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Moving Faces, Looking Places: Validation of the Amsterdam Dynamic Facial Expression Set (ADFES)

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We report two studies validating a new standardized set of filmed emotion expressions, the Amsterdam Dynamic Facial Expression Set (ADFES). The ADFES is distinct from existing datasets in that it includes a face-forward version and two different head-turning versions (faces turning toward and away from viewers), North-European as well as Mediterranean models (male and female), and nine discrete emotions (joy, anger, fear, sadness, surprise, disgust, contempt, pride, and embarrassment). Study 1 showed that the ADFES received excellent recognition scores. Recognition was affected by social categorization of the model: displays of North-European models were better recognized by Dutch participants, suggesting an ingroup advantage. Head-turning did not affect recognition accuracy. Study 2 showed that participants more strongly perceived themselves to be the cause of the other's emotion when the model's face turned toward the respondents. The ADFES provides new avenues for research on emotion expression and is available for researchers upon request.

Keywords: emotion, facial display, stimulus set, head-turning, ingroup advantage

Emotion research has greatly benefited from standardized sets of emotional expressions. These have spurred research on, for example, the recognition of emotional displays (Ekman & Friesen, 1976; Hawk, Van Kleef, Fischer, & Van der Schalk, 2009), the universality versus cultural-specificity debate (Ekman, 1994; Ekman et al., 1987; Elfenbein & Ambady, 2002; Matsumoto & Ekman, 1989; Russell, 1994), and mimicry (Lundqvist & Dimberg, 1995). In this paper, we present a new standardized set of emotional expressions, the Amsterdam Dynamic Facial Expression Set (ADFES). The ADFES is distinct from previous sets, because it consists of dynamic expressions rather than static pictures, utilizes active head-turning to clarify the directedness of the expressions, and includes North-European as well as Turkish and North-African models (for ease of reading we refer to the latter two as *Mediterranean* models). For these reasons, we expect that this stimulus set may prove to be useful for various types of emotion research.

The aims of the present paper are twofold. The first aim is to validate this new stimulus set by showing that the emotional expressions in the ADFES are recognized accurately (Study 1). Second, we more specifically examine two prominent features of this set, to show that ethnicity of the models leads to ingroup and outgroup effects in emotion recognition (Study 1), and that directedness of expression (conveyed by head-turning) influences interpretations of the cause of the models' emotions (Study 2).

Comparing Different Sets of Emotional Facial Expressions

Ekman and Friesen (1976) were the first to present a set of standardized facial expressions, the Pictures of Facial Affect (POFA). Their research on facial expressions resulted in the development of a scoring technique that codes facial behavior as specific movements of individual muscles, called the Facial Action Coding System (FACS; Ekman & Friesen, 1978). With this coding scheme, they were able to produce pictures of standardized facial expressions that were intended to represent 'prototypical displays' of emotions. The set contained black and white photos of White models that displayed six "basic" emotions, anger, disgust, fear, joy, sadness, and surprise.

Other researchers have since developed additional sets. The Japanese and Caucasian Facial Expression of Emotion (JACFEE; Biehl et al., 1997) includes color pictures of both European American and Asian American models. The Montreal Set of Facial Displays of Emotion (MSDEF; Beaupré & Hess, 2005) consists of displays of French-Canadian, Chinese, as well as sub-Saharan African models. This set does not feature surprise and contempt displays, but does include shame displays. The Karolinska Directed Emotional Faces (KDEF; Goeleven, de Raedt, Leyman, & Verschuere, 2008) is one of the more elaborate sets, consisting of 4,900 color pictures of six basic emotions, and includes directedness of the display with pictures taken from five different angles. More recently, Tracy, Robins, and Schriber developed a set of

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expressions (UCDSEE; Tracy, Robins, & Schriber 2009) that adds three 'self-conscious emotions'—embarrassment, pride and shame—to the basic emotion displays, and features both European American and West-African models. Finally, the Radboud Facial Database (RaFD; Langner et al., 2009) features both (North-European) children and adults displaying seven basic emotions. The RaFD includes averted and direct gaze orientations, and photographs taken from five different angles.

Our new set of emotion expressions, the ADFES, is unique as it includes a combination of several characteristics that cannot be found in any other facial stimulus set. First, none of the existing sets include filmed expressions. Because natural expressions include action (Ekman, 1994), we assume that dynamic stimuli are more ecologically valid than static stimuli. There is evidence supporting the assumption that emotion recognition is enhanced for dynamic stimuli, compared to static photographs. For example, schematic pictures of emotional displays are recognized to a greater extent when shown in sequence or as an animation, compared to a static presentation (Wehrle, Kaiser, Schmidt, & Scherer, 2000). In addition, as compared to static displays, dynamic emotional displays are more physiologically arousing (Sato & Yoshikawa, 2007a), and elicit stronger facial mimicry (Sato, Fujiumura, & Suzuki, 2008; Sato & Yoshikawa, 2007b; Weyers, Mühlberger, Hefele, & Pauli, 2006). Most of these studies have used animated stimuli or morphed pictures. It has been suggested, however, that the use of "real people" is a necessary condition for finding stronger effects with dynamic stimuli (Sato, Fujiumura, & Suzuki, 2008). To accommodate researchers who wish to use dynamic facial stimuli, the ADFES includes video clips of standardized expressions of nine emotions that are performed by real people.

Second, although previous sets have included Asian models (JACFEE), African models (UCDSEE), or both (MSDEF), no existing set includes Mediterranean models. These groups are relevant ethnic groups in Western-European nations (e.g., Turkish people in Germany and Moroccan people in the Netherlands), and standardized emotional displays of models from this group can be useful for research on intergroup emotions in these and other countries. The ADFES therefore includes expressions of 12 North-European and 10 Mediterranean models (12 males and 10 females).[1]

Third, most of the existing sets (except the RafD and the KDEF) have pictures taken only from a direct, face-forward angle. Recently, there has been an increased interest in the relation between gaze orientation or eye contact, and the interpretation of emotional facial displays (e.g., Adams & Kleck, 2003, 2005). Some emotions actually include averted gaze as a prototypical component (e.g., embarrassment; Keltner, 1995), and thus the ADFES expressions were filmed simultaneously from two positions, namely from face-forward (0°) and 45° angles. Directedness of expressions was further emphasized with an active head turn, either toward or away from the camera.

Finally, most of the existing sets only include the so-called basic emotions (with or without contempt). Various studies, however, have demonstrated that self-conscious emotions also have prototypical configurations, and can be recognized at levels above chance (e.g., Keltner, 1995; Tracy, Robins, & Schriber, 2009). The UCDSEE therefore includes shame, pride, and embarrassment displays, but this set only contains four models—one model for each gender (male and female) by ethnic group (North-European and West-African). It is therefore difficult to disentangle individual variations in displays from ethnic differences. The ADFES, in contrast, features multiple models of each ethnicity, who display six basic emotions (anger, disgust, fear, joy, sadness, and surprise), as well as contempt, pride, and embarrassment.

An Ingroup Advantage in Emotion Recognition

Our decision to include models from different ethnic backgrounds is motivated by recent studies suggesting different reactions to emotional displays between versus within groups. Based on a meta-analysis of cross-cultural emotion recognition data, Elfenbein and Ambady (2002) have suggested that there is an *ingroup advantage* in emotion recognition. Related to this finding, studies on social categorization and emotional mimicry have shown that mimicry of emotional displays is attenuated when the expresser is categorized as an outgroup member (e.g., Bourgeois & Hess, 2008; Van der Schalk, Fischer, Doosje, Wigboldus, Hawk, Rotteveel, & Hess, 2011). Furthermore, it has been shown that emotional displays of outgroup members may elicit opposite feeling states (Epstude & Mussweiler, 2009; Van der Schalk et al., 2011; Weisbuch & Ambady, 2008). These studies suggest that individuals automatically categorize faces as belonging to ingroup or outgroup, which subsequently may influence the ease with which emotions are recognized. In the current research, we investigated whether the ingroup advantage emerges when individuals judge standardized dynamic emotional expressions of ingroup and outgroup members.

Directed Expressions

Emotional displays are meaningful signals that provide information about the environment (e.g., Fischer & Manstead, 2008; Fridlund, 1994; Van Kleef, 2009). There are several possible cues that help us derive such information from an emotional signal (Hess & Fischer, 2010), including directedness of the expression by means of gaze direction and/or head orientation. Recent studies have investigated differences in the processing of emotional expressions when they are directed either toward or away from an observer. For example, Adams and Kleck (2003, 2005) showed that direct gaze enhances the speed at which observers process expressions that signal approach behavior (joy and anger), while an averted gaze enhances processing of emotions that signal avoidance behavior (fear and sadness). Similarly, gaze direction influences the perceived intensity of emotion displays, such that anger and joy displays are perceived as more intense when these are directed toward the observer, while fear and sadness displays are

[1] All of the *Mediterranean* models were Dutch-born and fluent in Dutch. They were second- or third-generation migrants of Turkish or Moroccan descent, with the exception of model M1 who was of biracial (African and North-European) descent. We chose to adopt the term "Mediterranean" to describe the subset of non-Dutch models in the remainder of the article, because the majority of the models in this subset fits to this description. Even though the ancestry of M1 is not Mediterranean, inspection of the perceived ethnicity scores for this particular model (see below) revealed that M1 was clearly identified as non-Dutch by participants. Further information about the specific ethnic background of the models is available upon request.

perceived as more intense when these are averted (Adams & Kleck, 2005; see also Sander, Grandjean, Kaiser, Wehrle, & Scherer, 2007).

In addition to tests of emotion recognition, other studies have investigated how reactions to emotional displays are influenced by directedness. For example, Hess, Adams, and Kleck (2007) showed that emotional reactions to displays depend on head orientation of the display. For example, anger directed toward an observer evoked more anxiousness, and fear directed at observers evoked stronger feelings of repulsion than averted anger and fear, respectively. Other research showed that when head orientation is such that the observer and the expresser have eye-to-eye contact directed expressions increased attention (as measured by eye fixation), increased convergent subjective responses, and increased congruent facial reactions as measured by facial EMG (Schrammel, Pannasch, Graupner, Mojzisch, & Velichkovsky, 2009).

Based on these findings, and to accommodate further research on the interaction between directedness of expression and emotion, we include directedness of expression in the ADFES. In studies that investigate the interaction between directedness and expression, directedness is manipulated by means of either gaze direction (Adams & Kleck, 2003, 2005; Hadjikhani, Hoge, Snyder, & De Gelder, 2008; N′Diaye, Sander, & Vuilleumier, 2009; Pecchinda, Pes, Ferlazzo, & Zoccolotti, 2008; Sander et al., 2007) or head orientation (Hess et al., 2007; Schrammel et al., 2009; Sato, Yoshikawa, Kochiyama, & Matsumura, 2004). It has been shown, however, that gaze direction and head orientation have similar effects and that the crucial factor in conveying communicative intention toward another person is direct eye-to-eye contact (Kampe, Frith, & Frith, 2003). Therefore, we operationalized directedness as an active head-turn, because this action seemed more naturalistic in dynamic films, and also because one of the expressions we investigate (i.e., embarrassment) entails an averted gaze as part of the display. Head-turn, rather than gaze shift, enabled the inclusion of directedness as a separate manipulation, without confounding it with an aspect of the embarrassment display.

The aforementioned studies assume that directedness of expression serves as a cue to the source of an emotion-eliciting event, influencing an observer's perception of personal involvement and the extent to which he or she has elicited the emotion in the target (e.g., Adams & Kleck, 2005; N′Diaye et al., 2009; Schrammel et al., 2009). When head and gaze are oriented toward observers, they may perceive themselves to be the cause of the emotion. In contrast, when head and gaze are oriented away from observers, they likely perceive someone or something else in the environment to be the cause. This assumption, however, has not yet been tested directly. In the current study we aimed to investigate this premise. Thus, in addition to validating the emotional expressions included in the set in terms of their recognizability, we also sought to validate the differences in the model's head orientations in terms of evoking the observers' feelings of personal involvement. We predicted that when an emotional display is turned toward an observer, individuals will more strongly interpret the expression as directed toward them, and will more strongly perceive themselves to be the cause of the emotion.

Recently, it has also been shown that orientation only influences recognition of expressions when these expressions are mild rather than strong (Graham & LaBar, 2007; N′Diaye et al., 2009). Because the ADFES consists of prototypical displays of emotion, we think it less likely that the recognition of the expressions will be substantially affected by the directedness of expressions. Therefore, we left it as an open research question whether the fixed-choice categorization of these standardized expressions would be altered by models' head orientations.

Overview

In summary, the current study aims to validate the ADFES as a rich stimulus set of 648 emotional displays. Furthermore, two specific features of the set are investigated. Study 1 investigates the effect of ethnicity on recognition of the displays, and Study 2 examines the effect of head movement on perceived directedness and cause of the emotion.

Study 1

In the first study, participants decoded the expressions. As an additional measure of emotion recognition, participants rated the stimuli in terms of valence and arousal. It has previously been argued that all emotions can be characterized by two dimensions—called *core affect*—that can be defined in terms of positivity–negativity and degree of arousal (Russell, 1980, 2003; Russell & Feldman Barrett, 1999). Therefore, we included measures of these dimensions, to investigate whether these dimensions can be inferred from perceived emotional displays.

The study had a 3 (head-turning: face-forward, turn-toward, turn-away) × 2 (social categories: North-European and Mediterranean) between-subjects design. We predicted above-chance recognition rates for all emotions across conditions. We further expected an ingroup advantage in emotion recognition. We had no specific predictions about the effect of head-turning on emotion recognition. In terms of valence and arousal (Russell, 2003; Russell & Bullock, 1985; Feldman Barrett & Russell, 1998; Russell & Feldman Barrett, 1999), we expected that ratings of joy and pride displays (similar to elation) would fall into the positive-arousing quadrant, while ratings of anger, fear, and disgust displays would fall into the negative-arousing quadrant. While we predicted that surprise would be rated as high in arousal, it was expected to be scored around the midpoint of the scale in terms of valence. We further expected that embarrassment (similar to shame) and sadness would fall into the quadrant of negative-low arousal. Finally, we expected that contempt displays would be rated as negative (Fischer & Roseman, 2007), but we had no specific expectations in terms of arousal, although studies in vocal prosody suggest midscale levels of activation for contempt (Banse & Scherer, 1996).

Method

Production of stimuli. The first goal of the ADFES project was to create a stimulus set of standardized facial expressions, in which all models utilized the same facial action units (AUs) to portray a particular emotion. The aim was to make expressions as similar as possible between models, and to incorporate the most prototypical elements of the displays as proposed by Ekman and Friesen (1978), Keltner (1995), and Tracy and Robins (2004). The two first authors (both certified in FACS) reviewed the list of prototypical AUs codes for each of the basic emotions and contempt devised by Ekman, Friesen, and Hager (2002; see also Ekman, 2007, and Ekman & Friesen, 1978). The codes are presented in Table 1 and represent target AUs for displays in the ADFES (at target intensities, when this is specified in the FACS prototypes). Because some variants exist for each prototypical emotion, we aimed primarily to capture the "core" AUs for the respective expressions. These are the AUs that are present in a majority of prototypical variants for a particular emotion. These core AUs (printed in bold in Table 1) were considered essential criteria for displays included in the final stimulus set. We followed similar procedures for the emotions of pride (see the description reported by Tracy & Robins, 2004) and embarrassment (see the description provided by Keltner, 1995; see also Haidt & Keltner, 1999). Neutral displays (no emotion-related AU activity) were also recorded.[2]

Twenty models (50% female, 50% North-European) were recruited for stimulus creation, all between the ages of 18 and 25. The two first authors also modeled the facial expressions, thus adding two more North-European males to the final set. A training manual for models, created for this study, utilized pictorial and verbal descriptions of the facial expressions. Models received the training manual at least 48 hr before their individual filming session, and practiced the facial expressions with the manual and a mirror for at least 1 hr.

The setup for the ADFES filming sessions can be viewed in Figure 1. The researchers first took time to discuss the targeted facial actions for each emotion with the models, and worked to improve any deficiencies. Three versions of each emotion and neutral expressions were then produced. The first version involved models beginning with a neutral face, and then expressing the emotion directly to a camera at a face-forward (0°) angle (the *face-forward* clips). Figure 2 gives examples for each emotion. The second and third version involved filming the model from two angles, simultaneously. Models began by directly facing the first camera (0°), with a neutral expression, and then turning to face the second camera (45°, on the right) before making the facial expression. This created two versions of the same film—one with the model turning *toward* the viewer before making the relevant expression (the *turn-toward* clips), and the other with the model turning *away* from the viewer before making the expression (the *turn-away* clips). Two examples of these different versions can be seen in Figure 3.

During the filming sessions, models' expressions were FACS-checked for accuracy with regard to the AU criteria formulated for each emotion (see Table 1). Quality checks were performed both by the researcher operating the camera, and by a second researcher who examined the models' expressions more closely on a TV monitor. Models were continuously coached during the session, to improve the accuracy and naturalness of their expressions. When both FACS coaches agreed that the models had satisfactorily generated each expression, they proceeded to the next emotion. Filming sessions typically lasted 2 to 2.5 hr per model.[3]

When the filming of the models was complete, the FACS coaches reviewed the footage for each model and selected the three versions—one face-forward, one turn-toward, and one turn-away—that best matched the target AU formula for each emotion (see Table 1). The selected turn-toward and turn-away versions were always derived from the same footage, shot simultaneously from the two different angles. These films were then edited to a standard length. The final films thus ranged from 6 to 6.5 s, all including a neutral face for .5 s, followed by the onset of the expression, and then the face held at apex for 5 s.[4]

Participants and design. Participants were 124 undergraduate students of psychology. They received partial course credit or €7 in exchange for their participation. Participants with a Turkish, Moroccan, or Arabic heritage ($n = 5$) were excluded from the analysis to keep the ingroup-outgroup relation similar for all respondents. A total of 119 participants remained (63.9% female; $M_{Age} = 20.90$, $SD_{\text{Age}} = 4.80$).

Participants were shown videos of anger, contempt, disgust, embarrassment, fear, joy, pride, sadness, and surprise displays from the ADFES. We divided the task in such a way that participants either viewed face-forward, turn-toward, or turn-away videos, from one of the two ethnic groups represented in the set. The study had a 9 (emotions, within) × 2 (ethnicity, between: North-European or Mediterranean models) × 3 (head-turn, between: face-forward displays, turn-toward displays, or turn-away displays) design.

Measures.

Manipulation check. At the onset of the experiment participants were shown neutral displays of the models. Participants indicated the extent to which the models appeared "*Autochtoon Nederlands*" (native Dutch) or "*Allochtoon Nederlands*" (this term refers to immigrants who also belong to an ethnic minority group) on a 7-point scale (not at all—completely). We reverse coded the answers to the second question and averaged the score across models within each ethnicity condition to create a measure of perceived ethnicity. Reliability of this measure was high in both ethnicity conditions ($\alpha = .90$ within the North-European condition and $\alpha = .93$ within the Mediterranean condition).

Dependent variable. Emotion recognition was measured with a fixed-choice question, with all nine of the presented emotions as response options, plus a "none of the above" option (Frank & Stennett, 2001). Participants indicated which emotion label best described the displayed expression.[5]

Per emotion category, we calculated the "raw hit rates" by dividing the number of accurately recognized displays by the total number of displays for that emotion. Raw hit rates can be biased, however, if respondents in a particular condition have tendencies to attribute a

[2] We also produced "high-dynamic" versions of the films for a limited number of embarrassment and contempt displays, which included additional hand and head movements related to the emotion category in question: face-touching for embarrassment (Keltner, 1995); and a head tilt, AU55/AU56, for contempt. To hold modality of display constant between emotions, however, the current article is limited to the validation of the stimuli in which the emotions are expressed solely through the face. In addition, because we only recorded these high-dynamic versions for some of our models, validation of these stimuli would have been limited. The stimuli are available, however, and can be accessed as supplemental materials through the Website: http://www.psychologie.uva.nl/ADFES.

[3] Because of time constraints, we failed to record embarrassment, pride, and surprise expressions for one of the female Mediterranean models, and pride expressions for one of the male Mediterranean models.

[4] The length of the turn-toward/-away films was slightly longer, to accommodate the head turn. The timing and onset of the facial expressions was equal to the face-forward films, however.

[5] Some researchers might argue that this is not a measure of emotion *recognition*, but rather a measure of emotion *decoding*, or a measure of *attribution* of emotion labels to the displays. We acknowledge that the latter terms are more appropriate from a technical perspective, but choose to adopt the prior term for the sake of readability.

Table 1
Targeted Facial Expressions for Each Emotion

Emotion	FACS Codes	Verbal description
Anger	**4CDE** + **5CDE** + 7 + 17 + **23/24**	**Brow lowered** + **Upper lid raised** + Eyelids tightened + Chin raised + **Lips tightened/pressed**
Contempt	U1 + U2 + **U14**	Unilateral inner brow raise + Unilateral outer brow raise + **Unilateral dimple**
Disgust	**9** + **10** + **25**	**Nose wrinkle** + **Upper lip raise** + **Lips parted**
Embarrassment	**12** + **14** + 23/24 + **54** + **64**	**Lip corner pull** + **Dimple** + Lips tightened/pressed + **Head down** + **Eyes down**
Fear	**1** + **2** + **4** + **5DE** + 20 + 25	**Inner brow raise** + **Outer brow raise** + **Brow lower** + **Upper lid raise** + Lips stretched + Lips parted
Joy	**6** + **12CDE** + 25	**Cheek raise** + **Lip corner pull** + Lips parted
Pride	**6** + **12** + **53** + **Posture straighten**	**Cheek raise** + **Lip corner pull** + **Head up** + **Posture straighten**
Sadness	**1** + **4** + 15ABC + 17	**Inner brow raise** + **Brow lower** + Lip corner depress + Chin raised
Surprise	**1** + **2** + **5AB** + **26**	**Inner brow raise** + **Outer brow raise** + **Upper lid raise** + **Jaw drop**

Note. AUs in boldface were considered essential for inclusion in the final video portrayal selected for each model. Alphabetical codes refer to the range of acceptable FACS intensity scores (A = *trace intensity*; E = *maximum intensity*) that exist for specific AUs in some emotion portrayals, according to established FACS-based prototypes (Ekman, 2007; Ekman, Friesen, & Hager, 2002). AUs without alphabetical codes can occur at any level of intensity.

specific emotion to any type of display. For example, if someone has the tendency to overattribute a label of anger to outgroup members' displays of other emotions, the recognition accuracy score for anger will be seemingly high, while in fact this is a product of the participant's response bias. To account for this possibility, we calculated "unbiased hit rates" (*Hu*; Wagner, 1993). We calculated this score for each emotion category as the proportion of correctly chosen labels, adjusted for the number of times participants erroneously chose the same label for other displays. This score yields a value between 0 and 1 (perfect score) for each emotion category.

Dimension ratings. To provide more relevant information for the validation of the stimulus set, participants also rated the displays on the dimensions of valence ("To what extent does the person in the video clip feel negative or positive?"; 1 = *very negative*, 7 = *very positive*), and arousal ("To what extent does the person in the video feel relaxed-excited?"; 1 = *very relaxed*, 7 = *very excited*).

Procedure. The task was administered via a PC. Participants were informed that they would judge facial expressions, and that their task was to indicate which emotion was being displayed and the extent to which the model felt negative/positive and relaxed/excited. Participants first viewed neutral displays of the models and rated the models on perceived ethnicity, before the experimental task started. The displays were presented to participants in random order. Depending on ethnicity condition, participants viewed displays of either North-European or Mediterranean models. Depending on head-turning condition, participants either viewed face-forward, turn-toward, or turn-away videos. Because of the different numbers of models for the ethnicity conditions and four missing expressions in the Mediterranean condition, the total number of displays varied between ethnicity conditions (108 for the North-European conditions, 86 for the Mediterranean conditions). At the end of the experiment, participants provided demographic information. Finally, participants were debriefed, compensated, and thanked.

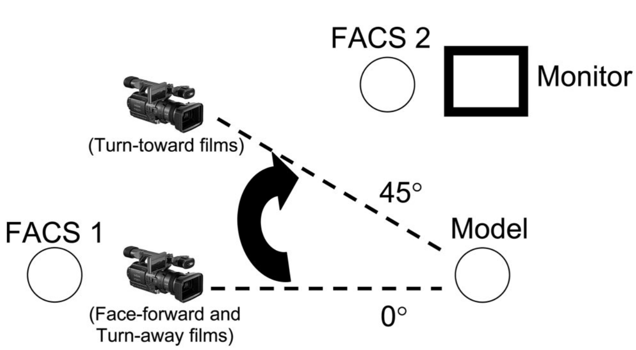

Figure 1. Schematic representation of camera setup and positioning of model and FACS-coaches.

Results

Manipulation check. A 2 (ethnicity) × 3 (head turning) ANOVA on perceived ethnicity revealed a strong significant effect of ethnic condition, $F(1, 113) = 302.51$, $p < .001$, $\eta^2 = .73$. Participants identified the North-European models as more "native Dutch" ($M = 5.19$, $SD = .79$) than the Mediterranean models ($M = 2.62$, $SD = .80$). No other effects were found.[6]

Emotion recognition. Raw and unbiased emotion recognition scores are portrayed in Table 2. Recognition rates were high overall, and were also high when the scores for the North-European and Mediterranean models were inspected separately. All raw and unbiased emotion recognition scores were significantly above chance, $p < .01$, when chance was set conservatively at 33% (Tracy, Robins, & Schriber, 2009).

[6] A closer look at the means for the individual models unexpectedly revealed that two of our North-European models (F4 and M6) were actually perceived as less native Dutch. Visual inspection of the stimuli revealed that these models have darker hair than the other North-European models, which may explain why these models were perceived as less native Dutch in the context where they were presented. We further investigated whether these models influenced the recognition of emotions. A 9 (emotion) × 2 (ethnicity) × 3 (head-turning) MANOVA on the arcsine-transformed unbiased hit rates without these models, however, revealed an identical pattern of results. Thus, although there may be some natural variation in the extent to which individuals are categorized in terms of ethnicity, our analyses reveal a stable pattern of results.

Figure 2. Example face-forward pictures. From left to right, top to bottom: anger, contempt, disgust, embarrassment, fear, joy, pride, sadness, and surprise.

In line with recommendations, we arcsine-transformed the unbiased hit rates before analyses (Wagner, 1993). A 9 (emotion) × 2 (ethnicity) × 3 (head-turning) MANOVA showed a main effect of emotion, $F(8, 105) = 34.23$, $p < .001$, $\eta^2 = .72$. Overall, anger was recognized best, followed by disgust, joy, fear, and surprise, then sadness and embarrassment, and finally pride and contempt (see Table 2). There also was a main effect of ethnicity $F(1, 112) = 15.14$, $p < .001$, $\eta^2 = .12$. Supporting our hypothesis, participants generally recognized emotional displays of North-European (ingroup) models ($M = .78$, $SD = .16$) more accurately than Mediterranean (outgroup) models ($M = .66$, $SD = .18$). These main effects of emotion and ethnicity were qualified, however, by a significant two-way interaction between emotion and ethnicity, $F(8, 105) = 6.25$, $p < .001$, $\eta^2 = .32$. Post hoc comparison showed that participants recognized the emotions better when they were displayed by North-European models than by Mediterranean models, except for fear and embarrassment displays, which were recognized equally well in both groups of models.

Analyses also revealed a significant two-way interaction between emotion and head-turning, $F(16, 212) = 1.83$, $p = .029$, $\eta^2 = .12$. Post hoc comparison showed a significant effect of head-turning condition only for the pride displays, $F(2, 112) = 3.15$, $p = .046$, $\eta^2 = .05$. This two-way interaction between emotion and head-turning was further qualified by a three-way interaction between emotion, ethnicity, and head-turning, $F(16, 212) = 1.89$, $p = .023$, $\eta^2 = .13$. For the North-European models, none of the emotions showed significant differences between head-turning conditions. For the Mediterranean models, however, there was a significant effect of head-turning for the joy displays, $F(2, 112) = 4.52$, $p = .013$, $\eta^2 = .08$, and the pride displays, $F(2, 112) = 9.40$, $p < .001$, $\eta^2 = .14$. Joy was attributed more accurately to the face-forward ($M = .81$, $SD = .23$) than to the turn-toward displays ($M = .68$, $SD = .20$) and the turn-away displays ($M = .68$, $SD = .19$), $p = .040$ and $p = .024$ in post hoc comparison. Similarly, pride was attributed more accurately to the face-forward displays ($M = .72$, $SD = .24$) than to the turn-toward ($M = .46$, $SD = .27$) and the turn-away displays ($M = .41$, $SD = .24$), $p = .003$ and $p < .001$ in post hoc comparison. There were no other effects of head-turning for any of the remaining emotions.

Dimensional ratings.

Valence. A 9 (emotion) × 2 (ethnicity) × 3 (head-turning) ANOVA on the valence rating showed a main effect of emotion, $F(8, 904) = 699.02$, $p < .001$, $\eta^2 = .86$. The results were in line with predictions. Joy and pride were rated most positively. Surprise fell close to the midpoint of the scale, while contempt and embarrassment fell somewhat below the midpoint. Disgust, anger, and fear were seen as negative displays, and sadness was rated as most negative (see Table 3). No other effects were found.

We tested the valence ratings against the midpoint of the scale, using one-sample *t* tests with Bonferroni correction. Joy and pride were rated significantly higher than the midpoint, both $t(118)$'s > 28.12, both p's < .001. Contempt, embarrassment, disgust, anger, fear, and sadness were all rated significantly lower than the midpoint of the scale, all $t(118)$'s < −6.76, all p's < .001. Surprise was not significantly different from the midpoint of the scale,

Figure 3. Examples of turn-toward (left; filmed at 45°) and turn-away (right; filmed at 0°) stimuli: anger (top) and joy (bottom).

$t(118) = -2.42$, $p = .15$. Perceptions of valence were not dependent on the ethnicity or on head-turning manipulations.

Arousal. For arousal, a 9 (emotion) × 2 (ethnicity) × 3 (head-turn) mixed ANOVA also revealed a significant main effect of emotion, $F(8, 904) = 163.54$, $p < .001$, $\eta^2 = .59$. Models were rated highest in arousal when they displayed pride and joy, followed by anger. Moderate arousal was attributed to models when they expressed surprise and disgust, while ratings for contempt and fear fell close to the midpoint of the scale. Sadness and embarrassment received the lowest arousal scores (see Table 3).[7]

We then tested the arousal ratings against the midpoint of the scale through one-sample *t* tests with Bonferroni correction. Pride, joy, anger, surprise, and disgust were all rated significantly higher than the midpoint, all $t(118)$'s > 3.45, all p's $< .009$. Fear, $t(118) = -1.32$, *ns*, and contempt, $t(118) = .97$, *ns*, did not differ from the midpoint of the scale. Sadness and embarrassment were both rated significantly lower than the midpoint of the scale, $t(118)$'s < -11.24, p's $< .001$. Again, ethnicity and head-turning manipulations did not affect these ratings.

Figure 4 graphically depicts each display within a two-dimensional (valence by arousal) grid. Pride and joy both fell in the high-arousal/positive-valence quarter. Anger and disgust fell within the high-arousal/negative-valence quarter. Sadness and embarrassment both fell in the low-arousal/negative-valence quarter. Surprise and contempt both fell near the center of the domain, with surprise being somewhat arousing, and contempt being somewhat negative. Fear fell in the negative domain, but was midscale in terms arousal.

Table 2
Raw (%) and Unbiased (Hu) Emotion Recognition Scores

	Overall		North-European		Mediterranean	
	Hu	(%)	*Hu*	(%)	*Hu*	(%)
Anger*	$.84^{a}$	88	$.87^{a}$	92	$.81^{a}$	85
Disgust*	$.77^{b}$	86	$.83^{a,b}$	90	$.70^{b,c}$	83
Joy*	$.76^{b}$	91	$.81^{b,d}$	95	$.72^{b}$	87
Fear	$.76^{b,c}$	84	$.80^{b,c}$	87	$.72^{a,b}$	81
Surprise*	$.75^{b,c}$	89	$.82^{a,b,c}$	93	$.68^{b,c}$	86
Sadness*	$.70^{c,d}$	82	$.79^{b,c}$	90	$.62^{c,d}$	75
Embarrassment	$.70^{b,c,d}$	74	$.72^{c,d}$	76	$.68^{b,c}$	72
Pride*	$.63^{d}$	69	$.74^{c}$	74	$.53^{d}$	63
Contempt*	$.55^{e}$	68	$.59^{e}$	69	$.51^{d}$	67
Mean*	.72	81	.78	85	.66	78

Note. Unbiased emotion recognition scores (*Hu*) in the same column not sharing a superscript differ significantly. Emotion terms marked with an asterisk indicate significant differences between ethnic conditions.

[7] The analysis also revealed a significant main effect of head-turning, $F(2, 113) = 3.19$, $p = .045$, $\eta^2 = .05$, which was qualified by a significant two-way interaction between ethnicity and head-turning, $F(2, 113) = 5.13$, $p = .007$, $\eta^2 = .08$. Post hoc analyses showed that, for the North-European models, face-forward displays were rated as less aroused ($M = 3.95$, $SD = .38$) than either the turn-toward ($M = 4.25$, $SD = .36$) or the turn-away displays ($M = 4.35$, $SD = .26$), $p = .003$ and $p = .034$. For the Mediterranean models, there were no significant differences between head-turning conditions. Because the higher-order interactions between emotion, ethnicity, and head-turning were not significant, F's < 1.31, p's $> .25$, this finding reflects a sum of means across emotions, which is not readily interpretable.

Table 3
Displays Ordered by Ratings of Valence (1-Negative, 7-Positive) and Arousal (1-Negative, 7-Positive)

	Valence			Arousal	
	M	*SD*		*M*	*SD*
Joy	5.88[a]	.60	Pride	5.28[a]	.71
Pride	5.78[a]	.69	Joy	5.27[a]	.67
Surprise	3.88[b]	.56	Anger	4.72[b]	.68
Contempt	3.58[c]	.67	Surprise	4.31[c]	.62
Embarrassment	2.72[d]	.65	Disgust	4.24[c]	.75
Disgust	2.51[e]	.71	Contempt	4.06[c,d]	.63
Anger	2.45[e]	.66	Fear	3.87[d]	1.10
Fear	2.37[e,f]	.68	Sadness	3.14[f]	.83
Sadness	2.28[f]	.60	Embarrassment	2.95[f]	.79
Mean	3.50	.34	Mean	4.20	.38

Note. Means in the same column sharing a superscript do not differ significantly.

Discussion

Study 1 showed that the ADFES received excellent recognition rates, which paralleled—and many times surpassed—other known sets of emotional expressions (e.g., Beaupré & Hess, 2005; Biehl et al., 1997; Ekman & Friesen, 1976; Goeleven, De Raedt, Leyman, & Verschuere, 2008; Langner et al., 2009; Tracy, Robins, & Schriber, 2009). This can be seen as indirect evidence that dynamic displays of emotions indeed provide additional information, beyond static photographs, that decoders can use to recognize the expressions. In line with our expectations, the ratings of the displays in terms of valence and arousal generally corresponded with circumplex theory (Russell, 2003; Russell & Bullock, 1985; Russell & Feldman Barrett, 1999). Although fear received lower arousal ratings than was expected, its position relative to other emotions was still in line with the circumplex perspective (e.g., it was still higher than the ratings for both sadness and embarrassment). Arousal ratings for surprise were also somewhat low, but were still significantly above the midpoint of the scale. Similarly, valence ratings for contempt were somewhat less negative than expected, but were still significantly below the midpoint of the scale. Interestingly, arousal ratings for embarrassment and sadness were equally low. Taken together, these findings suggest that individuals can indeed infer core affect from the emotional displays of the ADFES, and that the set can be used effectively by researchers who utilize different types of emotion theories.

Overall, and complementing findings from earlier studies (Elfenbein & Ambady, 2002), participants recognized displays from ingroup (North-European) models more accurately than from outgroup (Mediterranean) models, despite the fact that facial movements used to reach expressions were highly standardized. There were two exceptions to this general pattern, as we did not find the ingroup advantage effect for fear and embarrassment displays. Although the differences between recognition rates of ingroup and outgroup displays did not reach statistical significance for these emotions, the means were in the direction of an ingroup advantage effect. Therefore, we believe that these null findings should be interpreted with some reticence.

Recognition of the displays was not influenced by head-turning for most emotions. There were two exceptions: outgroup pride and joy displays received lower recognition rates when combined with a head-turn than when viewed face-forward. This speaks to the general quality of the expressions in the set, and researchers interested in effects of emotion directedness can use the set with confidence that recognition of the expressions are comparable between the different turn versions.

The fact that head-turning did influence recognition of joy and pride for outgroup displays is not surprising, given the high degree of overlap in AUs that are associated with these displays. Indeed, when we explored the incorrect attributions for these displays, joy and pride were most often confused with one another. It is interesting to note that this confusion only led to lower rates of recognition when these were preceded by an active head-turn. Apparently, the addition of a head-turn makes it more difficult to discern these emotions, perhaps because pride displays entail the same AUs as joy with the addition of an (upward) head movement (Tracy & Robins, 2004). The finding that this only occurs for outgroup displays, however, again points to the ingroup advantage in emotion recognition. This suggests that additional movements may add complexity to recognition of emotions that are closely related, but only when these are displayed by nongroup members (see also, Beaupré & Hess, 2006).

Even though directedness generally did not hamper recognition of the displays included in the ADFES, we expected that head-turning would make a difference in how observers *responded* to the emotional displays. Previous studies on the effect of directedness on reactions to emotions rest on the premise that directedness of displays provides information about the source of the emotion (Adams & Kleck, 2003; N′Diaye et al., 2009; Schrammel et al.,

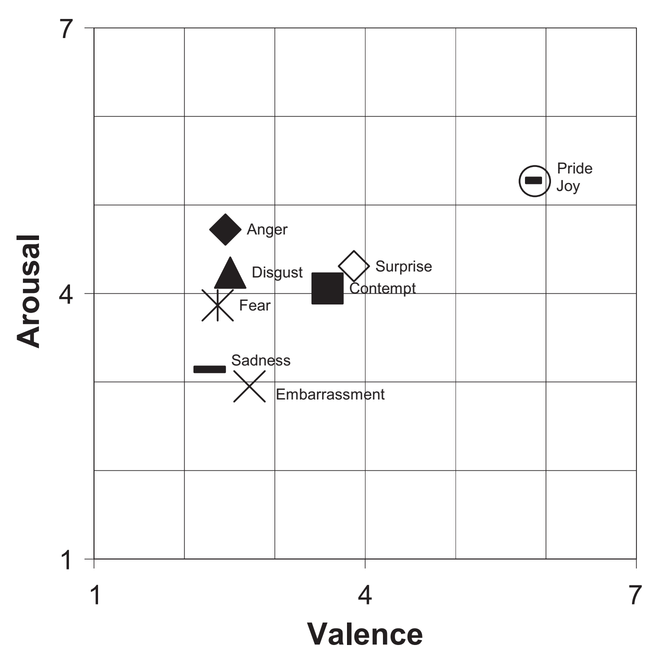

Figure 4. Valence (1-negative, 7-positive) by arousal ratings (1-negative, 7-positive) of the displays. The presented data points are the mean dimensional scores for each emotion, averaged across participants.

2009). Whether this assumption can be validated in terms of observers' own subjective interpretations has not yet been examined. In Study 2, we therefore investigated the hypothesis that head-turning provides information about the directedness of the display, which may lead viewers to infer themselves or something/someone other as the cause of the emotion.

Study 2

In Study 2 we further examined the influence of head movements. First, we sought to validate the assumption that models' head-turning would influence observers' perceptions of directedness and cause of the emotion. Participants viewed turn-toward versions or turn-away versions of the ADFES, and rated directedness of the expression and the extent to which they perceived themselves to be the cause of the models' emotions. We predicted that participants who viewed turn-toward versions of the displays would report stronger perceptions that the emotion was directed at them, compared to participants viewing turn-away versions of the displays. We also predicted that the turn-toward condition would increase observers' feelings that they, themselves, had caused the models' emotions.

Second, head movements may also have consequences for the relationship between perceiver and target. It has been argued that sharing of emotions serves the function of enhancing relational bonds between individuals (Fischer & Manstead, 2008; Haidt & Keltner, 1999). This is supposed to be the case for positive (i.e., joy) as well as negative emotions (i.e., sadness, but also anger; see, e.g., Van der Schalk et al., 2011). If head-turning influences perceived directedness of expressions, we may assume that emotional display from models that turn toward the observer may enhance affiliation to a greater extent than emotional displays from models that turn away from the observer. Furthermore, emotional sharing is more likely to occur between people that already have an emotional bond (Clark, Fitness, & Brissette, 2004). It has, for example, been found that mimicry of emotional displays is enhanced for ingroup members compared to outgroup members (Van der Schalk et al., 2011). Moreover, mimicry of ingroup members' emotional displays increased participants' liking of these models, while mimicry of outgroup models' emotional displays did not (Van der Schalk et al., 2011). Accordingly, we hypothesized that viewing emotional displays would increase affiliation with ingroup models, but not with outgroup models. We further hypothesized that this would be more pronounced when displays were turned toward the observer. We expected that this would be reflected in liking of the models.

Method

Participants and design. Participants were 116 undergraduate students of psychology. They received partial course credit or €7 in exchange for their participation. As in Study 1, participants with a Turkish, Moroccan, or Middle-Eastern heritage ($n = 8$) were excluded from the analysis. In total, 108 participants remained (73.1% female; $M_{Age} = 21.31$, $SD_{\mathrm{Age}} = 4.11$).

Participants were shown videos of anger, contempt, fear, joy, and sadness displays from the ADFES. We chose these emotions because these emotions are theorized to have the clear social-relational functions of bringing people closer—joy, sadness, and perhaps fear—or pushing them away—anger and contempt (Fischer & Manstead, 2008). We showed either turn-toward or turn-away displays, from one of the two ethnic groups represented in the set. Participants were shown displays of four models (2 male and 2 female). We selected the North-European and Mediterranean models that received the best recognition rates for the emotions that were included. Within both ethnicity conditions, the same models were shown for each emotion. The study had a 5 (emotion, within) × 2 (ethnicity, between: North-European or Mediterranean models) × 2 (head-turning, between: turn-toward or turn-away displays) design.

Measures. For every display, we measured *perceived directedness* ("To what extent do you feel that the display was directed at you?"; 1 = *not at all*, 7 = *very strongly*). The items were averaged across models into a directedness score for every emotion (five measures, all α's between .86 and .92). *Perceived causation* of the emotion was measured with two items for every display ("To what extent do you feel you caused the other's emotion" and "To what extent do you feel you are responsible for the other's emotion?"; 1 = *not at all*, 7 = *very strongly*). For this measure, too, the items were averaged across models for every emotion (five measures, all α's between .91 and .95).

We assessed *liking of the models* both before and after stimulus presentation. Participants rated neutral expressions of the models in terms of perceived friendliness (1 = *not at all*, 7 = *very strongly*) and positivity (1 = *very negative*, 7 = *very positive*). These ratings were averaged across models into a premeasure (α = .77) and postmeasure (α = .71) of liking, and a difference score between the two time-points was calculated. Finally, *approach-avoidance* action tendencies were measured with two items for every display "To what extent do you feel that you want to *approach* the person in the film fragment?" and "To what extent do you feel that you want to *avoid* the person in the film fragment?"; 1 = *not at all*, 7 = *very strongly*). The second item was recoded. For each emotion, the items were averaged across models into an approach-avoidance score (five measures, all α's between .61 and .74).

Procedure. Participants were seated in front of a PC. It was explained that they would judge facial expressions, and that their task was to indicate their reactions to the stimuli. We emphasized that the questions related to their own feelings, and not to the person in the video. Participants then viewed neutral displays of both North-European and Mediterranean models, and rated them on friendliness and positivity. The experimental task followed these initial ratings. As in Study 1, the displays were presented in random order. Depending on ethnicity condition, participants either viewed displays of North-European or Mediterranean models, and depending on head-turning condition, participants either viewed turn-toward or turn-away videos. Participants rated the 20 displays on perceived directedness and causation, and also rated their approach-avoidance tendencies in response to the displays. Participants subsequently rated the models' neutral displays on friendliness and positivity for the second time. Finally, participants provided demographic information and were debriefed by the experimenter.

Results

Perceived directedness and causation. We first analyzed the effects of head-turning on perceived directedness. A 5 (emotion) ×

2 (ethnicity) × 2 (head-turning) ANOVA showed the expected main effect of head-turning, $F(1, 104) = 17.51$, $p < .001$, $\eta^2 = .14$. In the turn-toward condition ($M = 2.98$, $SD = 1.38$), participants more strongly perceived the displays to be directed at them than in the turn-away condition ($M = 1.95$, $SD = 1.13$). The main effect of emotion was also significant, $F(4, 416) = 25.18$, $p < .001$, $\eta^2 = .20$. As can be seen in Table 4, participants perceived joy displays to be directed at them most strongly, followed by contempt displays. There were no differences in perceived directedness for anger, sadness, or fear displays. No other effects were found.

We then analyzed the effects of head-turning on observers' perceptions that they had caused the model's emotion. A 5 (emotion) × 2 (ethnicity) × 2 (head-turning) ANOVA showed that the expected main effect of head-turning condition was indeed significant, $F(1, 104) = 5.94$, $p = .02$, $\eta^2 = .05$. In the turn-toward condition ($M = 2.12$, $SD = 1.07$), participants felt that they had caused the models' emotions more than in the turn-away condition ($M = 1.66$, $SD = .89$). The analysis further showed that the main effect of emotion was significant, $F(4, 416) = 9.88$, $p < .001$, $\eta^2 = .09$. Participants felt that they had caused the models' joy and contempt more than their anger, sadness, or fear (see Table 4). No interaction effects were found.

We predicted that the perceived directedness of the displays would mediate the effect of head-turning on perceived causation. Figure 5 depicts this model and reports the effects of head-turning and perceived directedness upon causation perceptions. As predicted, the direct effect of head-turning condition on causation was no longer significant when controlling for the effect of perceived directedness, whereas there was a strong effect of perceived directedness on causation (Baron & Kenny, 1986). As a test for mediation, the indirect effect of head-turning on perceived causation, via perceived directedness, was estimated with 5000 bootstraps (Preacher & Hayes, 2004) and shown to be significant, $\beta = .61$, $SE = .15$, $p < .01$.

Liking of models. A 2 (ethnicity) × 2 (head-turning) ANOVA on the pre- versus postsession liking difference scores revealed a significant effect of ethnicity condition, $F(1, 104) = 18.67$, $p < .001$, $\eta^2 = .15$. Liking of North-European models increased after stimulus presentation ($M = .30$, $SD = .57$), while liking of Mediterranean models decreased ($M = -.15$, $SD = .53$). When tested against zero, both the increase in liking of North-European models, $t(54) = 3.94$, $p < .001$, and the decrease in liking of Mediterranean models, $t(52) = -2.09$, $p = .04$, were significant. The main effect of head-turning condition was not significant, $F(1, 104) = 2.56$, $p = .12$, $\eta^2 = .02$, nor was the predicted two-way interaction between ethnicity and head-turning, $F(1, 104) = 2.02$, $p < .16$, $\eta^2 = .02$. Simple effects analysis, however, revealed that, while there was no effect of head-turning in the Mediterranean condition, $F < 1$, *ns*, there was a significant effect of head-turning in the North-European condition, $F(1, 105) = 4.10$, $p = .045$. The increased liking of North-European models was more pronounced in the turn-toward condition ($M = .46$, $SD = .61$,) than in the turn-away condition ($M = .14$, $SD = .48$).

Approach-Avoidance. A 5 (emotion) × 2 (ethnicity) × 2 (head-turning) ANOVA on the approach-avoidance measure revealed a significant main effect of emotion, $F(4, 416) = 107.66$, $p < .001$, $\eta^2 = .51$. As can be seen in Figure 6, participants reported the strongest approach tendencies in response to joy displays, and moderate approach tendencies in response to sadness displays. Approach-avoidance was near the midpoint of the scale in response to fear. Furthermore, participants reported moderate avoidant responses to contempt displays, and even more avoidance in response to anger. We tested the approach-avoidance ratings against the midpoint of the scale with one-sample *t* tests. Joy and sadness elicited significantly higher ratings, both $t(107)$'s > 6.28, both p's $< .001$, indicating greater approach tendencies. The ratings for fear did not differ significantly from the midpoint of the scale, $t(107) < 1$, *ns*. Contempt and anger elicited significantly lower ratings than the midpoint of the scale, both $t(107)$'s < -4.45, both p's $< .001$, indicating greater avoidance tendencies.

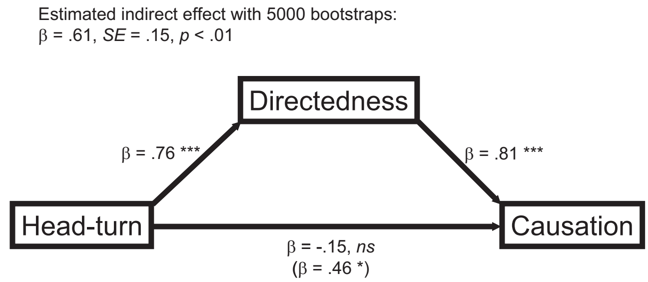

Figure 5. Indirect effect of head-turn condition on felt causation through perceived directedness.

Table 4
Perceived Directedness and Felt Causation of Display as a Function of Emotion

	Directedness		Causation	
	M	*SD*	*M*	*SD*
Joy	2.92[a]	1.69	2.10[a]	1.30
Contempt	2.58[b]	1.56	1.99[a]	1.18
Anger	2.35[c]	1.35	1.82[b]	1.00
Sadness	2.32[c]	1.34	1.81[b]	.95
Fear	2.20[c]	1.33	1.76[b]	1.01

Note. Means in the same column sharing a superscript do not differ significantly.

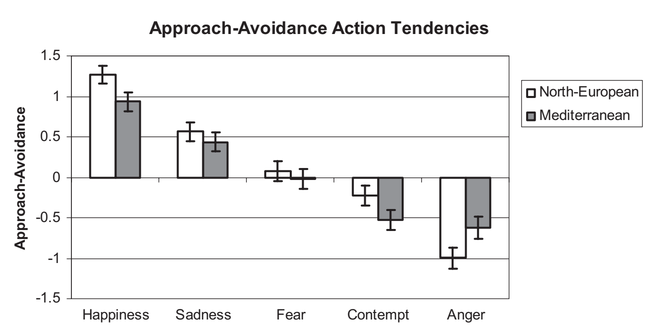

Figure 6. Approach-avoidance action tendencies as a function of emotion and ethnicity. Error bars represent *SE*s.

The two-way interaction between emotion and ethnicity was also significant, $F(4, 416) = 3.90$, $p = .012$, $\eta^2 = .04$. Post hoc analyses revealed a significant difference between ethnicity conditions for joy, $F(1, 104) = 4.08$, $p = .046$, $\eta^2 = .04$, and for anger, $F(1, 104) = 4.06$, $p = .047$, $\eta^2 = .04$. As can be seen in Figure 6, participants reported more approach tendencies in response to North-European joy displays than to Mediterranean joy displays, and more avoidance in response to North-European anger displays than to Mediterranean anger displays. No other effects were found.

Discussion

In Study 2 we examined the effect of head-turning on the interpretation of emotion. When models' faces were turned toward the observer, this increased perceptions that the expression was directed at the observer. This, in turn, enhanced one's sense of having caused the other's emotion. Notably, the effect for head-turning was not influenced by type of emotion displayed. Furthermore, viewing emotional displays increased participants' liking of ingroup (North-European) models, whereas viewing emotional displays decreased liking of outgroup (Mediterranean) models. There also was some indication that liking of ingroup models increased more when ingroup models' faces were turned toward participants. Lastly, there was an effect of models' ethnicity on approach-avoidance tendencies in response to emotion displays, such that action tendencies (in response to joy and anger) were more pronounced in response to ingroup models' displays.

Participants' sense that they had caused the models' emotions was strongest for joy and contempt. It has previously been found that faces with joyful displays are more likely to be judged as looking at the observer than anger, fear, or neutral displays (Lobmaier, Tiddeman, & Perrett, 2008). These authors interpreted their findings in terms of a self-referential positivity bias. People are biased to perceive positive expressions (like joy) as directed at them, because this affirms self-esteem. The current findings suggest that this bias can also occur for some negative emotions. Contempt, in particular, expresses rejection and exclusion of another person, and evokes others' feelings of being inferior (Fischer & Roseman, 2007). This shows that self-referential bias can also occur in response to negative emotions, especially contempt. We speculate that this is less the case for anger, because anger can also be interpreted as being caused by other negative events (e.g., goal blockage, frustration), rather than being caused by oneself. Future studies could further investigate self-referential biases in the perception of contempt.

In line with our expectations, participants' liking of ingroup models increased after viewing emotional displays. Notably, this tended to be more pronounced in the turn-toward condition. This finding provides further evidence that emotions are social messages and increase affiliation between individuals. Interestingly, this effect was found for both positive and negative emotions, which is also in line with prior research (Clark, Fitness, & Brissette, 2004). The design of the current study did not permit a disentangling of specific (positive and negative) emotions, however. Future studies could further investigate effects of specific emotions on emotional affiliation. In contrast, participants' liking of outgroup models decreased after viewing the emotional displays. This indicates that beneficial effects of emotion sharing for social bonding may only occur when individuals share a common identity, and that emotion expression may even have a detrimental effect on interpersonal relations when individuals do not share a common identity.

The current study did not show effects of head-turning on approach-avoidance tendencies. Because head-turning had an impact on observers' feelings that they had caused the models' emotions, however, we may expect that head-turning should influence behavioral tendencies when the consequences of the emotions are different for someone who is the cause, as compared to a bystander. The current study, however, did not provide this kind of more complex contextual information. It is likely that participants were primarily focused on the display, itself, and rated their action tendencies accordingly (e.g., approaching joyful individuals, while avoiding angry ones). Future studies could further investigate the relation between perceived causation of emotion displays and behavioral responses.

Interestingly, ethnicity did influence approach-avoidance tendencies. Approach-avoidance reactions were more pronounced in response to ingroup displays of joy and anger. Compared to outgroup models, participants had a greater inclination to approach joyful ingroup members, and to avoid angry ingroup members. This may, first of all, be explained by the fact that ingroup emotions are based on shared concerns and thus are seen as affecting oneself, as well. Second, this result may also be because of the ingroup advantage effect in emotion recognition, as reported in Study 1. It has been shown, for example, that people are more confident in their emotion attributions to ingroup displays (Beaupré & Hess, 2006). Individuals thus have more difficulty in recognizing facial displays of outgroup members, and are aware of this deficiency. As a consequence, they may be less distinctive in their responses to these displays.

General Discussion

The main aim of the present research was to present and validate the ADFES. Study 1 showed that this stimulus set received excellent recognition rates for all emotions. Another aim of the research was to examine whether ethnicity—North-European or Mediterranean—leads to an ingroup advantage in emotion recognition. As expected, and despite strong efforts to standardize the expressions posed by the models, we found that Dutch participants were better in recognizing emotional displays of North-European models than those of Mediterranean models. Because the ADFES contains the unique feature of two different head-turning versions, Study 2 specifically focused on the effects of head movement on perceived directedness of displays and perceived cause of displayers' emotions. The results showed that displays turned toward observers increased perceptions that the displays were directed at them, which in turn contributed to a sense of agency. In other words, the same display can affect observers differently, depending on where (or to whom) it is directed.

The turning of the head can be considered a contextual cue, which may alter the interpretation of the emotional signal. As Fridlund (1994) stated, "displays have meanings specifiable only in their context of occurrence, and they are issued to serve one's social motives in that context" (p. 139). Faces turned toward the observer signal that the emotion is directed at the observer, and this perceived directedness increases observers' feelings that they have caused the other's emotion. This finding implies that displays not only serve social motives of the displayer, but that the interpretation of displays also serves social motives of the observer.

Head-turning did not affect recognition of emotions. This seems to contradict previous studies showing that the processing of approach-related emotion displays (anger and joy) benefits from direct gaze, while processing of avoidance related displays (fear and sadness) benefits from averted gaze (e.g., Adams & Kleck, 2003, 2005; Sander et al., 2007). We assume that methodological differences between the present research and these prior studies may have contributed to this differential pattern of findings (see also Bindemann et al., 2008). For example, recent studies suggest that directedness only effects perceptions of emotional display when the displays have moderate intensity (N′Diaye et al., 2009), whereas the ADFES consists of strong, prototypical displays of emotions. Furthermore, the current study measured categorical recognition of emotion, rather than speed of processing (Adams & Kleck, 2003, 2005). It is possible that processing of displays can indeed be influenced by gaze orientation, but when the task is to attribute emotion labels from a fixed list, recognition does not appear to be hindered. The finding that head-turning influenced the perceived cause of the display does suggest that head movement effects the processing of emotion displays. The fact that recognition did not suffer from this, however, supports the utility of the ADFES for examining the social effects of directed emotions without potential emotion recognition confounds.

Social Categorization Effects on Emotion Recognition

The current studies replicated effects of social categorization upon emotion recognition and responses to emotions, which has been referred to as the "ingroup advantage" effect (Elfenbein & Ambady, 2002). One explanation for this effect relates to emotional "dialects" in both encoding and decoding of displays (Elfenbein & Ambady, 2003). Despite the standardization of the displays in the ADFES, we cannot exclude that our stimulus set contains subtle information that differs slightly between North-European and Mediterranean models, thus reflecting different emotional dialects. However, we do not think this explanation is plausible for the present findings, because the expressions were not collected in a free form format, and the AUs for the displays were held constant across ethnic conditions, making sure that the emotion displays were prototypical.

Another, more likely explanation is that automatic categorization effects have influenced responses to the displays. In other words, the initial social categorization of faces, and not the differences in emotion displays, may account for the observed effects. Other lines of research support this explanation. For example, it has been shown that stereotypes influence attribution of emotions to outgroup displays (e.g., Hugenberg & Bodenhausen, 2003). Individuals show more empathy to affective pictures of ingroup members, compared to outgroup members (Brown, Bradley, & Lang, 2006). Similarly, individuals mimic ingroup members' emotional displays more strongly than those of outgroup members (e.g., Bourgeois & Hess, 2008), and may even have opposite emotional reactions to outgroup displays (Epstude & Mussweiler, 2009; Van der Schalk et al., 2011; Weisbuch & Ambady, 2008). We believe that social categorization processes altered emotional reactions in response to the displays, and that this subsequently impaired emotion recognition and corresponding behavioral tendencies.

The findings also show that individuals are biased against outgroups in their responses to emotions. Not only was there an ingroup advantage in emotion recognition, but viewing emotion expressions by outgroup members also decreased emotional affiliation with the outgroup. Although we cannot directly extrapolate these findings to everyday social interactions, we may suggest that emotion sharing is less effective as an affiliation strategy between groups. Furthermore, individuals were less distinct in approaching or avoiding outgroups based on their emotion displays. This may inhibit appropriate responses to emotions in intergroup situations, and work against smooth interactions. Future research should investigate whether this biased responding toward outgroup members' emotion displays also occurs in actual social-interactional contexts, and whether it is possible to prevent such biases. Because the ADFES is the first set including emotional displays of both North-European and Mediterranean models, it provides new opportunities for research in the area of intergroup relations.

Conclusion

In summary, the ADFES is the first standardized set of dynamic filmed expressions. It consists of joy, anger, sadness, fear, disgust, surprise, contempt, pride, and embarrassment displays. It features male and female North-European and Mediterranean models, and has at least five models for each ethnicity-gender combination. The current studies show that the emotions displayed in the ADFES are very well recognized. Directedness of expression, by means of head-turning, influenced the perceived cause of the emotion, without affecting recognition. This shows that directed facial expressions not only provide information about *which* feelings and intentions another is experiencing, but can also inform observers about the *cause* of these feelings. Mediterranean models received lower recognition rates, indicating an ingroup advantage in emotion recognition, although recognition rates were still good. Detailed investigation of recognition rates and other responses, such as participants' liking of the models and their approach-avoidance tendencies, revealed that social categorization processes influence reactions to emotions, reflecting an emotional bias against outgroups.

Future studies can further investigate the relations between directed attention, dynamic facial expressions of specific emotions, and emotional affiliation between groups. The ADFES accommodates these avenues for research. The set is freely available for researchers who would like to use the set for the purpose of scientific investigations.

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