

BRIEF REPORTS

Moral Elevation Can Induce Nursing

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There is little extant research on the psychological or physiological response to witnessing good deeds. The authors call the emotional reaction to virtue “moral elevation” and the authors examined its effects on mother-infant dyads. Breastfeeding women who watched a morally elevating video were more likely to nurse their infants and were marginally more likely to hug them, compared to women who watched an equally enjoyable comedy video. Both of these effects suggest that moral elevation may involve the release of oxytocin, a hormone associated with lactation and affiliation.

Keywords: oxytocin, morality, emotion, maternal behavior

Psychologists have conducted a great deal of research on the negative moral emotions, which people feel when they witness acts of cruelty, injustice, and impropriety. Yet little is known about the positive moral emotions—emotions triggered by acts of virtue (Haidt, 2003a). Thomas Jefferson believed that stories about virtuous actions can “dilate [the reader’s] breast and elevate his sentiments. . .” as well as motivate people to behave more virtuously (Jefferson, 1771, as cited in Peterson, 1975). Haidt (2003b) followed Jefferson in calling this emotional response “moral elevation.”

How might witnessing acts of virtue cause physical and emotional feelings? The hormone oxytocin is a candidate. Oxytocin, which is synthesized in hypothalamic nuclei, as well as in organs located in the chest such as the heart and thymus (Carter, 2003), affects the vagus nerve, which modulates cardiac activity and the parasympathetic nervous system. Circulating oxytocin levels rise when people receive signals of trust (Zak, Kurzban, & Matzner, 2005), and elevated levels of oxytocin in turn cause greater willingness to trust (Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005). Because of these suspected effects of oxytocin—responsiveness to a kind of virtuous action, motivation of a kind of virtuous response—and the known activity of oxytocin at several locations in the chest, we investigated the possibility that oxytocin was part of a physiological system underlying Jefferson’s observation that stories about virtuous behavior can trigger physical feelings in the chest and can motivate virtuous behavior. To avoid the possibility that drawing blood to measure oxytocin levels

might interfere with subtle feelings of elevation, we relied upon a less intrusive index of oxytocin secretion: lactation. Oxytocin facilitates maternal processes including birth and parent-infant bonding. Additionally, it is the principal hormone that triggers milk letdown (Gabay, 2002) and accordingly is released in its highest concentrations just before breastfeeding (Carter et al., 2007). We therefore tested the hypothesis that breastfeeding women who experience moral elevation would be more likely to secrete milk, nurse their children, and interact with them warmly, compared to women who watched an equally enjoyable but non-elevating video.

Method

Participants

We recruited 42 mothers via email announcements to local parents’ groups in Charlottesville, Virginia. Mothers came to the lab individually, each with one child, and were randomly assigned to one of two video conditions. All mothers reported that their children had been breastfed exclusively or primarily since birth. One-way ANOVAs revealed no significant differences between groups in the ages of the children (Elevation $m = 7.57$ months, Amusement $m = 7.43$ months, $F(40) = .008$, $p = .931$) or in the number of hours that the mothers reported had elapsed since the child’s last feeding (Elevation $m = 1.62$ hours, Amusement $m = 1.56$ hours, $F(40) = .016$, $p = .899$). Mothers were paid \$15 for their participation.

Procedure

Participants (mothers) were seated in a 2 m × 5 m area within a larger lab room, separated by a black curtain surrounding the perimeter. At one end of the curtained area was a comfortable reclining chair. At the other end was a 37-in (diagonal measurement) CRT TV set. A female experimenter explained that the study concerned the question of how breastfeeding women responded emotionally to different types of videos. The experimenter explained that the mother would be videotaped, and showed the

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mother how to turn off the video camera if she wanted to at any time (no mother did). All mothers consented to being videotaped and to wearing nursing pads (disposable cotton pads worn by breastfeeding women to absorb accidental milk leakage) during the experiment. The pads were weighed before and after mothers wore them to determine whether milk was leaked.

When the mother had finished the first page of a 5-page questionnaire packet, inserted her nursing pads, and settled in with her child in her lap, she called out to the experimenter on the other side of the curtain, who pressed a button on a DVD player to begin the first of two video clips. All mothers first watched a 5-min emotionally neutral video clip from a documentary about how roads are built. Viewing this video allowed time for mother and child to settle in and reach a baseline level of interaction. After this "neutral" video clip was over, mothers were asked to turn to the second page of the questionnaire and answer questions about their reactions to the video clip. When the mother called out that she was finished, the experimenter pressed a button to begin playing the second video clip, which was the experimental manipulation.

Mothers in the elevation condition ($n = 22$) watched a 7-min clip from an episode of *The Oprah Winfrey Show* in which a musician pays tribute to his mentor and former music teacher, who had saved him from a life of gang activity and violence. Mothers in the amusement condition ($n = 20$) watched a 7-min clip from the commercial video *Jerry Seinfeld: I'm telling you for the last time*. The clip presented Seinfeld's musings on the ironies of supermarkets, dry cleaning, and drug warning labels. We chose amusement as our comparison to control for the known effects of positive emotions in facilitating positive social interactions (Fredrickson, 2001).

When the manipulation video ended, the experimenter instructed the mother to fill out the remaining two sheets of the questionnaire packet, which asked about emotional and bodily reactions to the manipulation video. When the mother had completed the questionnaire packet, she passed it through the flaps of the curtain. The experimenter then said that she had to leave the room for a few minutes to "get another form" for the mother to fill out. In fact, the experimenter left the room for 5 min to allow for a period of unstructured interaction between mother and child that could be later coded for emotional warmth and touch. When the experimenter returned and opened the curtain, she instructed the mother to place her nursing pads into a plastic bag, and she debriefed the participant.

Results

We analyzed three kinds of data to examine the effects of moral elevation: self-reported feelings, lactation-related behavior, and nurturant behavior coded from the videotapes.

Self-Reports

The mothers' responses on the questionnaires confirmed that we succeeded in matching the two videos on overall levels of positive affect and interest. Mothers had rated their moods after the neutral video, and again after the manipulation, on 100-point scales (anchors: 0 = "the worst you've ever felt," and 100 = "the best you've ever felt"). Mood increased in both conditions by an average of 6 points (up from 77 in the

Table 1
Self-Reports of Overall Ratings and of Eight Emotions Felt While Watching the Elevation and Amusement Videos

	Elevation	Amusement	t
Overall ratings (mean)			
How pleasant?	6.05	6.05	0.02
How interesting?	5.59	5.80	0.63
How emotionally affecting?	5.32	4.95	0.93
Emotion Ratings (mean)			
Touched/inspired	5.86	1.75	10.40***
Amused	2.24	6.05	9.06***
Happy/joyful	5.19	5.60	1.26
Calm/content	5.24	4.80	1.07
Sad	2.30	1.20	3.33**
Angry	1.00	1.30	1.45
Disgusted	1.05	1.05	0.0
Afraid	1.00	1.00	0.0

Note. Ratings were made on 7-point scales anchored at 1 = "not at all" and 7 = "extremely". $df = 40$. * $p < .05$, ** $p < .01$, *** $p < .001$

elevation condition and from 78 in the amusement condition). Mothers used 7-point scales to make a variety of ratings about each video (anchors: 1 = "not at all", 7 = "extremely"). The top section of Table 1 shows that there were no differences in how pleasant, interesting, and emotionally affecting the elevation and amusement videos were perceived to be.

After these overall ratings, mothers were given a checklist of nine bodily sensations (plus a space to write in others) and were asked to check all that they had felt while watching the manipulation video. Table 2 shows that mothers in the elevation condition were more likely than mothers in the amusement condition to report "tears/crying" and "chills/goosebumps/tingling on skin." Mothers in the elevation condition were less likely to report "laughter." (Only 9% of elevation participants and 15% of amusement participants added their own thoughts on the blank line, and these additions were generally synonyms of the items already in the checklist.)

Next, participants were asked about their emotional responses to the video. The bottom portion of Table 1 shows that the elevation and amusement videos elicited the predicted patterns of specific emotion ratings. The elevation video elicited its highest ratings on "touched/inspired," while the amusement video elicited its highest ratings on "amused." The only other significant difference between the videos was that the elevation video elicited higher (though still low) levels of "sad" ratings. Participants' free responses confirmed this pattern. Just before they had rated the emotions shown in Table 1, participants were asked to describe in their own words the feelings, if any, that the video had given them. The most common response among women in the elevation condition was "inspired" (36.4%) while the modal response for women in the amusement condition was "humor" (60%).

Lactation-Related Behavior

After each mother left the experiment, her nursing pads were sealed in a plastic bag and weighed on a digital scale. Only 5 women's pads changed weight. All five changes were increases, and all 5 women were in the elevation condition, $\chi^2(1, N = 42) = 5.16, p = .023$. We next determined which women had nursed or

Table 2
Percent of Women Reporting Each Physical Symptom While
Watching the Elevation and Amusement Videos

Physical symptom	Elevation	Amusement	χ^2
Tears/crying	32	0	7.64**
Smiling	77	95	2.69
Warm or pleasant feeling in chest	55	50	.09
Chills/goosebumps/tingling on skin	18	0	4.02*
Lump or tightness in throat	9	10	.01
Feelings in stomach	0	0	n.a.
Uterine contractions	0	0	n.a.
Feelings in breasts	22	25	.03
Laughter	9	95	30.93***
Other	9	15	.35

Note. Significance tested by chi-square statistic with $df = 1$, $n = 42$. * $p < .05$, ** $p < .01$, *** $p < .001$. n.a. = not applicable; no test could be performed because there was no variance.

attempted to nurse their children after the emotion-inducing video began. We excluded 5 women from this analysis because they were already nursing their children at the start of the emotion-inducing video, and one more for whom we had an incomplete videotape. Of the remaining 20 women in the elevation condition, nine (45%) commenced nursing after the emotion-inducing video began, as compared with 2 of the remaining 16 women in the amusement condition (13%), $\chi^2(1, N = 36) = 4.43, p = .035$. These results indicate that the moral elevation video caused a change in the mother that made her more likely to initiate nursing. (We cannot know, however, if the video stimulated milk letdown, which led the mother to initiate nursing, or if the video triggered other feelings that led the mother to initiate nursing, which in turn stimulated milk letdown.)

Nurturant Behavior

To examine changes in behavior, four coders (blind to condition) watched all tapes of the unstructured interaction period and coded the five most common interactive behaviors that mothers showed. Coders worked independently and rated the presence or absence of five specific behaviors on a trinary scale: 0 = behavior not at all present; 1 = behavior occurs just once or twice, or only weakly; and 2 = behavior is clearly and abundantly present. Discrepancies were worked out by consensus afterward. We calculated interrater reliability using each coder's original ratings. Because each coder and each mother were independent, we used the two-way random effects model in the statistical package SPSS to calculate intraclass correlation coefficients, which ranged from .87 to .91 for the five behaviors coded. We found no differences or trends on the three most common behaviors: talking to child ($t = 1.07$), smiling at child ($t = .56$), or close face-to-face interaction ($t = .06$).

Taylor et al. (2000) suggest that the most likely effect of oxytocin would be an increase in physical contact. We coded two such behaviors: kissing and hugging. Rates of kissing the child were no different across conditions (elevation $m = .76$, amusement $m = .83, t = .25, ns$). However, hugging, the behavior that best

expresses a desire for close physical contact, received marginally higher ratings in the elevation condition ($m = .52$) than in the amusement condition ($m = .17, t = 1.97, p = .056$). Mothers were more likely to hug their children in the 5 min after watching an elevating video than in the 5 min after watching an equally positive amusement video.

Potential Confounds

We did not have enough participants to run a mediation analysis, but we tried to determine what might have caused increased lactation in the elevation condition. One potential confound was the greater presence of tears and chills among elevation participants. Crying is associated with sympathetic arousal (Gross, Fredrickson, & Levenson, 1994; Rottenberg, Willhelm, Gross, & Gotlib, 2003), and may be part of a physiological stress response. Stress is associated with oxytocin release in women (Nishioka et al., 1998; Taylor et al., 2000; Heinrichs & Gaab, 2007). Therefore it is possible that elevation caused some mothers to cry, and that lactation was an incidental downstream effect of crying, rather than a response to feelings of elevation per se. To examine this possibility we divided the mothers in the elevation condition into those that cried and those that did not. Of the 7 women who cried, only two (29%) initiated nursing after the manipulation began. Of the 15 women who did not cry, seven (47%) initiated nursing after the manipulation began. This difference is not nearly significant, and its direction suggests that crying did not make nursing more likely.

We performed the same analysis for chills. The physiological substrate of chills is not known, but a handful of studies that induced chills with emotional music (Blood & Zatorre, 2001; Guhn, Hamm, & Zentner, 2007) have found chills to be associated with an increase in skin conductance, suggesting the same possible association with a stress response as in the case of crying. Yet the pattern for chills in our data was the same nonsignificant trend as was found for tears: only 1 of the 4 women who reported chills began nursing her child after the elevation video began, while 8 of the 16 women who did not report chills began nursing after the elevation video began.

Discussion

Mothers who watched a video that induced moral elevation were more likely to leak milk into a nursing pad, nurse their children, and hug their children, as compared with mothers who watched an equally enjoyable video that induced amusement. This finding suggests a possible physiological mechanism—oxytocin—underlying Jefferson's claim that hearing stories about virtuous actions can cause physical and emotional feelings. We stress, however, that our finding is a preliminary one, and our hypothesis that oxytocin played a mediating role was supported only indirectly. In particular, we did not draw blood to examine oxytocin levels before and after exposure to the videos. We hope that our results will encourage others to collect such direct measures. Furthermore, because of the difficulty of subject recruitment, our sample size was not large, and we ran only one control group. We chose an active control condition—amusement—and we succeeded in matching the two videos on how pleasant, interesting, and emotionally affecting they were. Nonetheless, it is at least

theoretically possible that the amusement video suppressed nursing, rather than that the elevation video increased it. Future researchers might include an emotionally neutral control condition to rule out this possibility.

We also note that the relationship between oxytocin and emotions in humans is complex and is not yet well understood. Several studies have found that oxytocin has a relaxing effect and reduces the negative emotional state of anxiety (Uvnas-Moberg, 1997; Uvnas-Moberg, Arn, & Magnusson, 2005; Scantamburlo et al., 2006). However, with regard to positive emotions, some studies have found that oxytocin increases positive emotions (Uvnas-Moberg, 1998), while one study found that positive emotions decrease oxytocin levels (Turner et al., 2002). We note further that it is not entirely clear that elevation is a uniformly positive emotion. Participants in the elevation condition reported high levels of positive emotions, and their moods increased by the same seven-point increment as did participants in the amusement condition. Yet in this study, as in our other unpublished research, we find that elevation elicits some reports of sadness, and some physical symptoms such as crying that are typically associated with negative emotion (e.g., sadness, distress). Likewise, we have found previously that elevating videos (including the music teacher video used in this study) produce a decrease in respiratory sinus arrhythmia, indicative of a reduction in vagal tone (Sherman, Oveis, Haidt, & Coan, n.d.), a response that seems on its face paradoxical if elevation is a positive emotion related to feelings of calmness. We suspect that elevation, while hedonically positive, might involve some underlying physiological systems that are part of the stress-related “tend-and-befriend” response described by Taylor et al., (2000). The “tend-and-befriend” response is believed to be a characteristic response to stress by women, not men, and is believed to be mediated in part by oxytocin. Our current findings are consistent with the notion that elevation induces “tender” feelings which are related, physiologically, to “tending and befriending.”

Finally, we note that lactation is a complicated phenomenon and is mediated by numerous psychological factors (e.g., stress, attachment) and neuroendocrinological pathways (e.g., prolactin as well as oxytocin; central as well as peripheral effects of oxytocin). Though we focused our thinking on peripheral oxytocin because of its known responsiveness to signs of virtue and its known effects on milk letdown, we assume that the full story of emotion-mediated nursing is much more complex. In particular, we cannot tell from our data whether feelings of moral elevation triggered the release of oxytocin which triggered milk letdown as well as desires to nurse and to touch (as we had predicted), or whether feelings of elevation triggered desires for physical contact with beloved children by some other mechanism, and the child’s suckling then stimulated milk letdown. Either way, oxytocin is a candidate mediator, but it likely plays a role in conjunction with many other hormones and cognitive mechanisms. (e.g., Heinrichs et al., 2001, found that suckling produces a short-term suppression of the cortisol response to stress, and an increase in circulating prolactin).

In conclusion, despite its limitations, we believe this study is the first to demonstrate that moral elevation, the emotional response to virtue identified long ago by Thomas Jefferson, may have measurable physiological and behavioral effects. Shakespeare’s phrase

“the milk of human kindness” (MacBeth, I, v, 17) may be more than just an evocative metaphor. Witnessing acts of kindness may indeed cause—directly or indirectly—nursing mothers to release milk.

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