Title

The Emotion of Disgust among Medical and Psychology Students

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Abstract

Disgust evolved as a way to protect one's self from illness. DS-R measures disgust propensity of three kinds of disgust (Core, Animal Reminder and Contamination). Although the DS-R scale was refined mainly with young and largely female student population its impact on educational orientation has not been assessed. In the present study we examined the DS-R scoring and the choice of postgraduate studies in medical (n= 94) and psychology (n= 97) students. They responded to an anonymous web-based survey and completed the DS-R and a questionnaire on their demographics and plans for postgraduate studies. Female students outnumbered males (3:1) and scored higher in Total DS-R score (median: 59 vs. 50, $p<0.05$). Psychology students scored higher in all three kinds of disgust ($p<0.05$), indicating a higher level of disease avoidance. Medical students willing to follow Internal Medicine scored higher in Core Disgust ($p<0.05$) while psychology students willing to study Experimental Psychology scored lower in Animal Reminder subscale ($p<0.001$). Also, the higher the psychology students scored in Core Disgust scale the higher was the probability to choose Experimental Psychology. In conclusion, disgust propensity as rated by DS-R differentiates medical from psychology students and is also related to orientation preferences in postgraduate studies.

Key words: disgust; DS-R; medical students; psychology students; academic orientation; specialization

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Introduction

Disgust is one of the basic emotions in Plutchik' s (1980) [1] theory of emotions and there is strong support that it evolved as a way to protect one's self from illness. [2,3] Disgust has been extensively studied by Rozin et al (1987) [4] who proposed a classification system of four broad categories of disgust elicitors. Core elicitors are characterized by a real or perceived threat of oral incorporation and a reactive sense of offensiveness (e.g. spoiled milk, feces, and rats). Animal-reminder elicitors consist of our own mortality and inherent animalistic nature (attitudes and practices surrounding sex, injury of the body or violations of its outer envelope and death). Interpersonal disgust is elicited by contact with individuals who are unknown, ill or tainted by disease, misfortune or immorality. Socio-moral disgust elicitors is a subclass of moral violations that the person is morally "sick" or "twisted". Haidt et al. (1994) [5] developed the Disgust Scale (DS) with eight subscales. The Disgust Scale – Revised (DR-R) provided by Olatunji et al (2008) [6] revealed three distinct factors with a better internal consistency and conceptualized three subscales namely the Core, Animal Reminder and Contamination disgust. The Core disgust factor is primarily characterized as a food rejection response centered on oral incorporation of offensive stimuli (e. g. eating monkey meat). The Animal – Reminder factor highlights stimuli or behaviors that serve as reminders of the original of humans (e.g. touching a dead body). The Contamination disgust factor (e.g. accidentally drinking from someone else's cup) reflects disease spread by people whereas Core disgust reflects disease spread by objects. The DS-R scale has been validated and its three factors confirmed internationally, including a Korean sample [7], students in the Netherlands [8] samples from the United States [9], Israel [10], Greece [11] and samples from Brazil, Australia, Germany, Italy, Japan, and the Netherlands [12].

However there is still need for further investigation on the influence of demographic characteristics on disgust propensity. Berger and Anaki (2014) [10] in a large heterogeneous sample (N= 1427) investigated the role of demographic variables on disgust's sensitivity. Gender was found to have a large effect on DS-R score, while the effects of other demographic variables, such as religion, political view, education and age, were exceptionally modest. They suggest that demographic variables create some of the diverse contexts in which disgust is evoked, without modulating the intensity of the subjective disgust sensitivity. Chalimourdas et al (2019) [11] administered the Greek version of the DS-R in a sample of 754 healthy participants. Women scored higher than men in all three subscales and religiousness was associated with heightened levels of disgust. There was a weak negative correlation between levels of disgust and years of education.

Nevertheless, in previous reports the academic context has not been studied as for its impact on DS-R scoring. DS-R scale was refined mainly with psychology students. Students of a different academic background might score differently in DS-R. Data suggest marginally lower disgust sensitivity among medical students and that medical training may reduce sensitivity [13]. Furthermore, the assessment of students' future plans for postgraduate studies might reveal differences among the three disgust

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subscales since different orientations involve distinct patterns of exposure to disgust-eliciting stimuli.
Studies suggest that decisions regarding medical specialization have been associated with demographic and outcome-expectancy type variables [14], personality-type characteristics [15], institutional factors and personal values [16], exposure to role models [17]. Reports examining the role of disgust sensitivity in decisions regarding post-graduate career specializations are scarce. According to Consedine & Windsor (2014) [18] disgust sensitivity predicted interest in careers of varying procedural intensity among medical students.
The present study has a twofold aim. First, to compare a sample of medical students to a sample of psychology students in order to assess the impact of academic background on DS-R scoring. Second, to investigate their future plan for postgraduate studies in relation to DS-R scoring. Our hypotheses were that educational orientation would elicit different disgust scores and that postgraduate orientation with less human contact and treatment (such as Experimental Psychology or Laboratory Specialty) might elicit different DS-R scores in the two samples of students.

Materials and Methods

Design and participants

During a two-week period at the beginning of the academic year 2019-2020, 94 medical students and 97 psychology students of the National and Kapodistrian University of Athens (NKUA) responded to a web-based survey, which guaranteed their anonymity. Participants were reached through their University Social Media groups. All students completed the DS-R and a questionnaire comprising their demographics and their plans for postgraduate studies. All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of the 1st Department of Psychiatry of the NKUA, Eginition Hospital (ADA:ΒΙΡΜ46Ψ8ΝΖ-ΟΩΩ).

Instruments

The anonymous questionnaire comprised information on sex, age, year of study. Medical students had to choose one among three possible future options of medical specialty, namely: Internal Medicine, Surgical Specialty, Laboratory Specialty while psychology students had to choose one of the three following postgraduate studies directions: Clinical Psychology, Educational Psychology and Experimental Psychology.

The DS-R scale

The scale consists of three subscales (a 12-item Core disgust scale, an 8-item Animal Reminder scale and a 5-item Contamination disgust scale). It has good psychometric characteristics and the Olatunji et al (2008) [6] 3-factor model has been replicated in Greek population making it suitable for use in the Greek population, for both clinical and research work [11].

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Statistics

Participants' characteristics were described using mean and standard deviation for quantitative variables or proportions for categorical variables. DS-R scores were summarized using median and (25^{th}, 75^{th}) percentiles. The demographic characteristics of the two groups of students as well as their DS-R scores were compared using t-test, chi-squared test or Mann-Whitney test, as appropriate. Multiple logistic regression models were used to assess factors independently associated with reporting Laboratory Specialty as future option (among medical students) and post graduate Experimental orientation (among psychology students) compared to all the other available options.

Results

Completed data were available for 94 medical and 97 psychology students (total N=191). Approximately three quarters of them (77.5%, n=148) were females. Students' mean (SD) age was 20.2 (2.2) years. 121 (63.4%) were students in the introductory two years of their studies. Among medical students, Internal Medicine and Surgical Specialty were the most frequently reported future options (42.5% and 47.9% respectively) while Laboratory Specialty was an option only for the 9.6% of them. Among psychology students, 67.0% chose Clinical Psychology as a post-graduate option, 21.7% Educational Psychology and 11.3% Experimental Psychology. The two groups did not differ in age (Table 1). A larger number of medical students in comparison to psychology students were males and belonged to an advanced study year. Medical students scored lower in all DS-R subscales compared to psychology students, with a median (25^{th}, 75^{th}) total score of 49 (38, 61) and 62 (52, 75), respectively ($p<0.001$) (Table 1), although score distribution of DS-R subscales did not differ between the two faculty students in relation to sex (Table 4). Medical students with Internal Medicine orientation scored higher in the Core Disgust subscale compared to Surgical and Laboratory Specialty (median (25^{th}, 75^{th}): 32 (26.5, 34), 26 (22,28) and 27 (23, 34), respectively, $p=0.023$) (Table 2). Psychology students with Experimental postgraduate orientation scored lower in the Animal Reminder subscale (Tables 2, 3).

Among medical students, there was no association between age, sex, study year and DS-R subscales with the odds of reporting Laboratory Specialty as future option compared to the other specialties (data not shown). From a multiple logistic regression model, female students and students with higher total disgust score had a lower probability of reporting post graduate Experimental orientation as compared to Clinical Psychology or Educational Psychology. Conversely, the students scoring higher in the Core disgust subscale had a higher probability of choosing Experimental orientation (Table 5).

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Table 1. Demographic characteristics and DS-R scoring in the total number of participants and according to Faculty.

Variable		***Total***	***Medical Students***	***Psychology Students***	***p-value***
		(N = 191)	***(N =94)***	***(N = 97)***	
Age (years), mean., (SD)		20.15 (2.21)	20.31 (2.27)	20.00 (2.15)	0.336
Sex, n (%)					<0.001
	Males	43 (22.51)	33 (35.11)	10 (10.31)	
	Females	148 (77.49)	61 (64.89)	87 (89.69)	
Study Year, n (%)					0.023
	1-2 years	121 (63.35)	52 (55.32)	69 (71.13)	
	3-6 years	70 (36.65)	42 (44.68)	28 (28.87)	
Study Year, n (%)					<0.001
	1	29 (15.18)	28 (29.79)	1 (1.03)	
	2	92 (48.17)	24 (25.53)	68 (70.10)	
	3	32 (16.75)	12 (12.77)	20 (20.62)	
	4	8 (4.19)	4 (4.26)	4 (4.12)	
	5	7 (3.66)	6 (6.38)	1 (1.03)	
	6	23 (12.04)	20 (21.28)	3 (3.09)	
Core disgust, median, (25º – 75º)		32 (26 – 36)	28.5 (24 – 34)	35 (29 – 40)	<0.001
Animal Reminder, median, (25º – 75º)		16 (11 – 21)	13.5 (9 – 17)	20 (14 – 24)	<0.001
Contamination Disgust, median, (25º – 75º)		8 (6 – 11)	8 (6 – 10)	10 (7 – 11)	0.047
Total score, median, (25º – 75º)		58 (45 – 66)	49 (38 – 61)	62 (52 – 75)	<0.001

Table2. Score distribution in relation to specialty orientation of Medical Students.

Variable	***Internal Medicine***	***Surgery***	***Laboratory***	***p-value***
Core disgust, median, (25º – 75º)	32 (26,5 – 34)	26 (22 – 8)	27 (23 – 34)	0.023
Animal Reminder, median, (25º – 75º)	15 (11 – 17.5)	12 (8 – 16)	13 (7 – 19)	0.120

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Contamination Disgust, median, (25º – 75º)	8 (6.5 – 10.5)	8 (6 – 10)	7 (5 – 11)	0.743
Total score, median, (25º – 75º)	53.5 (47.5 – 61.5)	42 (37 – 59)	42 (36 – 68)	0.046

Table 3. Score distribution in relation to postgraduate orientation of Psychology Students.

Variable	***Clinical***	***Educational***	**Experimental**	***p-value***
Core disgust, median, (25º – 75º)	35 (30 – 41)	34 (30 – 39)	29 (26 – 36)	0.214
Animal Reminder, median, (25º – 75º)	20 (15 – 25)	24 (17 – 26)	11 (9 – 18)	<0.001
Contamination Disgust, median, (25º – 75º)	10 (7 – 11)	10 (7 – 11)	7 (4 – 10)	0.081
Total score, median, (25º – 75º)	63 (53 – 78)	65 (58 – 73)	47 (41 – 58)	0.005

Table 4. Score distribution according to sex.

Variable	***Males***	***Females***	***p-value***
All students (N=191)			
Core disgust, median, (25º – 75º)	27 (24 – 33)	33 (27 – 38)	<0.001
Animal Reminder, median, (25º – 75º)	14 (8 – 20)	17 (12 – 22)	0.019
Contamination Disgust, median, (25º – 75º)	8 (7 – 11)	8.5 (6 – 11)	0.912
Total score, median, (25º – 75º)	50 (39 – 62)	59 (47 – 68)	0.004
Medical Students (N=94)			
Core disgust, median, (25º – 75º)	27 (24 – 32)	30 (24 – 34)	0.078
Animal Reminder, median, (25º – 75º)	13 (7 – 17)	14 (11 – 17)	0.372
Contamination Disgust, median, (25º – 75º)	8 (7 – 11)	8 (5 – 10)	0.424
Total score, median, (25º – 75º)	46 (37 – 59)	51 (40 – 61)	0.271

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Psychology Students (N=97)			
Core disgust, median, (25^{o} – 75^{o})	32 (26 – 35)	35 (29 – 40)	0.154
Animal Reminder, median, (25^{o} – 75^{o})	19 (16 – 21)	20 (14 – 26)	0.682
Contamination Disgust, median, (25^{o} – 75^{o})	9.5 (7 – 10)	10 (7 – 11)	0.729
Total score, median, (25^{o} – 75^{o})	59.5 (49 – 64)	63 (52 – 77)	0.316

Table 5. Odd ratios (OR) and corresponding 95% confidence intervals (95% CI) of univariable logistic regression for the selection of Experimental psychology (N= 97 Psychology Students)

	Multivariable analysis	
	OddsRatio (95% C.I.)	**p-value**
Age (per year)	1.09 (0.69 – 1.71)	0.712
Sex		0.023
Males	1.00	
Females	0.09 (0.01 - 0,. 1)	
Study Year		
1-2		
3+		
Core disgust	1.50 (1.13 – 2.00)	0.005
Animal Reminder		
Contamination Disgust		
Total score	0,76 (0,64 - 0,89)	0.001

Discussion

The first aim of the study was to explore possible differences in DS-R scoring among medical and psychology students. Medical students scored lower in all DS-R subscales in comparison to psychology students indicating that educational orientation, might have an impact on DS-R scoring. This finding challenges the notion supported by Berger and Anaki (2014) [10] that with the exception of gender the effect of demographic variables on the intensity of the subjective disgust sensitivity is exceptionally modest. Our finding is in accordance with data supporting lower disgust sensitivity among medical students [13]. It seems that Medical students are less sensitive to reactive sense of offensiveness (e.g. spoiled milk, feces), attitudes and practices surrounding injury of the body or violations of its outer envelope, death and

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contamination. Protection from illness has been considered as one of the evolving roles of disgust [2, 3]. Disgust has been found to increase during the first trimester of pregnancy [19] and certain aspects of disgust have been linked to mate preference [20, 21]. These findings suggest that disgust is associated to various aspects of reproduction and disease avoidance. Since medical students are expected to be less avoidant of diseases, difference in scoring between medical and psychology students may be attributed to choices when deciding to enter the undergraduate studies. The decision to follow Psychology studies may be influenced by the basic emotion of disgust as it is measured by DS-R in an opposite way to that of medical students. A study closer to the decision making for undergraduate studies could help to further elucidate the influence of the emotion of disgust to the decision making for studies orientation.

In our study DS-R score distribution was not influenced by sex among both medical and psychology students while in the DS-R score distribution of all students in relation to sex, females scored higher. This could be explained by the larger sample when these two groups of students were combined. Female preponderance in disgust sensitivity is a standard finding in previous reports [22, 23]. As mentioned above, evolutionary, women use more energy and resources to birth and raise their children [22] and have to protect themselves and their children from illness. In addition, Spark et al (2018) [24] in an extensive meta-analysis documenting the sex difference of disgust argue that key features of this pattern are best explained as one manifestation of a broad principle of the evolutionary biology of risk-taking for a given potential benefit. They also suggest that disgust and related emotions can be usefully examined through the theoretical lens of decision making under risk in light of human evolution.

The second aim of our study was to assess whether in our sample the emotion of disgust as measured by DS-R plays a role to the future postgraduate studies orientation. Medical students who chose Internal Medicine as their future medical specialty scored higher in the Core disgust subscale indicating sensitivity to a real or perceived threat of oral incorporation and a reactive sense of offensiveness (spoiled milk, feces, and rats). Since Internal Medicine involves less exposure to bodily products compared to surgical and laboratory specialties, students with high Core disgust are expected to prefer Internal Medicine to other specialties.

Psychology students with Experimental postgraduate orientation scored lower in the Animal Reminder subscale indicating lower sensitivity to attitudes and practices surrounding sex, injury of the body or violations of its outer envelope and death. This is in line with the fact that experimental psychology often includes high exposure to animal experiments and reminders of death and of the fact that “we are animals”.

A logistic regression model for postgraduate Experimental orientation revealed that female psychology students had a lower probability of choosing Experimental orientation. This might be explained by the fact that females are thought to be more empathetic and less systematizing compared to males [25], a trait that could make them choose a more clinically based orientation with more human contact. Also psychology students with higher total disgust score seemed to prefer clinical or educational to experimental orientation probably because experiments that might

include animals are more likely to expose them to disgust-eliciting stimuli. Finally, contrary to our expectations, the higher they scored in the Core disgust subscale score the higher was the probability to choose Experimental orientation. It seems that some psychology students with high core disgust score prefer an orientation with less human contact and treatment. This is a finding difficult to interpret that has to be replicated. The analysis for medical students as for their future option for Laboratory Specialty did not reveal any significant variable, indicating that in medical students, disgust propensity would not predict the choice of a specialty with less human contact and treatment.

The study has limitations related to the recruitment of participants since it was a web-based survey and there may be a self-selection bias that potentially compromises the generalisability of the findings. In addition, as this process guaranteed the anonymity of participants, we cannot exclude the possibility that a student completed more than once the questionnaire. The modest number of participants is another limitation regarding the generalizability of results. Finally, we should consider that there are many other factors determining students' decision for undergraduate studies and postgraduate orientation for both psychology and medical students [14-17, 26].

Conclusions

In conclusion, students' academic orientation was found to be related to DS-R scoring since psychology students scored higher than medical students in DS-R, indicating a higher level of disease avoidance. Since DS-R scale was constructed and refined mainly with young and largely female psychology student population the educational orientation should be taken into account when assessing disgust propensity in particular populations. Given that disgust propensity and sensitivity are significantly associated with the disease-avoidance functionality, a better understanding of disgust might be particularly helpful in shaping students' knowledge about disease [3, 27]. Moreover, as already mentioned by other researchers, further work is needed to elucidate the developmental pathways of disgust and to explore how predisposition interact with social norms. Since disgust is plastic, being able to retune according to signals from within the body and from the social and biological environment [27], follow-up study on the emotion of disgust among medical and psychology students during their pre-graduate studies might help to further assess the role of disgust in choosing postgraduate studies. Finally, it seems that individual disgust sensitivities should also be taken into consideration when providing guidance and taking post-graduate career specialization decisions for both psychology and medical students.

Author Contributions

Conceptualization: A.P, N.P, K.P; Methodology: A.P, N.P, K.P, T.C.; Formal analysis, V.S.; Investigation, N.P., E,B., V.M., T.C.; Data Curation, N.P., E.B., V.M; Writing—Original Draft Preparation, A.P, K.P.; Writing—Review and Editing, C.P, V.S.; Supervision, A.P., C.P.

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Conflict of interest
The authors declare no conflict of interest

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