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Development and validation of the Food Disgust Picture Scale

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ABSTRACT

The present set of studies developed and tested the Food Disgust Picture Scale (FDPS). This is a tool for the assessment of food disgust sensitivity that will measure disgust and predict possible reactions. This eight-picture tool can be used in complement to or as a replacement for currently available text-based measures. In an exploratory Study 1 ($N = 57$), we constructed a scale consisting of eight pictures. Most of them were taken from validated picture databases. They proved powerful in the assessment of food disgust sensitivity. Study 2 built on these results and refined the scale by substituting pictures from Study 1 with freely available images displaying similar content. The basic structure of the FDPS was then replicated in a bigger sample of Swiss adults ($N = 538$). Correlational analyses using the eight-item Food Disgust Scale (FDS short), the revised version of the Disgust Scale (DS-R), and the food neophobia scale (FNS) supported the convergent validity of the FDPS. In Study 3 ($N = 226$), we used a test-retest design to demonstrate the short-term stability of the FDPS. As a result of these studies, the present work provides a short and comprehensive measure of food disgust sensitivity. This novel approach of using pictures to induce a disgust response independently of language significantly facilitates intercultural research on disgust. The FDPS will further contribute to the understanding of food-related disgust and its impact on our food choices.

1. Introduction

Disgust is more than the feeling of nausea when a pungent smell hits our noses (Miller, 1997). It is one of our basic human emotions and was already recognised and described as such by Charles Darwin (1872). It has been reasoned that disgust originated from the rejection mechanism governed by taste perception, known as distaste, which protects the body by discouraging ingestion of bitter tastes often associated with the presence of toxins (Chapman & Anderson, 2012; Rozin & Fallon, 1987). From this early definition of disgust as disease-avoidance emotion, the understanding of disgust has evolved and is now seen as mechanism that helps to regulate behaviour in social and interpersonal situations (Tybur, Lieberman, & Griskevicius, 2009). The emotion is also triggered by culturally and morally unacceptable behaviour and thereby affects social attitudes (Davey, 2011; Haidt, Mccauley, & Rozin, 1994). This multifaceted nature of disgust makes it a difficult construct to capture as a whole. The aim of the present work was to develop a short and comprehensive eight-picture tool for the assessment of food-specific disgust. The scale was developed in three steps. First, items were developed based on currently available theories of disgust (e.g., Hartmann & Siegrist, 2018; Olatunji et al., 2007; Rozin & Fallon, 1987). Second, these items were analysed for their suitability and performance, and the scale was shortened and refined. In a third and final step, the newly developed scale was tested for construct validity including test-retest reliability.

Disgust, in its most basic form, is seen primarily as a food rejection mechanism (Chapman & Anderson, 2012). Thus, it is not surprising that it plays a role in our eating behaviour. Disgust was found to be closely related to food neophobia, a food behaviour where food items are rejected mainly due to their unfamiliar nature (Fessler, Arguello, Mekdara, & Macias, 2003; Hartmann & Siegrist, 2018). Furthermore, research suggests that even non-spoiled food can provoke a disgust reaction (Eickmeier, Hoffmann, & Banse, 2017) and that the emotion of disgust influences the way we handle and consume food (Hartmann & Siegrist, 2018; Pellegrino, Crandall, & Seo, 2015). These findings give us a glimpse of the impact that food disgust might have on our everyday lives. It is likely that a better understanding of the mechanisms underlying food disgust will not only pave the way for a better understanding of food avoidance behaviour but also help predict people's food

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choices and encourage acceptance of newly developed products.

The first specific measure of food disgust sensitivity was only introduced recently. The Food Disgust Scale (FDS, Hartmann & Siegrist, 2018) uses text-based items to assess an individual's food disgust sensitivity. Unlike other scales that include exotic foods such as monkey meat (Olatunji et al., 2007; Schienle, Walter, Stark, & Vaitl, 2002), the FDS focuses on food-related items associated with spoilage, hygiene, or contamination. It contains 32 items that describe food-related situations or products across eight subscales. These subscales include animal flesh, poor hygiene, human contamination, mould, decaying fruit, fish, decaying vegetables, and living contaminants. Specifically, these include ageing foods such as an apple slice that has turned brown or brown-coloured avocado pulp and potentially harmful foods, for example bread from which mould has been cut off, a steak that is still bloody inside, or raw fish, such as sushi. Items also cover human contamination (a friend bites into my bread) and poor hygiene (another person's hair in my soup) (Hartmann & Siegrist, 2018).

The use of text to elicit disgust has advantages and disadvantages in comparison to pictures. First of all, it has to be noted that the integrated model of text and picture comprehension (Schnotz & Bannert, 2003) suggests that comprehension of text requires a different cognitive processes than the comprehension of pictures. According to this model, text comprehension is a descriptive process including text processing, construction of a text surface representation, production of several propositional representations of the text content, and the formation of a mental model. In comparison, picture comprehension is a depictive process including the perception of an external picture, creation of a visual image thereof, and construction of the picture's propositional representation and mental model. The two processes have in common that they both require the reader to encode the information that is provided (Jian & Ko, 2017). Second, the use of text allows for a detailed description of an object's past and present. It is therefore possible to describe in detail how a food item was produced or handled. If, however, a participant looks at a picture of a food item, the object's past remains a subject to the participant's interpretation. Third, the use of textual information across various countries requires translation. Schienle et al. (2002) demonstrated that simply translating the English version of the questionnaire by Haidt et al. (1994) into German turns the scale into an unreliable measure for the emotion of disgust. We therefore believe that the combination of both a text-based and a picture-based measure allows for a more comprehensive assessment of people's disgust sensitivity.

In the present set of studies, we developed a food-specific disgust scale that uses images to induce disgust. Through the use of pictures, we aim to circumvent the limitations of text-based tools and to provide a measure that complements a text-based scale or that can be used as an alternative. In the following, three studies are presented that provide a comprehensive assessment of the Food Disgust Picture Scale (FDPS) and its factor structure. For these studies, we used independent Swiss adult samples. In the first study, we used an exploratory approach to collect pictures suitable for the assessment of food disgust sensitivity. In the second study, the knowledge we gained in Study 1 was used to refine the tool. Convergent validity of the FDPS was then assessed by comparing it to previously established measures of food disgust sensitivity, general disgust sensitivity, and food neophobia. In the third study, the short-term stability of the FDPS was determined in a test-retest design.

2. Study 1: scale construction

The first aim of this study was the selection of food-related pictures that possessed the ability to evoke disgust. The second, overarching aim of this first study was the development of a short and one-dimensional picture scale that measures participants' disgust sensitivity.

2.1. Method

2.1.1. Participants

Data for this exploratory study were collected in 2016 in Switzerland. The link to an online survey was sent to a convenience sample via e-mail. This sample included people across different age groups that were known to the authors but had no connection to the research project. Four participants were excluded due to incomplete data. The final sample contained 57 people (35 female, 22 male) with an age range from 19 to 80 ($M = 31.89$, $SD = 12.53$). The minimum survey duration was more than half the median of the total survey duration. Therefore, none of the participants were excluded due to answering the questions too quickly (e.g., Hartmann, Keller, & Siegrist, 2016).

2.1.2. Food Disgust Picture Scale

Pictures were collected from various sources, including online services providing open-source images (pixabay.com), online services selling pictures (istock.com), and validated picture databases (Blechert, Meule, Busch, & Ohla, 2014; Foroni, Pergola, Argiris, & Rumiati, 2013). Following a review of the existing literature (Blechert et al., 2014; Foroni et al., 2013; Hartmann & Siegrist, 2018), a pool of 36 food pictures covering a wide range of disgust-eliciting cues was gathered. These cues included hints of decay (rotting food), contamination (handling raw meat with bare hands, painted nails, and wearing rings), mould, or animal reminder (prawns with head and tail, whole chicken). For control purposes, we included four non-disgusting pictures (a slice of a watermelon, a strawberry, spinach leaves, and raisins, picture references NF_006, NF_037, NF_094, and NF_096, Foroni et al., 2013). We chose unprocessed natural food items to make sure that there were no hygiene concerns. The final selection then comprised 40 food pictures. Participants were asked to rate each of these pictures on a scale from 0 (not disgusting at all) to 100 (extremely disgusting). The introductory text to each picture was "Closely look at this picture. Imagine, you were asked to consume this food item. Please indicate how disgusting you perceive this item to be. Please answer intuitively, there are no right or wrong answers." Participants gave their answers on an interactive slider as depicted in Fig. 1. The instructions to each question read "Click on the slider to give your answer. Subsequently, a cursor will appear. You can move this cursor along the slider."

2.1.3. Food Disgust Scale

The short version of the Food Disgust Scale (FDS short, Hartmann & Siegrist, 2018) measures sensitivity to potential disgust eliciting food-related stimuli (animal flesh, poor hygiene, human contamination, mould, decaying fruit and vegetables, fish, and living contaminants) and can be used as a measure of food-specific disgust sensitivity. The short version of the scale consists of eight items describing scenarios which the participant is asked to rate on a scale from 1 (not disgusting at all) to 6 (extremely disgusting).

2.1.4. Procedure

The survey was conducted using the online survey tool Unipark (Management Questback GmbH, Germany) and its total duration was around ten minutes. First, participants were asked to answer socio-demographic questions. Second, participants had to fill in the FDS short. Third, participants were presented with the 40 selected food pictures. Picture order was randomised to prevent order