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The relationship between disgust, state-anxiety and motivation during a dissection task

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ABSTRACT

Emotions influence motivation, but emotions, such as disgust, have attracted less attention in learning research. We assessed the influence of disgust measured as trait and specific state component, state anxiety and self-efficacy on intrinsic motivation during the dissection of a fish using a pre-/post-design in science teacher students. Anxiety and disgust had a negative influence on motivation. Students with more experience in dissections reported lower pressure. Anxiety after the lesson was influenced by prior anxiety and by animal reminder disgust. Specific state disgust after the dissection was predicted by prior specific state disgust, core disgust and state anxiety. State anxiety and specific state disgust decreased during the dissection. The future commitment to use dissection at school was solely predicted by interest; competence and pressure failed the significance level marginally.

1. Introduction

Within an academic setting, different emotions can be experienced (Pekrun, Goetz, Titz, & Perry, 2002) and the importance of understanding these emotional processes is rapidly growing (Alsop & Watts, 2003). Emotions may significantly influence intrinsic motivation (Bergin, 1999; Krapp, 2005) and achievement (Gläser-Zikuda, Fuß, Laukenmann, Metz, & Randler, 2005; Randler & Bogner, 2007). Also, motivation – as well as self-efficacy – and enjoyment are positive predictors of achievement in science (Areepattamannil, Freeman, & Klinger, 2011). Apart from studies that showed an important influence of interest on the level of learning, academic performance and the quality of learning experience (Hidi & Renninger, 2006; Randler & Bogner, 2007; Schiefele, Krapp, & Schreyer, 1993), other emotions have attracted less attention (e.g., boredom: Pekrun, Götz, Daniels, Stupnisky, & Perry, 2010), and therefore, Pekrun, Goetz, Frenzel, Barchfeld, and Perry (2011) suggested measuring additional academic emotions and these authors developed a questionnaire to assess enjoyment, hope, pride, relief, anger, anxiety, shame, hopelessness, and boredom during class.

Apart from these academic emotions (Gläser-Zikuda et al., 2005; Pekrun et al., 2011), disgust may also be an important emotion with a negative influence on motivation. This could be particularly relevant in science or biological education, for instance during dissection (Holstermann, Grube, & Bögeholz, 2009) or when encountering living animals, both within the classroom (Hummel & Randler, 2012) and outside during fieldwork (Bixler & Floyd, 1999; Randler, Ilg, & Kern, 2005). Although disgust seems to be an important negative emotion, there are only very few studies discussing its impact on motivation or achievement in learning settings (see discussion in Bixler & Floyd, 1999; Holstermann et al., 2009; Randler et al., 2005). Few studies addressed the influence of disgust on educational outcomes: Bixler and Floyd (1999) found that pupils from a middle school who expressed the lowest interest in activities that required manipulation of organic substances had the highest disgust-sensitivity scores. In contrast, they found no differences for activities that required observation only. They suppose that manipulation may include the possible contact with disgusting animals, and that this disgust may reduce interest in the given activity. Randler et al. (2005) showed that children with higher level of anxiety for amphibians had significantly lower knowledge scores than those who felt less anxious. Holstermann et al. (2009) reported that participants who felt more disgusted saw themselves as less effective at mastering the dissection of a pig's heart and these participants reported lower interest. These studies suggest a strong negative influence of disgust on motivation suggesting that the emotion of disgust significantly influences learning efforts.

In biological and psychological terms, disgust is a basic negative emotion related to avoidance of certain animals, ill humans, feces, vomit, sexual substances and other harmful events (Rozin, Haidt, & McCauley, 2000). Disgust is an emotion that is adaptive in evolutionary terms — it reduces the probability of transmission of infectious diseases and helps to avoid contamination with harmful substances (Curtis, Aunger, & Rabie, 2004; Oaten, Stevenson, & Case, 2009;

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Prokop, Fančovičová, & Fedor, 2010; Prokop, Uşak, & Fančovičová, 2010; Tybur, Lieberman, & Griskevicius, 2009). The emotion consists of both a trait and a state component (Petrowski et al., 2010; Tolin, Woods, & Abramowitz, 2006). Conditioning disgust is easy despite an inter-personal sensitivity towards this emotion (e.g. Schaller & Duncan, 2007), and it seems resistant to conventional changes (see Curtis & Biran, 2001 for discussion). Disgust and fear were often addressed in the framework of phobias (Choplin & Carter, 2011; Haidt, McCauley, & Rozin, 1994; Mulkens, de Jong, & Merckelbach, 1996). In education, different authors tried to reduce disgust and/or fear, e.g., when encountering living animals (Killermann, 1996; Randler, Hummel, & Prokop, 2012) or to improve attitude and interest gain (Tamir & Shcurr, 1997). Survey studies on animal preferences and on disgust revealed interesting results that were often in accordance with a biological basis, e.g., students dislike spiders or snakes, which may be a consistent effect across different cultures, but with some subtle differences. In areas where spiders may pose a threat to health, these animals are rated as more fearful (Prokop, Tolarovičová, Camerik, & Peterková, 2010). Apart from spiders and snakes, other species were also often rated as negativistic, e.g. bats, and this might be related to aspects of fear and phobia and beliefs in myths (Knight, 2008; Prokop, Fancovicová, & Kubiatko, 2009). Further, in pre-service teachers, Wagler (2010) reported an association between pre-service teacher's attitudes towards a specific animal and the likelihood to include this species in their future science curriculum. This can be interpreted as the willingness to take action.

Dissection of animals in the classroom, both during University and secondary education, is still considered as a useful tool for teaching, although declarative knowledge is equal in alternative treatments, e.g., by using video instruction or virtual dissection (De Villiers & Monk, 2005; Dewhurst, 2004; Strauss & Kinzie, 1994), and De Villiers and Monk (2005) further emphasize that not all learners in biology should carry out dissection when alternatives may be perfectly adequate. However, apart from cognition, other aspects are also relevant in science education, such as emotions and methodological skills, and this is one central aspect why dissection is still present in science classrooms (Lord, 1990). Seventy nine percent of teachers in an American survey used dissection to teach biology. Further, 31% believed that alternatives were as good as dissection for teaching anatomy and physiology, 55% disagreed, and their primary reason was the hands-on aspect of dissection (69%; King, Ross, Stephens, & Rowan, 2004). With respect to students, they recognize the interest and educational value of animal uses such as dissection, while they disapprove the killing of animals for this purpose (Donaldson & Downie, 2007). Further, they recognize the ethical distinction between observing live animals (maggots), dissecting abattoir by-products (sheep heart and lungs) and dissecting animals bred and killed especially for student use (rats; Donaldson & Downie, 2007). Bowd (1993) reported that students mentioned a larger variety of negative responses to dissection in comparison with neutral and positive. Another retrospective study reported 27% negative, 36% mixed and 37% positive responses (De Villiers & Sommerville, 2005). These studies suggest that negative emotions may have an influence on motivation, and that they should be surveyed immediately after performing a dissection task. This has not been done previously with the exception of Holstermann et al. (2009) carrying out a state measurement 5 min after the dissection started.

In this study, we assess the influence of disgust (measured as trait and specific state component), anxiety and self-efficacy on motivation. Disgust and fear towards specific animals have been under research, usually by survey studies (Prokop, Fančovičová, & Fedor, 2010; Prokop, Özel, & Uşak, 2009; Prokop, Tolarovičová, Camerik, & Peterková, 2010; Prokop & Tunnicliffe, 2008; Prokop, Uşak, & Fančovičová, 2010), but here we used an experimental and controlled approach based on a specific dissection task with a pre-/post evaluation. We hypothesize that anxiety and disgust (both as a trait and a specific state measurement) might have an influence on motivation. Further, post examination of disgust and anxiety should be influenced by a prior measurement of these variables. We included self-efficacy as it is supposed to have an influence during a dissection task (Holstermann et al., 2009), and we applied standardized measures of anxiety because we assume that anxiety is an influential predictor, that has not been assessed in this respect but in other contexts.

2. Material and methods

2.1. Instruments

2.1.1. Intrinsic motivation

We used a short scale for measuring intrinsic motivation (KIM; Wilde, Bätz, Kovaleva, & Urhahne, 2009), which is based on the Intrinsic Motivation Inventory (IMI; Deci & Ryan, 1985). Our educational program at the University (the module zoology) is largely based on the motivational theory of Deci and Ryan (1985), thus we used instruments from this theory to assess motivation. The intrinsic motivation contains four dimensions: interest/enjoyment, perceived competence, perceived choice, and pressure/tension. Every dimension was assessed with three items each (all positively coded; 1–5 point Likert scale). The German version is a valid and reliable instrument (see Wilde et al., 2009). The reliabilities (Cronbach's alpha) of the subscales of the present samples were: interest: 0.89, competence: 0.90, choice: 0.89, pressure/tension 0.80.

2.1.2. Trait and specific state disgust

Disgust was measured as a trait variable with 37 items prior to the treatment based on three domains: core disgust (15 items), animal reminder disgust (9 items) and contamination disgust (13 items). All items are five-point Likert scaled and the participants have to respond how disgusting they assess the different questions. We used the German version of the scale which has good psychometric properties (Petrowski et al., 2010). The reliabilities of the present sample are core disgust 0.77, animal reminder disgust 0.85, and contamination disgust 0.74. In addition, we developed a specific state disgust scale related to the dissection of the rainbow trout (see Table 1). The scale had a reliability of 0.79 (pre) and 0.84 (post). The development was necessary because there were no available scales for this specific topic.

2.1.3. State anxiety (STAI-S)

State anxiety was measured immediately before and after the dissection task with a scale sensitive towards changes (STAI-S; Laux, Glanzmann, Schaffner, & Spielberger, 1981). The items are four-point Likert scaled and 10 items are positively and 10 items are

Table 1
The 'specific state disgust scale'. Inter-item correlations are shown.

	SDS1	SDS2	SDS3	SDS4	SDS5	SDS6
If I would get served a whole trout (including head and eyes) in a restaurant, I would not be able to eat a thing. (SDS1)	1.000					
Trouts are disgusting. (SDS2)	.595	1.000				
I don't mind touching a trout. (reverse coded) (SDS3)	.214	.311	1.000			
I would rather leave the room when we dissect a trout. (SDS4)	.433	.626	.362	1 .000		
Trouts are beautiful animals. (reverse coded) (SDS5)	.409	.568	.312	.355	1.000	
The trout's mucus nauseates me. (SDS6)	.440	.606	.281	.601	.431	1.000
During trout dissection, I would rather use a nose clip to avoid the smell. (SDS7)	.521	.615	.345	.647	.394	.576