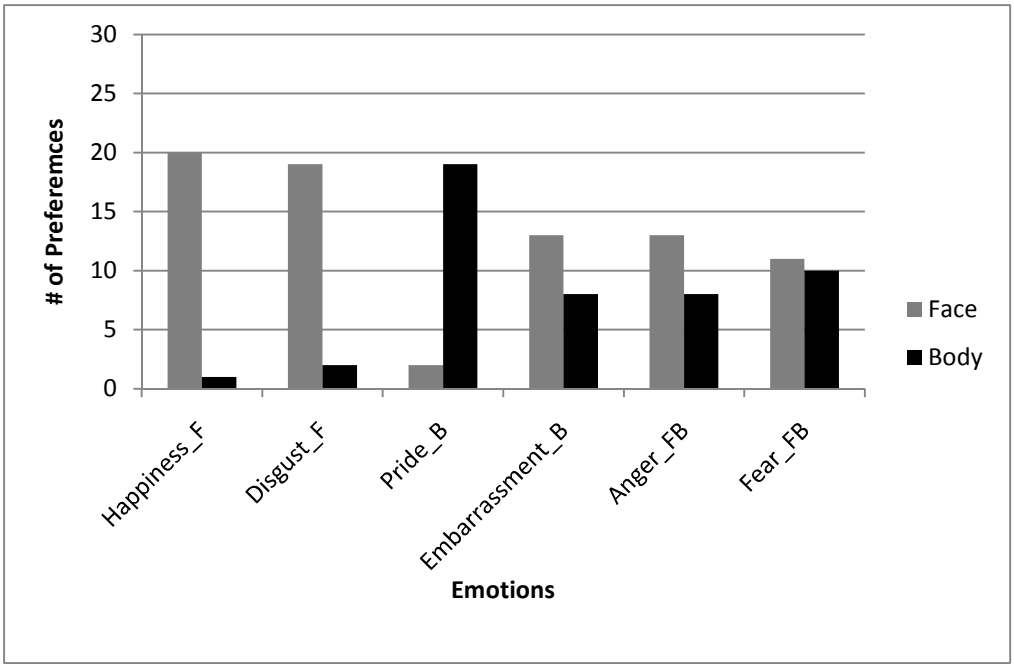

Figure 5. Preferences of Participants in Standing Group

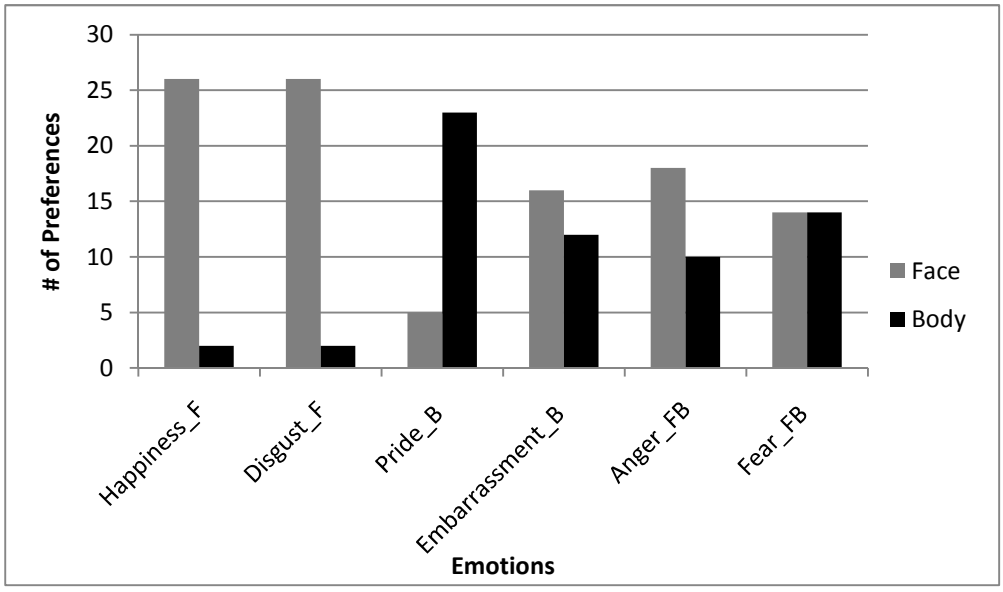

Figure 6. Preferences of Participants in WC Restricted Group

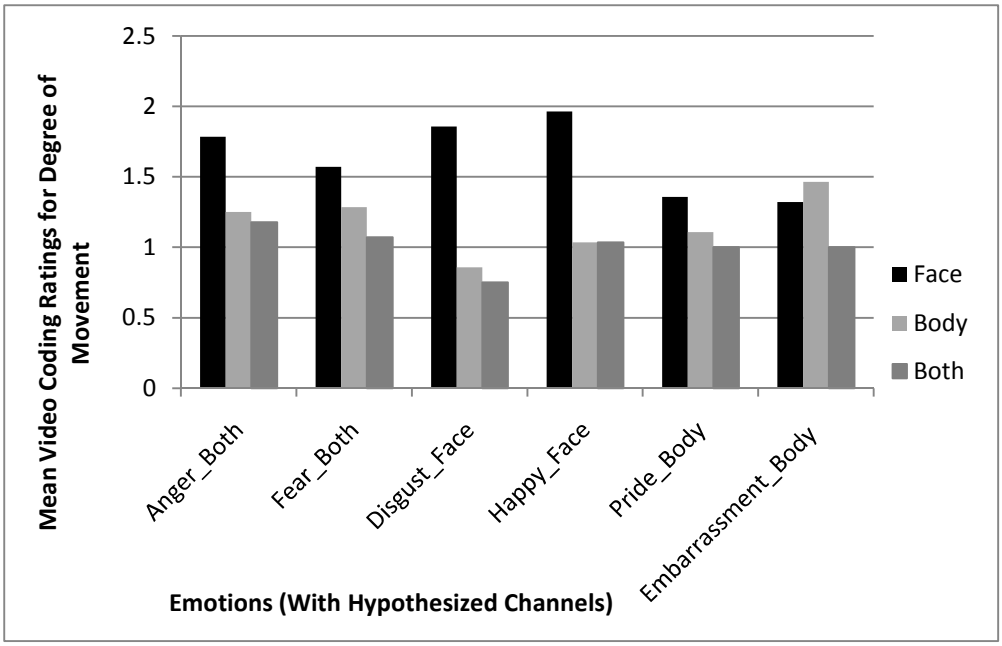

Figure 7. Actual Use of Channels in Wheelchair Restricted Participants

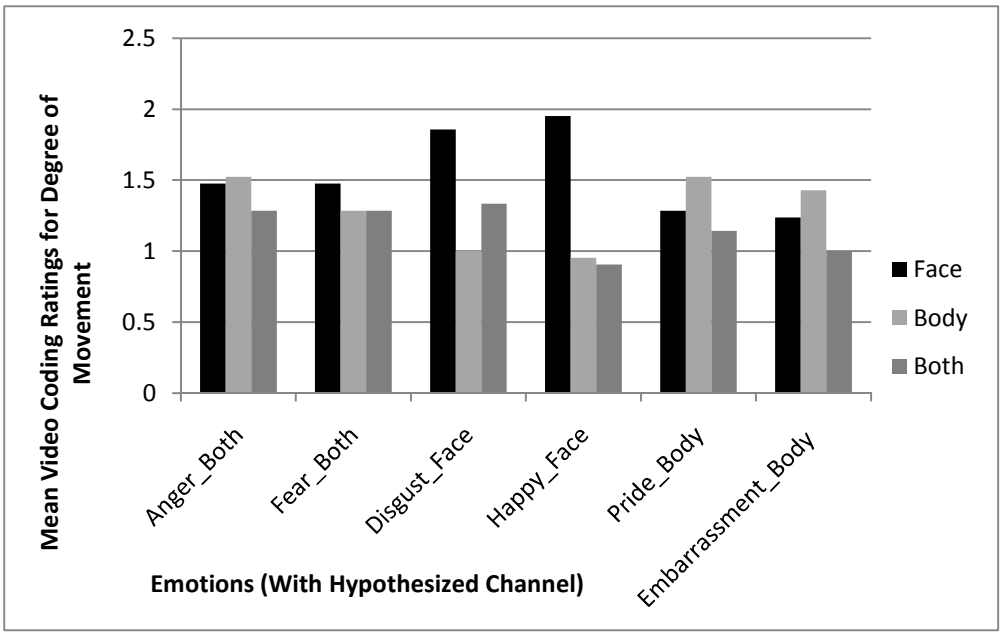

Figure 8. Actual Use of Channels in Standing Participants

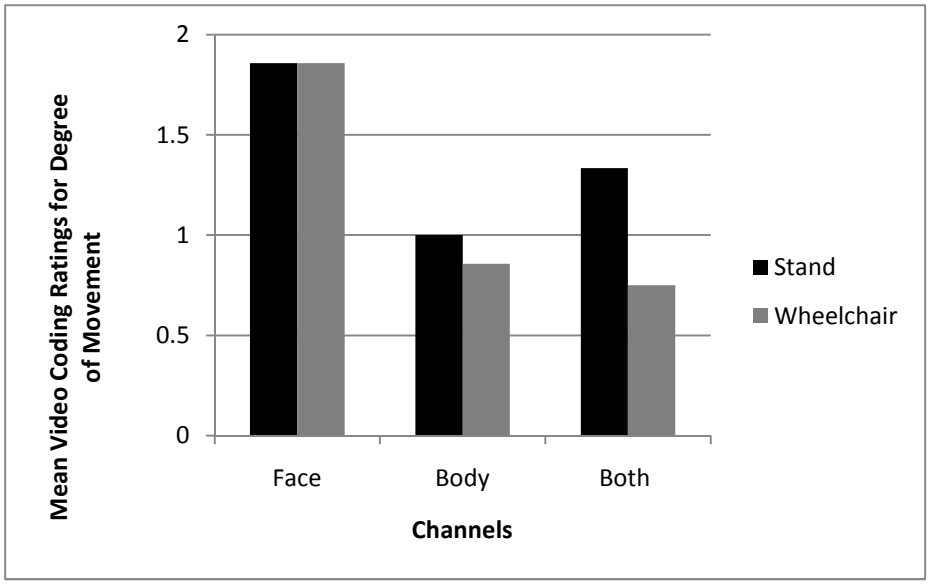

Figure 9. Actual Use of Channels for Disgust

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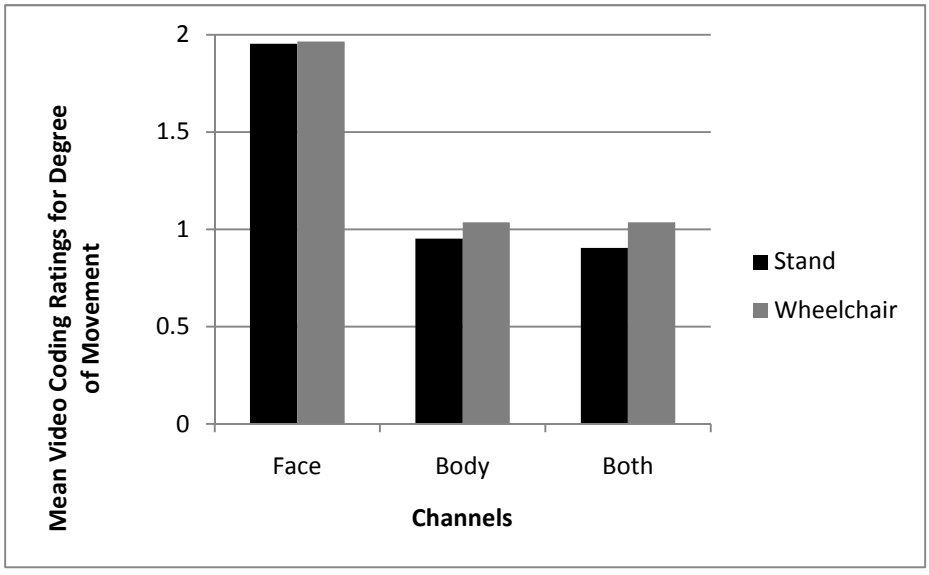

Figure 10. Actual Use of Channels for Happiness

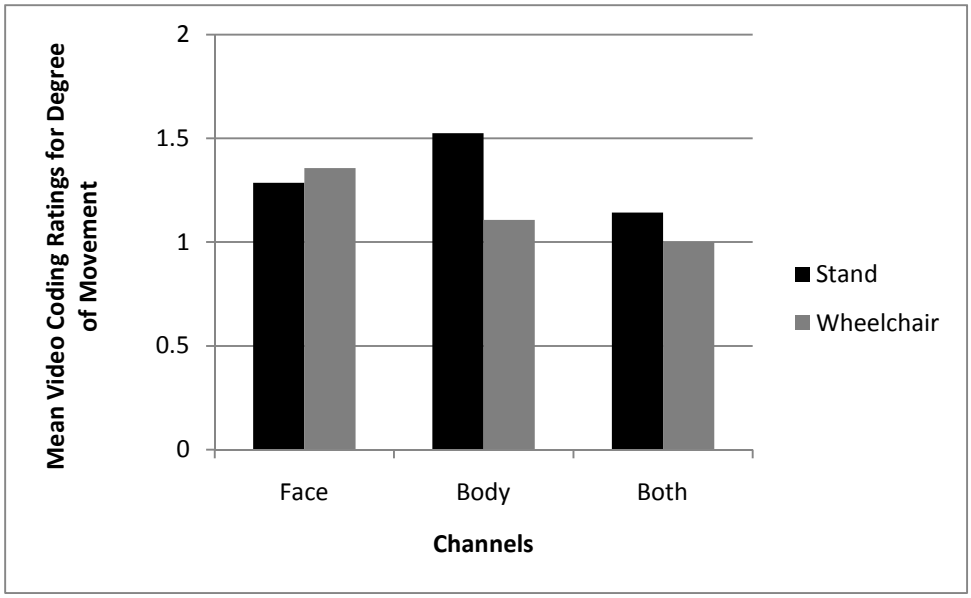

Figure 11. Actual Use of Channels for Pride

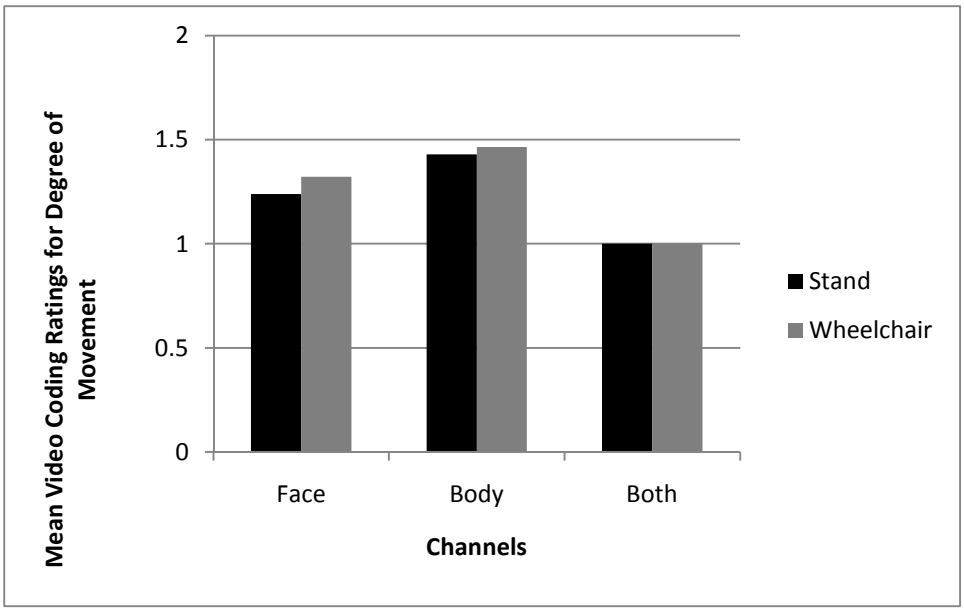

Figure 12. Actual Use of Channels for Embarrassment

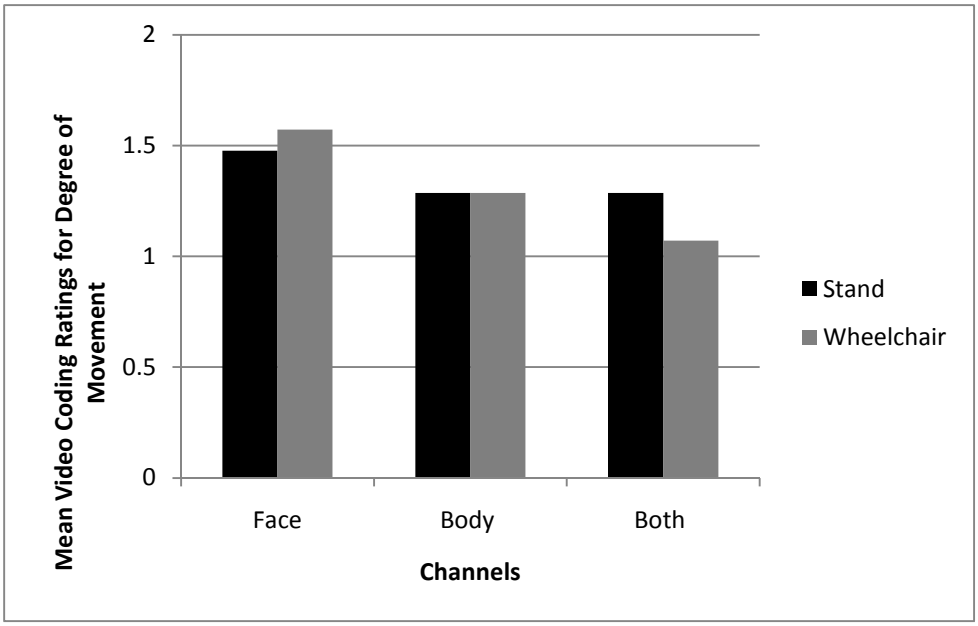

Figure 13. Actual Use of Channels for Fear

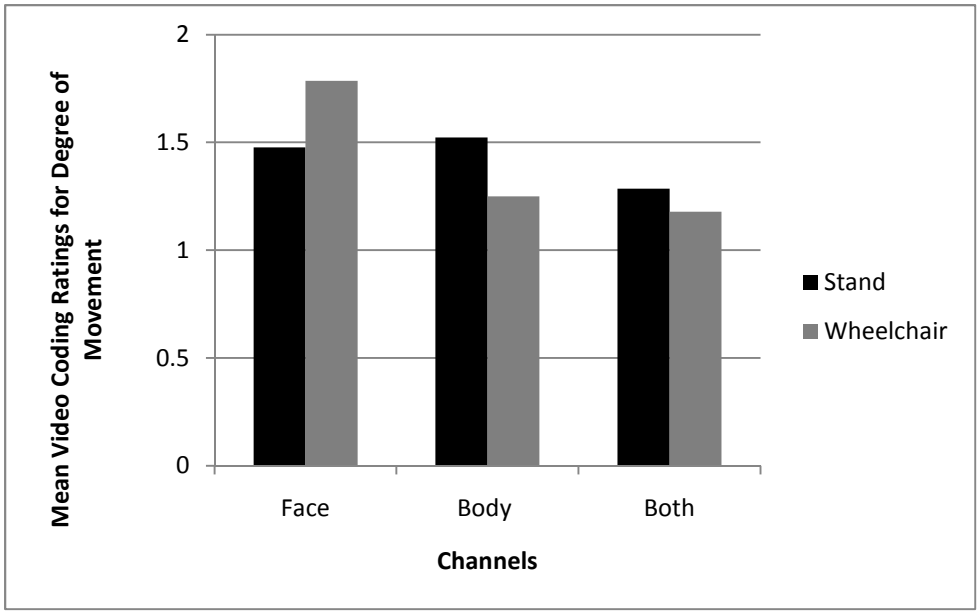

Figure 14. Actual Use of Channels for Anger

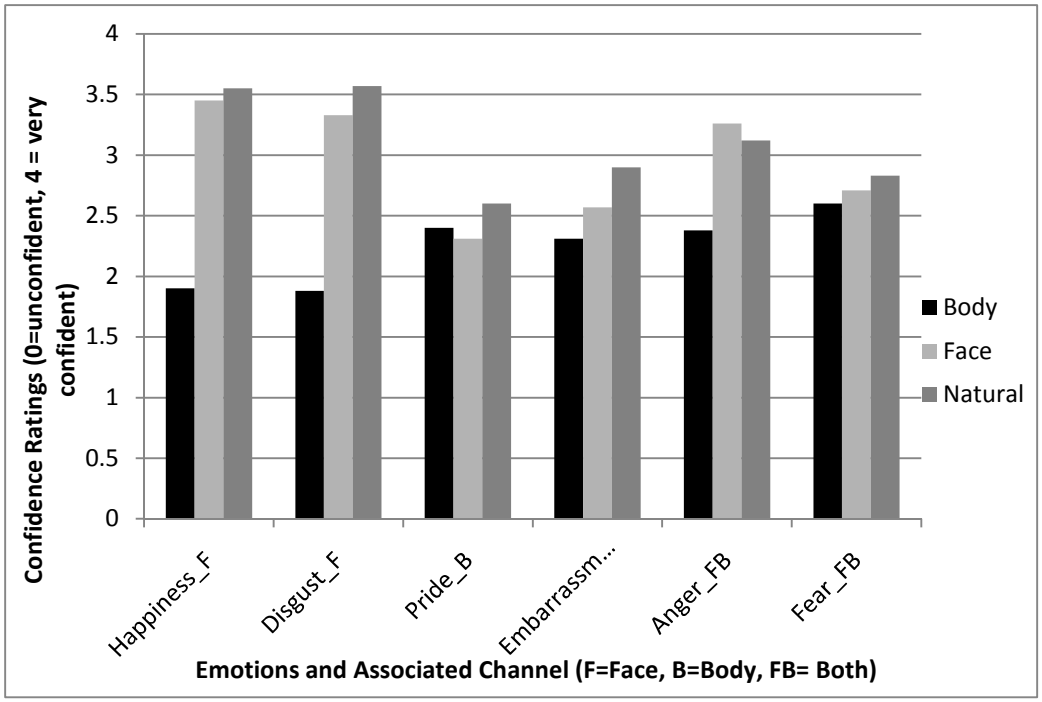

Figure 15. Mean Confidence Ratings for Standing Participants

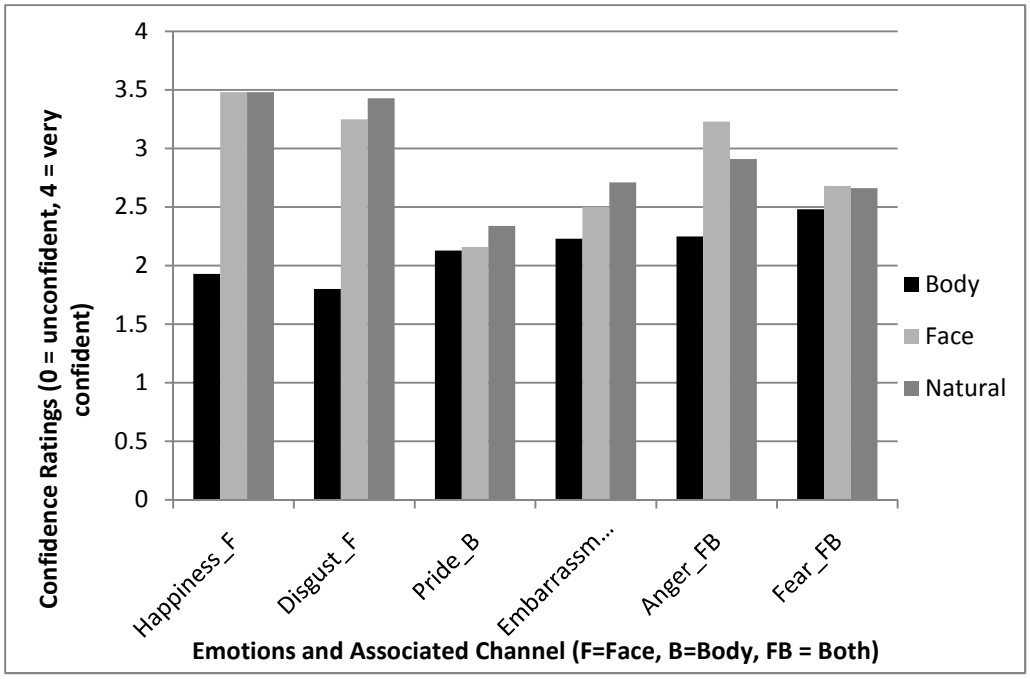

Figure 16. Mean Confidence Ratings for Wheelchair Restricted Participants

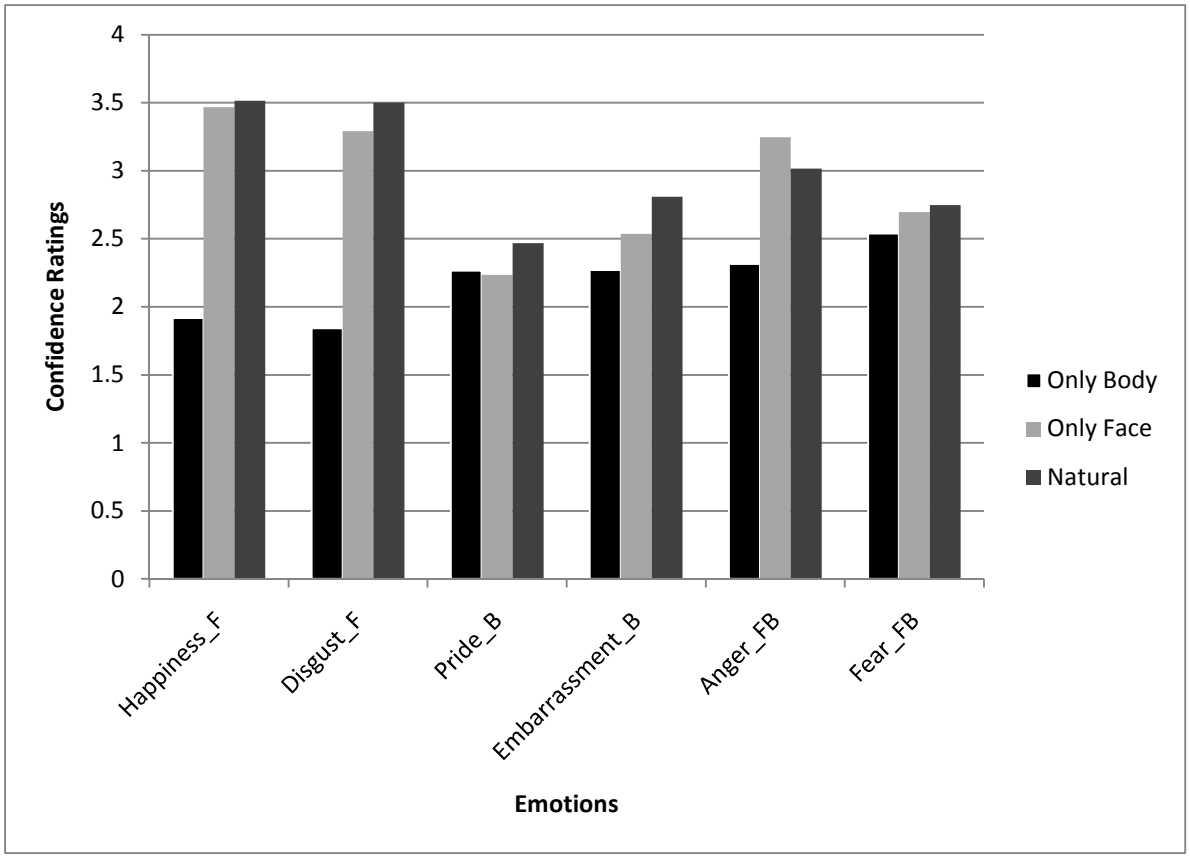

Figure 17. Combined Mean Confidence Ratings of Emotions vs. Channel Used for Production