



Humor Reduces Anxiety and Disgust in Anticipation of an Educational Dissection in Teacher Students

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•Received 08 February 2016 •Revised 15 February 2016 •Accepted 15 February 2016

Dissections of human organs and animals are an important part of medical and science education but students usually express negative emotions towards dissections. Some studies show a negative influence of disgust and anxiety on motivation, interest and achievement. Therefore, reducing anxiety and disgust should be an important aim. As humor can lead to lower anxiety in medical settings, we hypothesize that a kind of humor treatment prior to an educational dissection of fish may also lead to a lower anxiety and lower disgust. We used humorous video clips before the dissection and compared them with a control video of the life history of the fish (trout). A total of 49 University students received the treatment with the humor video clips and 65 the life-history video. We measured state anxiety and disgust prior to the treatment and after the film treatment. The treatment with humorous video clips reduced anxiety and disgust compared to the control group with the life-history film. Although this study has been carried out in dissection of an animal in teacher students, we believe that these results can be generalized and transferred into other parts of dissection, such as cadaver dissection of humans in medical education.

Keywords: anxiety, disgust; dissection, STAI-S, science education

INTRODUCTION

Dissections of humans and animals are an important part of both medical education and science education but students usually express negative emotions towards dissections, such as anxiety, stress, disgust or negative affect (see, e.g., Holstermann, Grube, & Bögeholz, 2009; Randler, Hummel & Wüst-Ackermann, 2013; Randler, Demirhan, Wüst-Ackermann, & Desch, 2016). The main goal of this study was to reduce the negative emotions disgust and anxiety by an experimental intervention – we used humorous video clips before the dissection and compared them with a control video of the life history of the fish (trout). Our research was informed by medical studies that showed that humor could enhance well-being and by studies about humor in educational settings.

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doi: 10.12973/ijese.2016.329a

Background

Humor to enhance well-being

There are many studies in the medical domain suggesting that humor in different forms increases well-being and decreases anxiety on a short-term basis. For example, short-term effects have been found during preparation for surgery, such as anesthesia (Mifflin, Hackmann, & Chorney, 2012) or in pre-operative clown interventions in children (Dionigi, Sangiorgi, & Flangini, 2014; Vagnoli, Caprilli, & Messeri, 2005, 2010), which resulted in reduced anxiety levels. On a long-term basis, humor (watching funny videos) was found to reduce levels of psychopathology, anger, anxiety, and depression symptoms in psychiatric inpatients over a longer period of some months (Gelkopf, Gonen, Kurs, Melamed, & Bleich, 2006). Higher pain tolerance after the viewing of a humorous film - compared to control groups - has been found by Weisenberg, Raz and Hener (1998). Also, viewing a humorous film may be useful in the treatment and study of bronchial asthma (Kimata, 2004).

Concerning psychological studies, Szabo, Ainsworth and Danks (2005) compared the effects of aerobic exercise, humor, and music on state anxiety of healthy women. In all cases, a decrease in state anxiety was measured, but was highest after the humor session, followed by music and exercise. Similarly, a humor treatment after a stressful situation (video) successfully reduced anxiety and raised positive affect compared to a control group (Cann, Holt, & Calhoun, 1999). Another study, also based on anxiety and affect revealed an overall greater benefit from viewing a humorous video versus a non-humorous video, which resulted in a reduction in state anxiety and an improvement in positive affect under both low and high stress (Abel & Maxwell 2002). These studies, therefore, suggest that humor may reduce anxiety levels.

Humor in educational settings

Different strands of research have been employed in educational settings. Concerning recall and memory, Suzuki and Heath (2014) investigated the interactions between humor and relevance in recall and recognition performance. Subjects were given humorous or serious video examples that were either relevant or irrelevant to lecture materials. These authors reported that recognition performance was better when examples were humorous and relevant to the lecture materials. However, recall performance was not. They further suggest the use of humorous relevant video examples for teaching. In emotionally challenging teaching situations, such as sexual education, humor can also play an important role. Allen (2014) reported that humor serves purposes such as consolidating heterosexual masculinities, securing peer group hierarchies and disrupting learning agendas, but it may be also pedagogically relevant to lower monotony or to reduce apprehension around potentially uncomfortable topics, such as sexuality. Jonas and Bradley (2013) suggest the use of humorous, short videos as a new teaching technique called "videagogy": this allows students to select video content themselves and is related to self-directed learning of students.

Concerning test anxiety, Ford, Boxer and Armstrong (2012) exposed students to humorous material prior to a difficult math test. Participants who were exposed to funny cartoons performed better on a math test compared to participants exposed to non-humorous poems or nothing at all. Humor lowered test anxiety, which in turn lead to a better performance in the math test. In another study, Ford, Ferguson, Brooks and Hagadone (2004) found that women higher in coping sense of humor, performed better in an examination because they felt less anxious while taking a

test. Some studies tried to analyze the differences between humorous and serious versions of the same test content (Smith, Ascough, Ettinger & Nelson, 1971; Berk & Nanda 2006; Perlini, Nenonen & Lind 1999). Smith et al. (1971) supported the hypothesis that exposure to humor may reduce anxiety and thereby affect task performance. Berk and Nanda (2006) found that humorous directions had a statistically significant impact on constructed-response item performance for a test in descriptive statistics, but anxiety predicted test performance with about 21% of variance explained. In contrast, Perlini et al. (1999) stated that the influence of humorous test items seems overstated.

Emotions in education

Anxiety

Anxiety is defined as an organism's preparatory response to contexts in which a threat may occur (Cisler, Olatunji, & Lohr, 2009). Therefore, anxiety can produce physiological responses, for example, an increased heart rate variability or stress hormone secretion, and in natural situations, anxiety is adaptive (Weinberger, Schwartz, & Davidson, 1979). There is a bulk of research of anxiety in educational settings, but rarely related immediately to learning and instruction in an experimental way, particularly in science and medical education. Apart from test anxiety which can be found in all subjects (Zeidner, 1998), anxiety is also an important emotion in science education, for example, during dissection of animals (Holstermann et al., 2009; Randler et al., 2012). Anxiety has been reported, e.g., in medical students in different settings such as breast inspections (Pugh & Salud, 2007) and anatomy (Boeckers et al. 2010). Randler et al. (2012) reported correlations between anxiety and motivation. They found interest and competence during a dissection being positively correlated with low anxiety, while high pressure/tension was predicted by high anxiety.

Anxiety, therefore, is an adaptive emotion in biological settings (e.g., when animals have to flee from a predator), but counter adaptive in educational settings such as dissection. We, therefore, view anxiety as negative for an educational intervention and want to reduce anxiety by the means of videoclips to improve learning for students.

Disgust

Disgust is a basic human emotion which is considered to be part of the human behavioural immune system (Curtis, Aunger, & Rabie, 2004). Disgust is also a basic negative emotion in biological and medical education. Randler et al. (2013) asked their students for disgust ratings immediately after the respective lessons (state-approach) and they found that the dissection of a fish elicited highest disgust responses. Holstermann et al. (2009) found that participants who felt more disgust were less effective during the dissection. Randler et al. (2012) based their study on fish dissection and found that interest and competence were positively predicted by low disgust and low anxiety, and high pressure/tension was predicted by high disgust and anxiety. In the specific situation of dissection, disgust is not helpful because the negative emotion hinders learning and performance of students. Although it is an adaptive response, for example in situations where disgust prevents from eating rotten food, it is negatively related to motivation and achievement (Randler et al., 2012). Thus, reducing disgust in this particular context may help students to focus more on the dissection task rather than being "loaded" with some kind of "emotional load".

Dissection in education

Dissection of animals or their organs in University and at school is considered as a useful tool for learning and instruction. However, some studies reported that declarative knowledge may be even better when alternatives to dissections were taught (e.g., video instruction, virtual dissection; DeViliers & Monk, 2005; Dewhurst, 2004; Strauss & Kinzie, 1994), and some science educators suggested that not all learners in biology should carry out dissection when alternatives may be available and adequate (DeViliers & Monk, 2005). However, in addition to cognitive aspects, methodological skills are also an important part in education (Lord, 1990). In an American survey, 79% of the teachers used dissection to teach biology and only 31% believed that alternatives were as good as dissections. The main reason was that the dissection fosters methodological skills.

Current study

The studies presented here consistently show a negative influence of disgust and anxiety on motivation, interest and achievement. Therefore, reducing anxiety and disgust might be an important aim. As humor can lead to lower anxiety in medical settings, e.g., before surgery, we assume and hypothesize that a kind of humor treatment prior to an educational dissection of fish may also lead to a lower anxiety and probably lower disgust levels.

MATERIALS AND METHODS

Participants and data collection

The participants of the winter terms 2014/15 were pre-service biology teacher students and they have a history of 13 years of schooling. A total of 114 students (83 females, 24 males, 7 not specified) participated in the study. 49 participants received the treatment with the humor videoclips and 65 the life history video. Participation was unpaid, voluntary and anonymous. The students were instructed that we use questionnaires to assess our teaching and to improve it. The trouts for the dissection were not present in the room, and students could not see, hear or smell them because this could elicit negative emotions.

Measures

State Anxiety (STAI-S)

State anxiety is measured by the State-Trait-Anxiety Inventory (STAI; Spielberger et al. 1970, 1976). The STAI is a brief self-report assessment designed to measure and differentiate between anxiety as a trait and a state (Spielberger et al. 1970). State anxiety fluctuates and is a function of the stressors on an individual. State anxiety should be low in non-stressful situations (Barnes et al. 2002). State anxiety was measured with a scale (20 items) that is sensitive towards changes (STAI-S; Laux et al. 1981). The items are four-point Likert scaled and 10 items are positive and 10 items are negative coded. Students rated how they feel at a particular moment (e.g., calm, tense). The reliability of the state anxiety scale was high in the present sample (pretest: $\alpha = 0.903$ / posttest $\alpha = 0.916$).

Trout disgust scale

The trout disgust scale was developed by Randler et al. (2012, 2014) and improved subsequently with an additional item (Table 1). Items and loadings as well

as the alpha level are presented in Table 1. These 8 items are directly related to the dissection task and the scale is sensitive towards changes (see Randler et al. 2012, 2014). The scale was constructed following a qualitative study in 2009. In that study, students were asked after the dissection "What was the most disgusting aspect?". The students mentioned appearance, smell and mucus. We used this prior study (unpublished) to construct the items of the specific state disgust scale. In addition, we used theoretical considerations based on different facets of disgust (following Petrowski et al. 2010), which contains items dealing with smell, feel, appearance and taste. Therefore, we included and two items dealing with the possibility of eating a piece of trout generally and after the dissection. The trout disgust scale, therefore, covers all facets from Petrowski et al. (2010). The original scale is in German and the items are presented in both German and an English translation (see Table 1). The items were rated on a five-point Likert scale and three of the eight items are reverse coded. Convergent validity was tested by correlations with the three dimensions of the trait disgust scales (Randler et al. 2014).

Experimental procedures

The students came into the laboratory (dissection) room. Immediately after the students had arrived and settled, the pretest was applied. After the pretest was collected by the lecturer, we showed a 10-minute video about the life history of the

Table 1. Items of the trout disgust scale. Please note that the original items have been developed in German language.

		Pretest		Posttest	
		Item-Scale correlation	α if deleted	Item-Scale correlation	α if deleted
If I would get served a whole trout (including head and eyes) in a restaurant, I would not be able to eat a thing.	Wenn ich eine ganze Forelle (samt Kopf und Augen) im Restaurant serviert bekäme, würde ich keinen Bissen runterbekommen.	0.593	0.839	0.603	0.817
Trouts are disgusting.	Forellen sind eklig.	0.706	0.823	0.714	0.804
I would rather leave the room when we dissect a trout.	Wenn wir eine Forelle präparieren, würde ich am liebsten den Raum verlassen.	0.625	0.834	0.645	0.811
The trout's mucus nauseates me.	Der Schleim der Forelle widert mich an.	0.607	0.833	0.596	0.815
During trout dissection, I would rather use a nose clip to avoid the smell.	Bei der Forellenpräparation würde ich am liebsten eine Nasenklammer verwenden, um den Geruch zu vermeiden.	0.658	0.827	0.619	0.813
I don't mind touching a trout. (reverse coded)	Es macht mir nichts aus, eine tote Forelle anzufassen (inverse)	0.524	0.843	0.415	0.837
Trouts are beautiful animals. (reverse coded)	Forellen sind schöne Tiere (inverse)	0.435	0.851	0.438	0.833
After the dissection I would be able to eat a trout. (reverse coded)	Nach der Forellenpräparation könnte ich mir vorstellen, Forelle zu essen (inverse)	0.684	0.823	0.609	0.815
	Total		0.852		0.837

trout (FWU 46 02344). In this film, the life cycle during the year is shown (feeding, predator-prey relationships, behavior, reproduction) but the film has no direct relation to the dissection – it is intended as background information. The humor treatment group received different video clips from YouTube in a similar length. The streamed video clips from YouTube are given in the Appendix. These videos were all related to fish to keep the content of both treatments similar. Immediately after the films have been shown, the posttest was administered and collected. Then for both groups the dissection followed. The dissection was similar for the students and they were informed about the dissection day (e.g., when it will happen) already at the start of the semester term. Both treatments and data collection were done by the same teacher who is an expert in trout dissection since 2000 and is also familiar with the data collection procedures. The study was based on intact classes and this lead to a slightly unbalanced sample size because of different class sizes.

Dissection task

The lesson lasted 100 minutes. After the film treatment, the lecturer explained the handling and gave some background information about the anatomy and internal and external structure (30 minutes) of the rainbow trout (*Oncorhynchus mykiss*, WALBAUM, 1792; family Salmonidae). Lectures for all students were carried out by the same person. The trouts were bought from commercial rearing. Afterwards, the students dissected the trout in groups of usually two persons.

Statistical analyses

We used t-tests for paired samples and general linear models with covariances (earlier known as MANCOVA) for every set of variables. This was done because the same measures are applied two times, one time before the treatment and one time after the treatment. In addition, these measures are correlated. For example, for State anxiety (STAI-S), we used pre-test state anxiety as co-variate and post-anxiety as dependent variable. Treatment (humor video clips versus life history video) was used as fixed factor. SPSS 22 was used for all statistical analyses (IBM Corp. Armonk, NY).

RESULTS

Disgust

As expected, the prior measure of disgust before the treatment was significantly positively related to the disgust after the treatment ($r = 0.934$, $p < 0.001$). However, treatment showed a significant influence on post-disgust scores (Table 2). The estimated marginal means (and SE) were 2.44 ± 0.04 after the life history film and 2.26 ± 0.05 after the humor film clips. The treatment explained about 7% of the variance (Table 2). Disgust scores did not change significantly in the life-history film treatment ($t = 0.975$, $p = 0.333$; Figure 1). In the humor treatment, disgust scores were significantly lower after the treatment ($t = 4.574$, $p < 0.001$).

Anxiety

Concerning state-anxiety, STAI-S scores prior to the treatment were related to the scores after the treatment ($r = 0.880$, $p < 0.001$). Similarly, the treatment showed an effect on the post-treatment scores (Table 3). Anxiety was lower in the humor film group (1.84 ± 0.03) compared to the life history film group (1.97 ± 0.03). The treatment explained about 8% of the variance. Anxiety scores did not change

significantly in the life-history film treatment ($t = -0.406, p = 0.686$; Figure 2). In the humor treatment, anxiety scores were significantly lower after the treatment ($t = 3.564, p = 0.001$).

Table 2. General linear model with disgust after the treatment as dependent variable, treatment (humorous film vs. life history video) as fixed factor and disgust prior to the intervention as covariate.

Source	df	F	P	Partial eta-squared
Corrected Model	2	414.549	<0.001	0.882
Constant	1	0.266	0.607	0.002
Disgust (prior to treatment)	1	816.507	<0.001	0.880
Treatment	1	8.607	0.004	0.072
Error	111			
Total	114			
Corrected total variation	113			

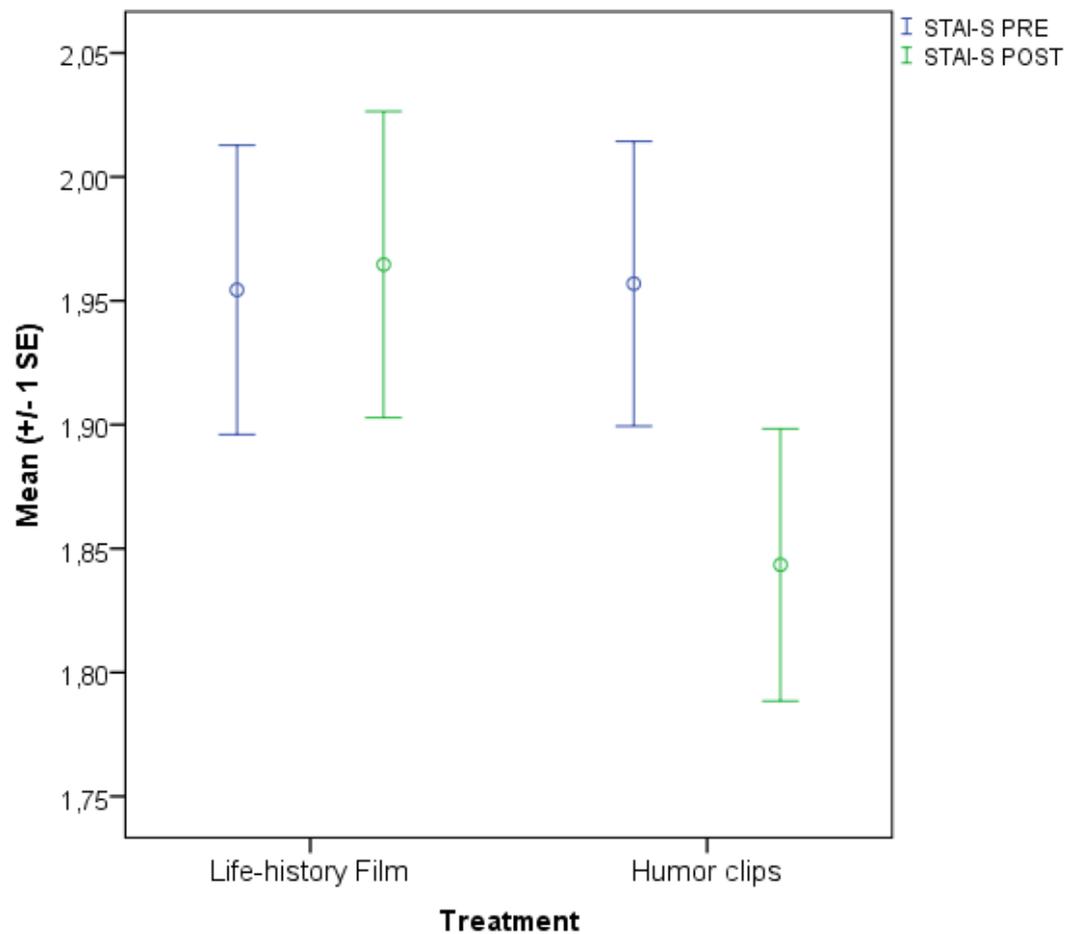


Figure 1. Changes in anxiety (STAI-S) according to the treatment life history films versus humor clips. Based on the raw data.

Table 3. General linear model with anxiety after the treatment as dependent variable, treatment (humorous film vs. life history video) as fixed factor and anxiety prior to the intervention as covariate.

Source	df	F	Sig.	Partial eta-squared
Corrected Model	2	212.364	<0.001	0.793
Constant	1	1.991	0.161	0.018
State anxiety STAI-S (prior to treatment)	1	415.337	<0.001	0.789
Treatment	1	9.748	0.002	0.081
Error	111			
Total	114			
Corrected total variation	113			

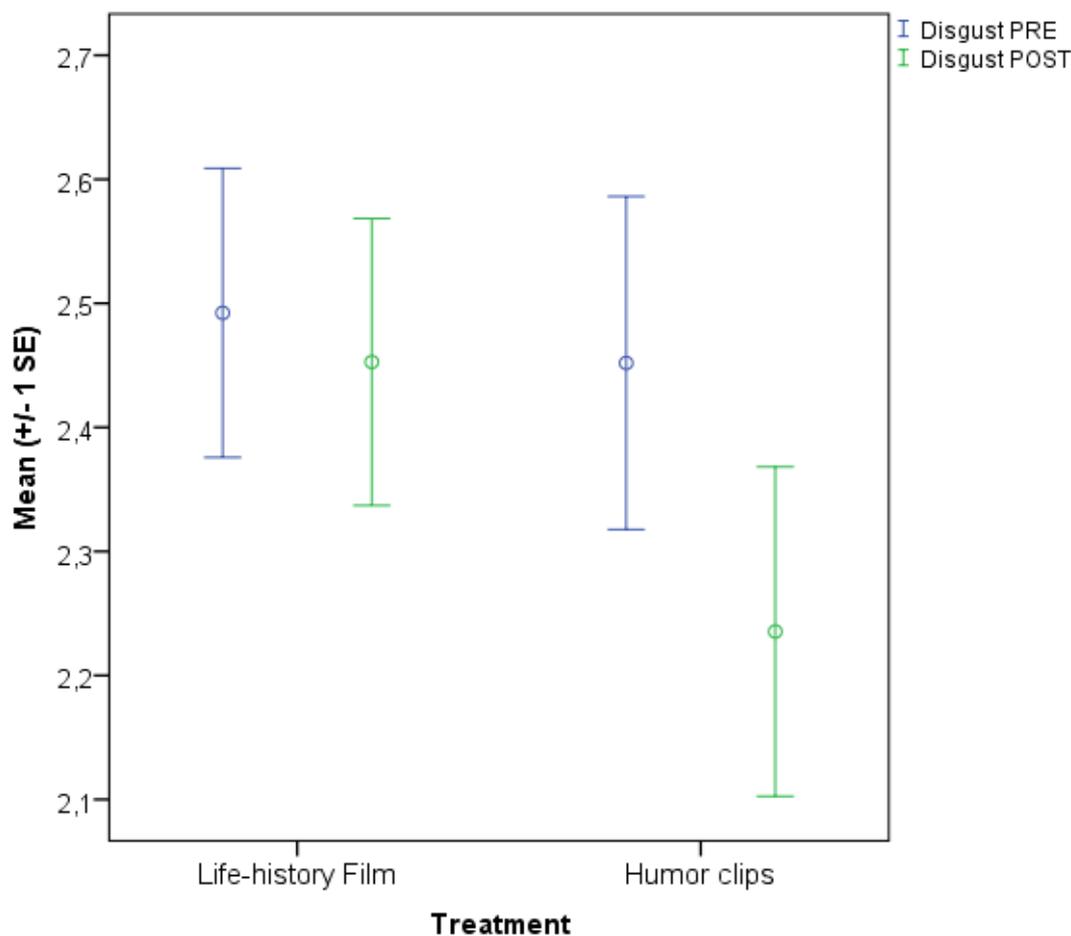


Figure 2. Changes in disgust according to the treatment life history films versus humor clips. Based on the raw data.

DISCUSSION

General aspect

The most important result was that a treatment with humorous video clips about fish reduced anxiety and disgust in a University student sample compared to a control group who received a video about the life history of the fish species (trout). The students of the humor treatment group had lower disgust and anxiety scores after the treatment and before the dissection.

Anxiety

Viewing the humorous video clips has reduced anxiety (STAI-S) immediately before the dissection starts. This is a positive result reinforcing previous studies about other situations that produce anxiety, such as surgery (during anesthesia; Mifflin et al., 2012) or in the preparation for a medical operation (Dionigi et al. 2014; Vagnoli et al. 2005, 2010). Also, pain tolerance was higher after viewing a humorous film (Weisenberg et al. 1998). Humorous videos also had a positive effect and lowered anxiety in stressful situations (Cann et al. 1999; Abel and Maxwell 2002). Therefore, our study is in line with previous works that were applied in different subject fields and in different situations. Our study adds to the literature because it shows that reducing anxiety in education is also possible based on humorous films. This is important since anxiety is also an important variable in science and medical education. The study showed that the humor clips resulted in a reduced anxiety. As anxiety is an important aspect in motivation during the dissection of a fish, we assume that this will benefit the students also during dissection, and hence, may lead to a higher performance during the dissection and finally a higher knowledge. However, this relationship has to be established in a further study, because the main aim was to assess if it is possible to reduce the anxiety prior to the dissection, because this measurement point seemed the most influential for the subsequent dissection task (e.g., Randler et al., 2012).

Disgust

The funny video treatment lead to lower disgust scores. To our knowledge, humor has never been applied to reduce disgust in an educational context. Also, other studies about reducing disgust seem rather scarce. One general aspect in many studies was that – comparable to behavioural therapy – confrontation with a disgusting object lowered disgust (e.g., Randler et al. 2012). Other approaches to lower disgust were based on pornographic video material (Borg and de Jong 2012), where viewing sex-related materials subsequently led to a lower disgust. Although these results were interesting, we do not suggest to transfer them to educational settings due to ethical concerns. Lowering disgust in science and medical education is a worthwhile task because studies reported that disgust correlates with important outcome variables. For example, high disgust tended to be correlated with lower achievement (Randler et al. 2013). Also, disgust was negatively related to interest (Holstermann et al. 2009) and competence (Randler et al. 2012), while higher disgust scores were related to higher pressure/tension (Randler et al., 2012). In this study, the lower disgust might be a possibly influential factor for the following dissection. For previous work (e.g., Randler et al., 2012), there was a clear relationship between disgust and motivation during a task, with high disgust leading to lower motivation. Thus, decreasing disgust should result in higher motivation, and presumably higher achievement. However, this has to be checked in future studies, because the main aim was first to show if it is possible to reduce disgust at all. After this has been shown, there are many aspects that should be addressed in future work.

CONCLUSION

Our study is interesting, because most other studies are correlational and they describe how anxiety and/or disgust change during educational dissection in science and medical education. However, as it is now well-known, these tasks are related to a high disgust and anxiety, so approaches are needed to reduce disgust and anxiety and improve well-being of prospective teachers and medical staff. Using

humor may be one alternative to achieve this goal. The results suggest that prior to a dissection, humor can be used to reduce disgust and anxiety. Although this seems an easy message, the implementation of such a treatment in universities dealing with medical and science education might see some obstacles. Such treatments should be applied at least in groups with high anxiety and disgust, for example in school students. Also, it may be applicable in university students prior to their very first dissection, because disgust and anxiety decrease in subsequent dissections (Randler et al. 2012).

IMPLICATIONS

Although this study has been carried out in dissection of an animal in teacher students, we believe that these results can be generalized and transferred into other parts of dissection, such as cadaver dissection of humans in medical education and veterinary education. Concerning school pupils, dissections are also often an integral part of science education. Both, the National Association of Biology Teachers [NABT] (2008) and the National Science Teachers Association [NSTA] (2005) support dissection in science education for several reasons: first, helping students to develop observation and comparison skills, second to discover structures of specific organisms. Some people have claimed to use alternatives to dissection, which is supported by animal welfare considerations that should not be neglected. Dissection alternatives (model, videos or diagrams) provide the same amount of learning content and are equal to dissections, but they cannot provide acquiring practical skills (DeVilliers and Monk, 2005).

ACKNOWLEDGMENTS

We are grateful to our students for participating in this study and for their patience in filling the questionnaires. The study was partially funded by "Qualitätsfondsmittel Lehre" for buying the trouts.

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APPENDIX

1. Video clips from YouTube used in the study. Please note that these clips are in parts in German because the study was carried out in Germany.
2. <https://www.youtube.com/watch?v=i9SSOWORzw4> (Monty Python)
3. <https://www.youtube.com/watch?v=-jOysYnctEs> (Angelausflug | Mensch Markus mit Markus Maria Profitlich)
4. <https://www.youtube.com/watch?v=Qyt1g393qQY> (Lustiges Fischen)
5. <https://www.youtube.com/watch?v=wNnk1zJsroU> (Ernie & Bert: Fischlein, Fischlein, Fischlein)

