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SENSITIVITY TO DISGUST AS AN INDICATOR OF NEUROTICISM: A PSYCHOBIOLOGICAL APPROACH

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Summary—This study was conducted to confirm previous questionnaire data claiming higher sensitivity to disgust in neurotics, by an experimental approach. Biological variables which had previously been demonstrated to reflect stress (salivary cortisol) and/or emotional lability (secretory immunoglobulin A = sIgA) were used as markers for reactivity to induced feelings of disgust. Thirty-two healthy male subjects were randomly assigned to an experimental group (induction of disgust) or a control group. Selected sequences of the German movie *Die Blechtrommel* were used to induce disgust while subjects in the control condition were exposed to neutral movie sequences in a matched order. At defined time points ratings on emotional states as well as saliva samples for determination of sIgA and cortisol were obtained. Subjects were divided into high and low neurotics (N+/N−). The results clearly demonstrate that the movie sequences induced feelings of disgust. However, N+ could not be identified as high responders by questionnaire data. With respect to biological responsiveness, marked reductions in sIgA were observed in both groups. However, N− returned to baseline levels within 10 min, whereas in N+ decreased secretion rates of sIgA were observed until the end of the experiment. For cortisol no changes could be observed in either group. The results are discussed with respect to a reduced ability to recover or re-adapt in subjects high in neuroticism. Copyright © 1996 Elsevier Science Ltd.

INTRODUCTION

Feelings of disgust were described as a fundamental emotion because disgust has distinct and specific neural substrates: a typical facial expression and a biological and evolutionary meaning (Izard, 1991). Interestingly, the emotion of disgust should protect the organism from contaminated food or toxic substances. The facial expression of disgust clearly induces spitting or other motor responses in order to reject food (Rozin & Fallon, 1987). Even a newborn baby shows a spitting reflex when a bitter substance is put on the top of his tongue. Therefore, the emotion of disgust seems to be genetically determined and not acquired during later life. An experimental investigation of disgust within the context of personality psychology seems to be promising because feelings of disgust are restricted to states and therefore may clearly be separated from the personality trait under investigation. In contrast to anxiety which is more frequent in *Ss* high in trait anxiety, feelings of disgust cannot be related to a trait of disgust, since this does not exist. However, the question of higher sensitivity to disgust with respect to neuroticism was investigated in a paper by Haidt and coworkers (Haidt, McCauley & Rozin, 1994) and served as the stimulus to investigate sensitivity to disgust by an experimental approach.

In the paper mentioned it could be demonstrated that neuroticism was positively correlated with the score on a very carefully designed scale of disgust. Furthermore, negative correlations were reported with psychoticism and sensation seeking (Haidt *et al.*, 1994). However, since *Ss* high in neuroticism (N+) are characterized by a higher readiness to use the whole range of Likert or analogue scales and therefore may show non-specifically high scores on disgust as well, the question of higher sensitivity to disgust in N+ should be confirmed by experimental data using objective biological measures of responsivity.

Since the induction of disgust will mostly be perceived as a mild emotional stressor, it is meaningful to include the measurement of cortisol as a biological response marker. As early as 1968 Mason had demonstrated that especially mild emotional stress was suitable to activate the hypothalamus–pituitary–adrenal axis which leads to increases in cortisol concentrations (Mason, 1968). Meanwhile

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several hundred studies demonstrated that stress leads to elevated cortisol concentrations and, furthermore, measurement of salivary cortisol has been established as a reliable and valid parameter in psychoneuroendocrinology (Kirschbaum & Hellhammer, 1994). The biological meaning of the facial expression of disgust can be described as a motor *line of defense* of the upper respiratory and gastrointestinal tract. In this respect there is an interesting analogy to immunoglobulin A in saliva which also has been characterized as a 'first line of defense' for the same area (Tomasi, 1972). Based on this analogy and the fact that secretory immunoglobulin A reflects mood (Stone, Cox, Valdimarsdottir, Jandorf & Neale, 1987), stress (e.g. Jemmott & Magloire, 1988; McClelland, Ross & Patel, 1985; Hennig, Rammsayer, Bahner, Brück & Netter, 1991) and has been shown to be correlated with neuroticism (Hennig, 1994) measurement of sIgA as a possible second biological marker of responsivity to disgust seemed to be justified.

The following question should be answered:

> Is the tendency of N+ to be more sensitive to disgust also present in an experimental approach, and is there evidence that biological indicators to experimentally induced disgust are more pronounced in subjects high in neuroticism than in low scorers?

METHOD

Subjects

Prior to the start of the experiment *Ss* were asked to fill in a questionnaire on health status and related behavior. This health report was essential because a couple of exclusion criteria were suspected to lead to artifacts with respect to cortisol and sIgA. Therefore, *Ss* reporting any hormonal, immunological, psychiatric, or neurological diseases were excluded. Furthermore, cigarette smoking, frequent alcohol consumption and intake of drugs led to a rejection of the *S*. Furthermore, *Ss* had to report whether they met the dentist within the last 24 h. The reason was that both cortisol and sIgA concentrations are extremely biased if blood contaminates the saliva samples. For the same reason *Ss* who were suspected to have blood in saliva were also rejected from the final sample. The final sample comprised 32 healthy male volunteers who were randomly assigned to an experimental group (induction of disgust) and a control group. The mean age of the groups was 24 ± 4.3 y. Most of the participants were students (psychology). After the experiment *Ss* received a certificate that they had participated in an experiment, which is necessary to apply for the first exam.

Stimuli to induce disgust

Prior to the experimental session selected sequences of the movie *Die Blechtrommel* directed by Volker Schlöndorff were rated by experts on the dominant emotion they induced. The sequences were selected according to their liability to elicit disgust and therefore all of them refer to 'oral intake' directly or indirectly. All raters described the following four sequences chosen for the main experiment as eliciting a high extent of disgust:

1. Oskar (that is the central figure in the story), his parents, and the friend of his mother walk on the beach. A fisherman tries to fish eels with the head of a horse by dipping it into the water. The fisherman then catches the eels which had attached themselves to the head of a horse and put them into a sack. Oskar's mother vomited.
2. Oskar and his girl friend are lying in bed. He takes a piece of sherbet sweet out of his pocket and puts it in her hand. He then spits on it, it starts to foam and his girl friend puts it in her mouth.
3. A couple of children are 'cooking' a soup. Some put in it living frogs, other urinate into the soup. Then the children try to catch Oskar and force him to drink the soup.
4. Oskar's mother opens a box with fish and eats them with her fingers. She puts her fingers deep into her mouth. She is then observed eating whole fishes from a huge barrel.

Experimental design

Since no movie contains *only* disgusting sequences we decided to cut the above mentioned sequences and to embed them into other (neutral) movie sequences to induce the emotion disgust

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