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Furrowing the Brow May Undermine Perceived Fame: The Role of Facial Feedback in Judgments of Celebrity

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Two studies are reported that investigate whether facial expressions may influence judgments of fame. In the current research, the authors tested the hypothesis of whether feelings of mental effort influence judgments of fame. To test this hypothesis, participants were required to contract the corrugator muscle while judging the fame of persons depicted in a photo. In Experiment 1, participants who succeeded in maintaining the contraction during the entire task evaluated the targets to be less famous than did judges who did not succeed or were not required to engage in any facial contraction. In the second experiment, participants' success at their muscle contraction was monitored by electromyograph (EMG) feedback and a control group had to activate a different (frontalis) facial muscle. The fame effect was replicated under those conditions. The present findings suggest that facial expressions may modify nonemotional feelings and the judgments that are based on them.

Social judgments are not only influenced by what one knows about the judged topic but also by the experienced ease with which relevant knowledge comes to mind. This idea is reflected in the availability heuristic (Tversky & Kahneman, 1973), which has stimulated an immense amount of research. As an example, individuals tend to believe that words including the letter *n* in the second to last position occur less frequently than do words ending with the string *-ing*. Based on the outcomes of a different experiment, Tversky and Kahneman (1973) have argued that such judgmental biases hinge on the fact that the experienced ease with which a certain outcome can be generated will be used to judge its frequency of occurrence. In the present example, words ending in *-ing* are recalled more easily than are words possessing an element of this ending.

However, there exists an alternative account for this finding in that the outcome of a task that can be easily

performed may be different. In particular, more relevant cases may be recalled if the task is easy than if it is difficult, and the size of the sample, rather than the feeling of ease or effort, may be used to draw inferences. To disentangle the contributions of content and experience, Schwarz et al. (1991) conducted a series of experiments in which participants had to generate either 6 or 12 episodes of assertive or unassertive behaviors from their own life. Schwarz et al. observed that participants who had been given the more difficult task of recalling 12 behaviors described themselves as less assertive than did participants who had to recall 6 instances. Thus, although 12 instances provide a broader basis for the judgment, individuals referred to the experienced ease versus effort evoked by the mental operation.

These findings suggest that cognitive contents and feelings may provide different bases for social judgments. This distinction is reflected in differences in the mental representation of feelings and knowledge (Strack & Gonzales, 1993; Strack & Neumann, 1996). Although feelings are perceptual experiences that may vary in intensity and cannot be true or false, cognitive contents are noetic propositions that are activated in an all-or-none fashion and have a definite truth value. Occasionally, the two representations may be in conflict. For example, although a person may know that a perceptual

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experience is caused by a visual illusion, the faulty experience will not go away. Judgments that are derived from the elicited experience will differ from judgments that are based on the activated knowledge. The findings obtained by Schwarz et al. (1991) demonstrate similar divergences for social judgments.

Another characteristic of feelings is that they are often associated with specific patterns of facial action. However, facial expressions may not only be a consequence but also a cause of a feeling. This thesis was first suggested by Charles Darwin (1872/1965), who has argued that bodily expressions may intensify the experience of feelings, whereas their suppression may attenuate it. This hypothesis was predominantly tested for facial expressions of emotions (e.g., Laird, 1974). For example, it was found that the intensity of positive versus negative feelings can be influenced if the contraction of the zygomaticus muscle (used for smiling) was unobtrusively manipulated (e.g., Martin, Harlow, & Strack, 1992; Strack, Martin, & Stepper, 1988; Zajonc, Murphy, & Inglehart, 1989).

Extending these results to feelings of mental ease or effort, one might consider an expression that is frequently associated with effortful actions. As Darwin (1872/1965) has observed, humans (and even some higher animals) furrow the brow when they focus their attention on a particular target. The underlying muscle activity is a contraction of the corrugator muscle, which also plays a role in the expression of anger (e.g., Ekman, 1973) and negative affect. That feelings of effort and difficulty also may be intensified by such facial action was indicated by the results of a study by Cacioppo, Petty, and Morris (1985), who found that the feeling of mental effort was accompanied by higher activity across the corrugator supercilii region. Moreover, Larsen, Kasimatis, and Frey (1992) reported a tendency toward reports of higher difficulty from participants who were unobtrusively induced to furrow the brow, compared to a no-contraction control group.

Taken together, these findings suggest that specific facial expressions elicit feelings of mental effort that may be used as a basis for social judgments. In an attempt to test this assumption, Stepper and Strack (1993) had participants furrow the brow while doing part of the Schwarz et al. (1991) task. Specifically, participants had to recall six instances of assertive or unassertive behavioral episodes from their own life before they assessed their own assertiveness. The results showed that self-ascriptions of assertiveness were in fact influenced by the contraction of the corrugator muscle. In detail, participants who were successful at maintaining the muscle contraction (leading to feelings of mental effort) judged themselves to be less assertive after recalling episodes of

high assertiveness and more assertive after recalling episodes of low assertiveness.

A common denominator of the studies described so far is that the feelings of mental effort also may be relevant for subsequent judgments. However, there is reason to believe that one and the same feeling may influence judgments of a different nature. In the domain of affect, it has been shown that a positive mood may become the basis for decisions as diverse as about one's quality of life (Schwarz & Clore, 1983; Strack, Schwarz, & Gschneidinger, 1985) or about whether one should continue an ongoing activity (Martin, Ward, Achee, & Wyer, 1993).

The feeling of mental effort may become relevant for a type of judgment that has been studied by Jacoby and his associates (e.g., Jacoby, Kelley, Brown, & Jasechko, 1989; Jacoby & Woloshyn, 1989). Based on previous work on recognition memory (Jacoby & Dallas, 1981; Mandler, 1980), these authors have demonstrated that the feeling of familiarity that is elicited by a name may be used to judge the target person's fame. The present studies were designed to test the hypothesis that feelings of mental ease versus effort that are elicited by the accompanying facial expression also may affect such judgments. This prediction was derived from notions by Jacoby and Dallas (1981), who argued that feelings of familiarity are the consequence of the ease with which a stimulus is perceived (for a more recent discussion of this issue, see Whittlesea, 1993). If a corrugator contraction induces feelings of mental effort, less familiarity may be experienced when people's fame has to be assessed. As a result, furrowing the brow should attenuate ratings of fame.

EXPERIMENT 1

Method

PARTICIPANTS AND DESIGN

Forty-six students from the University of Würzburg served as participants (25 women, 21 men) and were paid DM5.00 (approximately U.S.\$3.60 at the time). Participants were randomly assigned to the conditions of a 2 (target fame: nonfamous vs. famous) \times 2 (corrugator: contracted vs. relaxed) factorial design; the corrugator manipulation was administered between participants, whereas fame varied within participants.

PROCEDURE

Participants were brought to our lab and informed that we wanted to find out whether working on a computer would produce tension on the forehead. Allegedly, we had developed a method to find out whether people were prone to tenseness caused by this type of work. Half of the participants were instructed to simulate

tension by contracting the eyebrows toward the middle of the forehead. No further instructions were given to the other half of the participants. All participants were then successively exposed to 20 portraits of 6 famous and 14 nonfamous target persons. The famous persons employed in this study were preselected according to a criterion of moderate public exposure. This was done to increase the difficulty of the judgment and the likelihood that participants would have to use their subjective experience. A pilot study revealed that participants were able to distinguish between famous and nonfamous target persons, but most of them only knew the names of the target persons.¹ The portraits of both famous and nonfamous target persons were selected from German magazines.

Each photo was presented in the same size on the computer screen for 10 seconds followed by a screen depicting a 10-point rating scale ranging from 0 (*not at all famous*) to 9 (*famous*). It was the participants' task to judge the presumed fame of the persons depicted in the portraits. After having pressed a number key between 0 and 9, the next portrait appeared on the screen. The portraits were presented in random order. The only restriction was that no more than two portraits of famous persons should be presented in immediate succession.

After completing the fame judgments, participants had to indicate how well they succeeded at the contraction task. Specifically, participants had to indicate if they had been able to maintain the muscle contraction on a scale from 0 (*not well at all*) to 9 (*very well*). This measure was included because in the previous experiment by Stepper and Strack (1993), participants' success in maintaining the muscle contraction was critical to obtaining the predicted effects. Finally, participants were probed for suspicion about the actual purpose of the study. No participant expressed any doubts concerning the cover story.

Results

FAME JUDGMENTS

An inspection of Table 1 reveals that famous persons were, in fact, judged to be more famous than nonfamous persons. A 2 (famous vs. nonfamous person) \times 2 (corrugator muscle contracted vs. not contracted) analysis of variance yielded a significant main effect for the factor of Fame, $F(1, 44) = 284, p < .001$. However, there was no reliable influence of the facial action and no significant interaction of the two variables (all other F s < 1).

Yet, on the basis of the described findings from our previous work (Stepper & Strack, 1993), we expected that the effect may be contingent on participants' success at maintaining the muscle contraction during the entire evaluation task. Therefore, the median rating on the self-report scale ($Mdn = 5$) was used as a criterion to

TABLE 1: Experiment 1: Fame Judgments as a Function of Facial Contraction, Fame of the Target Person, and the Reported Success at Continuously Maintaining the Posed Facial Expression

Facial Contraction	n	Target Person	
		Famous	Nonfamous
Corrugator	22		
<i>M</i>		5.3	1.5
<i>SD</i>		1.3	1.1
Successful	12		
<i>M</i>		4.7	1.1
<i>SD</i>		1.4	0.9
Unsuccessful	10		
<i>M</i>		5.9	2.2
<i>SD</i>		0.8	1.1
No contraction	24		
<i>M</i>		5.8	1.7
<i>SD</i>		1.5	1.0

determine whether a participant was successful at maintaining the contraction task. Because no such split was conducted in the control group, we decided to perform separate analyses for participants who were able to maintain the contraction and for those who were not.

The first 2 \times 2 analysis of variance included the control group and participants who succeeded at contracting the corrugator muscle. The mean pattern in Table 1 suggests that participants who reached the criterion of successful corrugator contraction judged both famous and nonfamous target persons to be less famous than did participants who had their corrugator muscle relaxed, $F(1, 44) = 5.56, p < .03$. A second 2 \times 2 analysis of variance included the no-contraction control group and participants who had been unsuccessful at contracting their forehead muscle. In this case, the mean pattern (Table 1) indicates that the fame ratings resemble those of the control group and did not differ significantly as a function of the facial action ($F < 1$).

Discussion

The present results provide initial support for the hypothesis that furrowing the brow may influence fame judgments. Participants who reported being able to maintain their expression judged the target persons to be less famous. Although the photos allowed participants to differentiate between famous and nonfamous persons, the induced feeling of effort affected judgments of both groups. That is, although judges were much more likely to assign high fame ratings to pictures of famous persons, their ratings were attenuated when the corrugator muscle had to be contracted. Also, the present results are consistent with previous findings by Stepper and Strack (1993) in that success at maintaining

the muscle contraction played a crucial role in obtaining the effect.

However, the present findings also have some ambiguities. The main problem can be identified in the nature of the control group. In particular, it can be argued that the present effect may be due to the possibility that keeping a facial muscle contracted may have required nonspecific effort and attention that, therefore, could not be allocated to the photos. As a consequence, participants may have failed to note features of the targets that are relevant to generate a fame judgment. In other words, the possibility remains that the obtained effect in Experiment 1 may not be mediated by mental effort but by a reduced attention to the characteristics of the photos.

This, however, is not the mechanism we assume to be operating. Rather, we propose that corrugator contractions induce a feeling of mental effort that is used as a basis of judgment. As a consequence, it seems necessary to use a control group that resembles the experimental group in that it requires participants to engage in a facial contraction but at the same time differs from the experimental group in the quality of this contraction. In addition, reports of experienced mental effort should differ as a function of the quality of the expression, which should be assessed in a manipulation check.

Also, using a self-report measure to assess participants' success at completing the contraction task is problematic in at least two ways. First, the self-selection problem weakens the causal interpretation of the findings. Second, participants' assessments of their own success ratings may be determined by a third variable, which may be related to the dependent variable and thus ambiguate the interpretation of the results.

EXPERIMENT 2

We conducted a second experiment in which we used a biofeedback procedure to ensure that the corrugator contraction would be constantly maintained while generating the judgments. Specifically, by alerting participants to a decrease in their muscle tension, it was expected that the intensity of the induced feeling of effort would be maintained at a high level. To minimize participants' attention to the muscle contraction, participants were provided with acoustical feedback when the muscle activity decreased below a predetermined threshold.

In addition, we wanted to ascertain that the fame effect was not due to the possibility that the operation of two tasks (i.e., judgment and contraction) required more attention than the operation of one. Therefore, we used a control condition that involved the manipulation of a different facial contraction of the forehead, specifically the frontalis muscle, which raises the eyebrows.

Thus, participants were induced to contract either the corrugator or the frontalis muscle while generating fame judgments. In line with our previous reasoning, we expected that only furrowing the brow would induce the feeling of mental effort and reduce the fame assigned to the target persons.

Method

PARTICIPANTS

Twenty-three students from the University of Würzburg served as participants. They were paid DM5.00 (at the time U.S.\$3.57) for their participation.

EXPERIMENTAL DESIGN

The experimental design was a 2×2 factorial design with Target Fame (famous vs. nonfamous) and Facial Contraction (corrugator vs. frontalis) as factors. As in Experiment 1, contraction was manipulated between participants and fame within participants. Participants were randomly assigned to conditions.

PROCEDURE

After arriving at our laboratory, participants were told that we wanted to find out if computer work causes muscular tension. Therefore, it would be necessary to measure participants' muscle activity while performing several tasks at the computer. To measure their muscle tension, surface electrodes were placed on the skin over the corrugator muscle. Participants were then informed that while performing the computer tasks, they had to simulate tenseness by either furrowing their brow (contract the corrugator muscle) or by raising their eyebrows (contract the frontalis muscle). Participants were further instructed that because they might sometimes forget to simulate tenseness while performing the tasks on the computer screen, they would be reminded to contract the muscle whenever their muscle contraction fell below an individual baseline. At that time, participants were familiarized with the acoustical feedback signal. Afterward, individual electromyograph (EMG) baselines were assessed for both relaxation and contraction of the muscle that participants had to activate. To increase the credibility of the cover story, the effect of their individual muscle contraction was displayed to the participants on a separate computer screen.

Following the calibration of the feedback procedure, participants were instructed to judge the fame of the persons depicted on the computer screen. Similar to the procedure employed in the previous study, participants were exposed to portraits of either famous or nonfamous persons while contracting either the corrugator or the frontalis muscle.

The pool of pictures used in the previous study was extended by 12 pictures so that 8 photos of famous and

24 photos of nonfamous persons were presented. Each picture was presented for 15 seconds. Again, participants provided their answer on a 10-point rating scale ranging from 0 (*not at all famous*) to 9 (*famous*), which was presented on a separate screen. During the experimental trial, participants received an acoustical feedback signal whenever their muscle tonus fell below 80% of their individual contraction baseline.

Following this task, participants were instructed to relax their facial muscle and were asked to indicate on a 10-point rating scale how effortful their task had been (0 = *no effort at all* to 9 = *much effort*). Finally, participants had to indicate what they believed was the purpose of this study.

Results

MANIPULATION CHECK

Analysis of participants' ratings to the question concerning how much effort they expended on the task revealed that participants who furrowed their brow believed that their task was more effortful ($M = 3.64$) than did participants who raised their brow ($M = 2.25$), $F(1, 21) = 7.5$, $p < .02$. However, the average amount of acoustical feedbacks during the experimental session did not differ reliably between conditions ($F < 1$).

FAME JUDGMENTS

A 2×2 ANOVA with the factors Target Fame (famous vs. nonfamous) and Facial Contraction (corrugator vs. frontalis) was computed on participants' fame judgments.

In line with our hypotheses, both famous and nonfamous target persons were judged to be less famous if participants were asked to furrow their brow. As Table 2 reveals, contracting the corrugator muscle resulted in significantly lower fame judgments ($M = 3.6$) than did contracting the frontalis muscle ($M = 4.9$), $F(1, 21) = 6.4$, $p < .02$, for the main effect of muscle contraction. In addition and consistent with the results from the first study, participants were able to distinguish between famous and nonfamous people, $F(1, 21) = 53$, $p < .001$. Photos of famous persons were judged to be more famous ($M = 5.6$) than were photos of nonfamous persons ($M = 3.0$). No significant interaction was obtained ($F < 1$).

Discussion

This study replicates and extends the findings of the previous experiment. Controlling the muscle contraction using a biofeedback procedure revealed that furrowing the brow resulted in a tendency to judge persons to be less famous. In combination with the findings of Experiment 1, this suggests that the predicted judgmental effect will be obtained if the corrugator contraction is successfully maintained.

TABLE 2: Experiment 2: Fame Judgments as a Function of the Facial Contraction and the Fame of the Target Person

Facial Contraction	Target Person	
	Famous	Nonfamous
Corrugator		
<i>M</i>	4.8	2.4
<i>SD</i>	1.1	1.6
Frontalis		
<i>M</i>	6.4	3.5
<i>SD</i>	1.2	1.9

Moreover, because the contraction of the frontalis muscle did not have the same judgmental effect, the present findings suggest that the tendency to judge persons to be less famous is specific to the contraction of the corrugator muscle. This assumption is supported by the observation that independent of the conditions, participants received approximately the same frequencies of acoustical alerts for insufficient contractions. Therefore, both conditions seem to require the same amount of nonspecific effort and attention. In their subjective ratings, however, participants found the experimental task to be more effortful if they had to contract the corrugator muscle. This discrepancy between experiential and behavioral indices of effort may be due to the possibility that the match of the feeling with the task in the corrugator condition facilitated a corresponding attribution. In addition, this discrepancy supports the notion that the judgments of fame were not influenced by a nonspecific experience of effort that would deplete judges' attention but instead by a specific feeling of mental effort that served as a basis for the required judgments.

Replicating the results of the previous experiment, participants were able to distinguish between famous and nonfamous people. One might argue that feelings should be less likely to become the basis of the judgment if targets are known to be famous. However, the data of both experiments suggest that the expression of mental effort influenced judgments of famous and nonfamous targets to a similar degree. There are two reasons for this observation. First, fame judgments were not dichotomous and even famous people differ in the degree of their celebrity. It seems likely that the experienced effort was used to generate the specific fame rating even for targets known to be famous. The fact that the famous people were not assigned the most extreme values of the scale ($M = 5.6$ on a scale from 0 to 9) supports this interpretation. The second reason lies in fact that the experimental manipulation was not meant to intensify but to attenuate fame judgments. Thus, because of scale boundaries, stronger attenuation effects should be obtained for targets further away from the lower end of

the response scale, that is, for moderately famous targets. Of course, a potential floor effect for the nonfamous targets was partly produced by including pictures of famous persons, which may have caused the fame scale to be anchored differently (Upshaw & Ostrom, 1984).

As another possible explanation for the present findings, one might speculate that the contraction of the corrugator muscle may have elicited affect, which served as a mediating mechanism. In fact, Larsen et al. (1992) found that the unobtrusive contraction of the corrugator muscle induced feelings of sadness, and it is conceivable that concomitant negative affect might reduce judgments of fame. However, evidence by Forgas, Bower, and Moylan (1990) suggests that sad individuals tend to over-emphasize the achievements of others, which would be more likely to result in the opposite effect, namely, higher fame ratings. Also, in the study described above, Stepper and Strack (1993) have not only found that participants who contracted the corrugator muscle while recalling assertive behaviors described themselves as less assertive but they also observed that recalling nonassertive behaviors while contracting this muscle led to more assertive self-ratings. Whereas the first result also can be explained by invoking mechanisms of mood-congruent judgment, the second influence is mood incongruent and cannot be explained by affective influences.

CONCLUSIONS

The present findings support the assumption that the expression of mental effort may intensify its experience and influence judgments of fame. In two experiments, furrowing the brow diminished the fame ascribed to both famous and nonfamous persons. Thus, in line with Jacoby et al. (1989), our results provide evidence that individuals may use their concurrent subjective experience to generate fame judgments. Jacoby et al. (1989) found that the persons designated by nonfamous names were judged to be more famous when the ease of processing was enhanced by a previous exposure. In contrast, we demonstrated that a different subjective experience can have the opposite effect on fame judgments. In particular, the feeling of effort seems to reduce the experience of familiarity and make targets appear to be less famous.

Our results are consistent with previous findings in demonstrating proprioceptive influences on judgments (Stepper & Strack, 1993; Strack et al., 1988). Thus, our findings can be taken as further support for the facial-feedback theory, which holds that feelings can be brought about by the manipulation of facial expressions and that these feelings can become the basis of judgments, be it the funniness of cartoons, one's own assertiveness, or the fame of other people. However, there is

one alternative explanation that may account for the obtained findings and cannot be refuted by the present data. In a recent series of experiments, Förster and Strack (1996, 1997) found evidence that the compatibility of a motor action and a thought content may facilitate mental processing, whereas their incompatibility may have an inhibiting effect. In one of their experiments, participants were better at encoding positive words when they were induced to nod and better at encoding negative words when they were induced to shake their head. On the basis of additional data using a dual-task procedure, Förster and Strack extended James's (1890) ideo-motor principle and argued that fewer attentional resources are required if motor actions are performed that are associated with a cognitive activity (e.g., nodding while agreeing) than if the motor action is associated with the negation of a cognitive content (e.g., nodding while disagreeing). Applied to the present paradigm, furrowing the brow also can be seen as an expression of doubt and disbelief, and it is possible that the process of assigning fame to a target is inhibited, whereas the expression of doubt is upheld. To juxtapose both approaches and to decide if bodily expressions influence cognition more through a phenomenal experience or through the facilitation/inhibition of the required mental task may be a stimulating challenge for future research.

NOTE

1. The famous persons were Arabella Kiesbauer, Olaf Ludwig, Günther Jauch, Götz George, Manfred Schmittbauer, and Monika Weimar.

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