

## Developmental Trend of the Effect of Disgust Emotion on Moral Judgement in Children and Adolescents

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### Abstract

Disgusting emotion was evolved to avoid disease infection. When the risk of contracting disease increases, people become more compliant with social rules to avoid the infection of disease. Previous studies showed that when primed with disgusting emotion (vs. neutral emotion), young adults rated moral violation behaviors more severely. In the present study, we examined the developmental trend of the influence of primed disgusting emotion on moral judgment across age groups. Participants rated either disgusting or neutral pictures and then completed a standardized moral questionnaire. Results showed that 10 and 16-year-old participants', but not 6 or 13-year-old participants, rated the moral violations more severely when disgust primed. These findings suggest that the influence of disgusting emotion on moral judgements is not constant but varies at different developmental stages.

**Keywords:** Disgust; Emotion; Moral judgment; Priming; Disease avoidance

### Introduction

Disgusting emotion, as part of the disease avoidance system, not only guides our body but also guides our heart. Previous studies that investigated the relationship between disgust and moral judgment showed that, for example, experimentally evoked physical disgust render more stringent judgement on moral violations in adults [1-3]. In a typical paradigm, the ways to evoke physical disgust are diverse, such as posthypnotic suggestion, viewing disgusting video clips or photos, and exposure to an unpleasant odor. After being primed with disgusting emotion, participants are presented with short vignettes about moral transgressions, which can be related to physical disgust (e.g., having sex between cousins, eating a dead dog) or pure moral disgust (e.g., stealing, lying). In these studies, moral judgement is defined as the consequence of appraisal [4]. Participants are asked to judge how wrong they consider the behavior to be, the extent to which they would punish the actor [5], and how much they would like to avoid the act or actor [6]. The typical finding is that experimentally evoked physical disgust can bias participants' moral judgements by rendering them more severe.

Most of these studies that investigated the relationship between disgust and morality involved adult participants. The disgust system responds to parasite pressure not just over evolutionary time, but over lifetimes [7]. Rozin, et al. [8] proposed a developmental model of disgust, which suggests that different categories of disgust elicitors become salient in certain sequence during lifespan development. Distaste emerges first and is then preceded by core disgust after which emerge animal reminder disgusts, followed by interpersonal disgusts (e.g., avoiding an ill or immoral person), and, finally, socio-moral disgusts. As disgusting emotion is acquired during one's growing up,

the association between disgust and morality may be developed when one gets older.

However, to our knowledge only one study examined the association between disgust and morality from a developmental perspective [9]. Peng and Chang showed that 10- and 21-year-old participants judged the moral violation behaviors more wrong in the disgusting condition than in the control condition, and 10-year-old participants rated higher avoidance scores in the disgusting condition than in the control condition. However, 7-year-old participants did not show any difference in the judgement of moral violations as indicated by wrongness scores, punishment scores, and avoidance scores. These results suggest a developmental trend in the influence of disgusting emotion on moral judgements. However, the interpretation of these results might be clouded by some methodological limitations in their study. First, unlike previous studies [10], Peng and Chang [9] did not use the neutral emotion prime in their control group, such that participants in their control group were not necessarily in the neutral emotion state. Second, Peng and Chang adopted Stevenson et al.'s [11] procedure and had participants rate the disgusting pictures on a like-dislike scale. However, the extent to which participants disliked a picture might not necessarily reflect how disgusting they felt towards the picture so that the variation of their participants' moral judgements might not solely be attributed to their disgusting (vs. neutral) feelings being induced by the pictures. In previous research, participants were typically asked to rate specific emotion when comparing the emotion induced in different conditions [2]. Third, Peng and Chang did not use the same set of moral violation behaviors in different age groups, such that the effects of disgusting emotion on judgements of moral violation behaviors could not easily be compared across different age groups in their study. Moreover, the moral violation behaviors they used did not cover all aspects of moral domains.

In the current study, we used disgusting pictures and building pictures as the primes to induce in participants disgusting emotion and neutral emotion, respectively. The participants were asked to evaluate the pictures on a 3-point scale of disgust feeling and then complete a standardized moral questionnaire that measured their moral reasoning. This questionnaire (i.e., Sociomoral Reflection Measure-Short Form [SRM-SF], [12] was widely used in previous studies across 23 countries [13]. It contains 11 items that comprise the core of morality, such as honoring contracts, being faithful to truth, and upholding justice. Suitable to the current study, SRM-SF can be used in samples of children as young as 5 years old [12,14]. Because we were more interested in participants' moral judgements rather than their moral appraisal, we had them rate the extent to which they agreed with the items without having to explain their reasoning.

To track down the development of the disgust-morality association from childhood to late adolescence, we recruited the 6-, 10-, 13-, and 16-year-olds as our participants. Children in ages of 5-9 are in the stage of heteronomous morality, characterized by a strict adherence to rules and obedience to authority [15]. Thus, even though 6-year-old children have adult-like disgust responses, we predicted that their moral judgements would not be influenced by disgusting emotion [11,16]. Children older than 10 are at the conventional moral development stage [17] and were reported to have acquired moral-related disgusting emotion. Stevenson et al. [11] revealed that the evaluative ratings of sociomoral items was increasingly negative from the 2.5 to 10.1 years old and remained quite similar after the age of 10.1. Danovitch and Bloom [18] asked children whether a behavior was regarded as disgusting (Study 1 and 2) and whether a disgusting face was associated with the event in the story (Study 3). They found that 10-year-old children were more likely to label moral violation behaviors as disgusting than 6- or 8-year-old children. This suggests that children may acquire moral disgust at 10 years of age. Moreover, moral judgements in 10-year-old children develop from heteronomy to autonomy, characterized by following self-regulating principles [15], which state that interests, feelings, intentions, and values are involved in moral judgements, suggesting that moral judgement can be impacted by incidental emotion. Based on this theorizing, we predicted that only 10-year-old, but not 6-year-old, participants' moral judgements would be influenced by disgusting emotion. Finally, for 13-year-old (early adolescence) and 16-year-old participants (late adolescence), previous studies showed that moral reasoning skills and moral self-regulation constantly reinforce each other throughout the adolescence [19]. Hence, we expected that disgusting emotion would continuously influence the moral judgements after 13 years of age.

## Method

**Participants:** Four hundred and 27 (49.89% female) students from a large city in central China participated in the study. The participants represent four age groups – 6, 10, 13, and 16 years old. Equal numbers of participants were sampled from each of the four age groups and the two genders were evenly distributed across the age groups. About the same numbers of participants in each age group were randomly assigned to the neutral and disgusting emotion conditions. Table 1 contains the sampling information.

	Age Group			
	6	10	13	16

All participants	6.26 (SD = .39)	10.09 (SD = .41)	13.10 (SD = .53)	15.83 (SD = .49)
Female participants	6.25 (SD = .38)	10.07 (SD = .37)	13.08 (SD = .52)	15.73 (SD = .55)
Male participants	6.27 (SD = .39)	10.12 (SD = .46)	13.11 (SD = .54)	15.95 (SD = .39)
Sample size	110	104	102	111
M:F	54:56	52:52	53:49	55:56

**Table 1:** Participants' information.

**Stimuli:** Priming stimuli consisted of 10 images depicting pathogen (e.g., maggots, gory wounds) in the disgusting condition and 10 images depicting buildings in the neutral condition. Before the study, we asked 28 adults (13 female, age M=24.07, SD=4.59) to rate the priming stimuli in accord to their disgusting feeling in a 5-point Likert scale [1 (not at all) to 5 (very much)] (Table 2). The ratings were significantly higher for the images in the disgusting condition than those in the neutral condition,  $F(1,27) = 425.30, p < 0.001$ .

	Neutral pictures M (SD)	Disgusting pictures M (SD)
Evaluation in pilot study (range: 1-5)	1.14 (.05)	4.01 (.38)
6 years (range: 0-2)	0.47 (0.47)	1.33 (0.42)
10 years (range: 0-2)	0.26 (0.26)	1.52 (0.34)
13 years (range: 0-2)	0.23 (0.30)	1.22 (0.48)
16 years (range: 0-2)	0.19 (0.24)	1.23 (0.35)

**Table 2:** Emotion evaluation of priming pictures

We used the Chinese version of SRM-SF, originally developed by Gibbs et al. [12], as the standardized moral questionnaire. This scale consists of 11 items that assess the extent to which a participant agrees with a statement (e.g., parents keeping promises to children, judges sending people who break the law to jail). It was demonstrated to be reliable and valid in measuring one's level of sociomoral reasoning [20] and was utilized in Chinese population in previous studies [21,22].

**Procedure:** The study was conducted in a quiet computer room in school settings. The 6-year-old participants were tested in groups of 10, whereas participants in other age groups were tested in groups of 20. Each participant sat in front of an individual computer. An experimenter explained the processes and requirements of the tasks and maintained the order during the study. The distance between every two participants was between 50 cm and 1 m to avoid interference.

After participants arrived in the computer room, they were asked to fill out the demographic information such as gender and date of birth. Then, experimenter introduced the requirements of the forthcoming tasks. After that, participants were presented with priming pictures one at a time in their own computer screens and asked to judge each of them in a 3-point scale on how disgusting they felt towards the picture [0 (not at all) to 2 (very strong)]. The participants then completed the Chinese version of SRM-SF on their own computers, in which they were asked to assess how much they agreed with the statements from 0

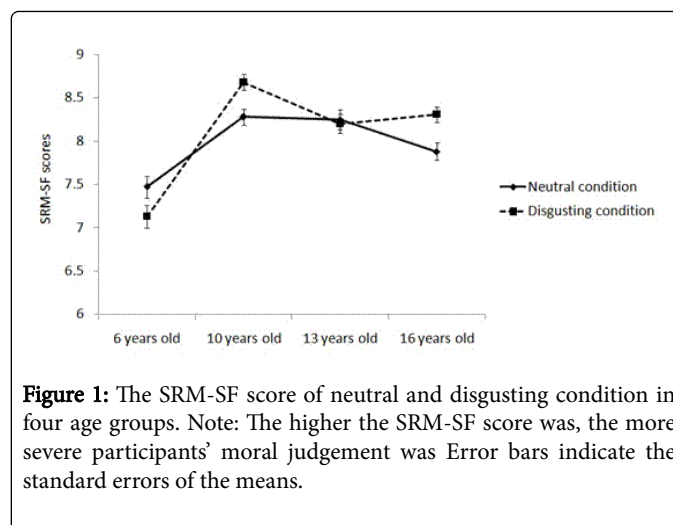
(not at all) to 10 (very much). Stimuli in all tasks stayed on the screen until participants responded.

For 6-year-old participants, because of their limited reading abilities, an experimenter read aloud the requirements and all the items in the experiment. The same content presented in a large screen at the time when experimenter read aloud the items. After participants had completed one item, they raised their hands. After all participants raised their hands, the experimenter read the next item. In the SRM-SF task, participants were told that a higher score means that they agreed with the statement more strongly. The experimenter made sure that all participants understood the concept of scoring. Throughout the study, another experimenter sat at the back of the computer room to maintain order and to answer questions.

## Results

**Prime pictures evaluation:** We excluded one participant from the analysis because the data were not captured or saved. A 2 (condition: disgusting or neutral)  $\times$  4 (age group: 6, 10, 13, or 16 years of age) ANOVA yields a significant main effect of priming conditions ( $F(1,418) = 831.41, p < .001, \eta_p^2 = 0.67$ ) and of age groups ( $F(3,418) = 8.24, p < .001, \eta_p^2 = 0.06$ ). The interaction between priming and age groups was also significant ( $F(3,418) = 5.59, p = 0.001, \eta_p^2 = 0.04$ ). The interaction effect was ordinal registering differences between disgust and neutral conditions across age groups in magnitude but not in directionality. The mean disgust ratings were higher for pictures in the disgusting condition than those in the neutral condition in participants of 6 years of age ( $F(1,107) = 101.51, p < 0.001$ ), 10 years of age ( $F(1,102) = 438.22, p < 0.001$ ), 13 years of age ( $F(1,102) = 152.19, p < 0.001$ ), and 16 years of age ( $F(1,109) = 316.80, p < 0.001$ ). The mean disgust rating of disgusting pictures in 10-year-old participants was significantly higher than the other three age groups [ $p < 0.05$ ], whereas other age-related differences did not approach significance (all  $p > 0.16$ ) (Table 2). In all of the analyses, gender registered no significant differences.

**SRM-SF:** The higher score the participants obtained, the stricter moral judgements they made. The internal consistency reliability estimate of the SRM-SF is 0.62. A 2 (condition: neutral or disgusting)  $\times$  4 (age group: 6, 10, 13, or 16 in years) ANOVA yielded a significant main effect of age group,  $F(3,419) = 22.39, p < .001, \eta_p^2 = 0.14$ , and a significant interaction effect between condition and age group,  $F(3,419) = 2.99, p = 0.031, \eta_p^2 = 0.02$ . Follow-up analyses showed that both 10- and 16-year-old participants reported higher scores in the disgusting condition compared to the neutral condition,  $F(1,102) = 4.66, p = 0.03$ , and  $F(1,109) = 5.05, p = 0.03$ , respectively, but this difference did not occur in 6- or 13-year-old participants,  $F(1,108) = 1.80, p = 0.18$  and  $F(1,100) = 0.03, p = 0.86$ , respectively [Figure 1].



**Figure 1:** The SRM-SF score of neutral and disgusting condition in four age groups. Note: The higher the SRM-SF score was, the more severe participants' moral judgement was Error bars indicate the standard errors of the means.

## Discussion

In the current study, we investigated the impact of disgusting emotion on the moral judgement across age groups. The significant differences on SRM-SF scores between the neutral and disgusting emotion condition occurred in 10- and 16-year-old participants. A stronger agreement with the statements of the SRM-SF represents more rigorous moral standard. Therefore, 10- and 16-year-old participants reported more rigorous moral standard when they were primed with disgusting emotion as compared to the neutral emotion.

Similar to the result of the previous study [9], we found that the youngest participants (i.e., 7 years old in Peng & Chang and 6 years old in our study) did not make more severe moral judgement when primed by the disgusting condition as compared to the neutral emotion condition, suggesting that the influence of disgusting emotion on moral judgements was not established in these age groups. It is possible that 6-year-old participants did not acquire moral-related disgusting emotion. Sociomoral disgust, the last category that induces disgusting emotion, typically occurs after the interpersonal contamination category that is acquired at 5 to 7 years of age [8,23-25]. Hence, sociomoral disgust was not likely fully acquired in 6-year-old participants. However, it is also possible that children in 6 years of age are still in the moral heteronomy stage [15]. That is, they make moral judgements according to external requirements, such as complying with parents' or teachers' instructions and requirements. Their internal feeling did not influence the criterion of judgement. Hence, the impact of disgusting emotion on the moral judgement does not manifest among the 6 to 7 year-old children.

In contrast to the 6-year-old counterparts, 10-year-old participants yielded higher scores in SRM-SF (i.e., using stricter moral criteria) in the disgusting condition than in the neutral condition, suggesting that the impact of disgusting emotion on moral judgements occurred in this age group. This finding is consistent with those of previous studies [11,18]. In this age group, the concepts of contamination and interpersonal disgusting were fully acquired. Moreover, their moral judgement was transformed from heteronomy to autonomy [15], such that they made judgements based on their inferences and feelings. Hence, the influence of disgusting emotion appeared in 10-year-old participants.

Contrary to our expectation that the influence of disgusting emotion would manifest after 10 years of age, our 13-year-old participants did not show any influence of disgusting emotion on moral judgements. Given that these participants have acquired adult like disgusting emotion, the absence of the relationship between disgusting emotion and moral judgement might not be attributed to their not having acquired sociomoral disgusting emotion. Rather, this finding might be due to other developmental characteristics (such as socioemotional development). It is worth noting that the 13-year-old young adolescents have in general reached puberty. The developmental changes in the dopaminergic system take place at puberty [26,27]. The dopaminergic activity is important to affective and motivational regulation that influences the processing of social and emotional information [28]. Therefore, the changes likely shape the course of socioemotional development in adolescence. Previous studies reported that scores on sensation seeking, risk preference, and reward sensitivity all increased from age 10 until mid-adolescence and declined thereafter [28]. When people seek sensation and risk, they are less likely to comply with rules and laws [28]. Hence, our 13-year-old participants did not make moral judgements more severely in the disgusting condition than in the neutral condition. It is noteworthy that the current study is the first to show the absence of the relationship between disgusting emotion and moral judgement in this age group and therefore more evidences should be sought in future studies.

The likelihood of taking risks and seeking sensation increases from childhood to adolescence and declines from adolescence to adulthood [28,29]. In the mid or late adolescence, the coordination of cognition and affect is facilitated by the maturation of cognitive control systems, fully-grown connections across cortical areas, and well-developed connections between cortical and subcortical regions. This explains why our 16-year-old participants showed influence of disgusting emotion on the moral judgement. One implication of our findings is that moral education and socialization should take into consideration that some aspects of the moral development is unnecessarily linear among children and adolescents. This less than linear development of disgust related moral judgment in part also explains why some of the existing findings that are inconsistent with linear moral development theories [30].

## Conclusion

We investigated the influence of disgusting emotion on the moral judgement in different age groups. Disgusting or neutral emotion was induced in each group, and then they were asked to complete a standardized moral questionnaire (SRM-SF). We found significant differences between neutral and disgusting condition on the SRM-SF judgement in 10- and 16-year-old participants, but not in 6- or 13-year-old participants. Consistent with our prediction, the influence of disgusting emotion on the moral judgements did not appear in 6 years old participants, but it appeared in 10-year-old and 16-year-old participants. Contrary to our expectation, there was no influence of disgusting emotion on the moral judgement in 13-year-old participants. Future studies should further examine the influence of disgusting emotion on moral judgement in adolescents.

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