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## EFFECTS OF INTENTIONALLY ENHANCED CHOCOLATE ON MOOD

Dean Radin, PhD,<sup>1#</sup> Gail Hayssen,<sup>1</sup> and James Walsh<sup>2</sup>

**Objective:** A double-blind, randomized, placebo-controlled experiment investigated whether chocolate exposed to “good intentions” would enhance mood more than unexposed chocolate.

**Design:** Individuals were assigned to one of four groups and asked to record their mood each day for a week by using the Profile of Mood States. For days three, four and five, each person consumed a half ounce of dark chocolate twice a day at prescribed times. Three groups blindly received chocolate that had been intentionally treated by three different techniques. The intention in each case was that people who ate the chocolate would experience an enhanced sense of energy, vigor, and well-being. The fourth group blindly received untreated chocolate as a placebo control. The hypothesis was that mood reported during the three days of eating chocolate would improve more in the intentional groups than in the control group.

**Subjects:** Stratified random sampling was used to distribute 62 participants among the four groups, matched for age, gender, and amount of chocolate consumed on average per week. Most

participants lived in the same geographic region to reduce mood variations due to changes in weather, and the experiment was conducted during one week to reduce effects of current events on mood fluctuations.

**Results:** On the third day of eating chocolate, mood had improved significantly more in the intention conditions than in the control condition ( $P = .04$ ). Analysis of a planned subset of individuals who habitually consumed less than the grand mean of 3.2 ounces of chocolate per week showed a stronger improvement in mood ( $P = .0001$ ). Primary contributors to the mood changes were the factors of declining fatigue ( $P = .01$ ) and increasing vigor ( $P = .002$ ). All three intentional techniques contributed to the observed results.

**Conclusion:** The mood-elevating properties of chocolate can be enhanced with intention.

**Key words:** Intention, nutrition, mood, chocolate, mind-matter interaction

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## INTRODUCTION

Why does homemade chicken soup taste better than the same soup purchased at a restaurant or scooped out of a can? Proposed explanations range from the serious<sup>1</sup> to the humorous.<sup>2,3</sup> Among the serious reasons, one contributor is undoubtedly the nurturing association between home and food. Another might be an ingredient missing from both the restaurant and the soup can—the role of good intentions. Parental love and caring are known to be significant predictors of a child’s future health.<sup>4,5</sup> Is it conceivable that such factors may also be subtle “ingredients” in food?<sup>6,7</sup> Most cultures have maintained the belief that spells, prayers, or intentions can be mentally imprinted into substances, which if ingested, would help bring about those intentions. The act of blessing water, wine, and bread still plays a central role in many religious rituals, and even in secular contexts the practice of toasting or offering special salutes with food or drink is universal.<sup>8</sup>

Occasionally, consuming blessed food or water is said to result in remarkable healings.<sup>9(pp11-16,99-104)</sup> The conventional explanation for such reports is that *belief becomes biology*, that is, that any such healings are due to the placebo effect.<sup>10</sup> But given that

the means by which belief becomes biology are not well understood, one wonders whether food exposed to good intentions might play a role. Such intentional effects would presumably require the existence of a form of direct mind-matter interaction (MMI). Experiments investigating MMI have studied systems ranging from random events<sup>11-14</sup> to the structure of water,<sup>15</sup> growth of cells in vitro,<sup>16</sup> and human physiology and health.<sup>17-20</sup> Cumulatively, the empirical evidence supports the plausibility that MMI phenomena do exist.<sup>21</sup>

From an orthodox scientific perspective, the idea that physical effects may be associated with focused intention is dismissed as a vestige of primitive beliefs about sympathetic magic. From that framework, any evidence presented in favor of MMI must necessarily be regarded as flawed. But there is at least one aspect of traditional magic, so-called *contact magic*, that deserves a second look. As described by Frazer in the early 20th century classic, *The Golden Bough*, contact magic involves objects “which have once been in contact with each other [and] continue to act on each other at a distance after the physical contact has been severed.”<sup>22</sup> If we substitute the word *object* for electron, then Frazer’s definition is virtually identical to the modern physical phenomenon of quantum entanglement,<sup>23-25</sup> which is now accepted as a demonstrable fact in microscopic and a growing number of macroscopic systems.<sup>26-29</sup>

Similarities between ancient beliefs about contact magic and the modern phenomenon of quantum entanglement raise the possibility that, like other ethnohistorical medical therapies once dismissed as superstition—eg, the use of leeches<sup>30</sup> and mag-

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gots<sup>31</sup> in medicine—some practices such as blessing food may reflect more than magical thinking or an expression of gratitude. As William James put it in 1897,

In psychology, physiology, and medicine, whenever a debate between the mystics and the scientifics has been once and for all decided, it is the mystics who have usually proved to be right about the facts, while the scientifics had the better of it in respect to the theories.<sup>32</sup>

James' observation prompted us to investigate the possibility that under placebo-controlled conditions, intentions directed toward food might be detectable by monitoring mood changes in people who consume that food. Chocolate was used for the test substance partially because it is the most craved food in the world,<sup>33</sup> and also because of its mild psychoactive properties, principally methylxanthine and its constituents, caffeine and theobromine. These stimulants, combined with the sensory pleasures associated with chocolate's bittersweet taste, creamy texture, and sensuous aroma, are known to produce short-term elevations in mood.<sup>34-37</sup> This experiment investigated whether these known mood enhancements could be further elevated through the use of intention.

## METHOD

### Participants

The study was designed for 60 participants, 15 to be assigned to each of four groups. Most of the recruited individuals lived in the San Francisco Bay Area. They learned about the study from the first two authors at lectures and meetings and through family friends and business associates. Each potential participant filled out a questionnaire that inquired about allergies to nuts or other foods, any adverse reactions to eating chocolate, whether mood-altering medications were presently being taken, the amount of chocolate consumed in an average week, and gender and age. Affirmative answers to any of the first three questions excluded the volunteer from the test.

The purpose of the experiment was described to all participants, including that they would be randomly assigned either to receive a small amount of either intentionally treated or untreated dark chocolate (68% cacao). All of the chocolate originated from the same commercial source, Hawaiian Vintage Chocolate (Honolulu, Hawaii). The intention was described as: "An individual who consumes this chocolate will manifest optimal health and functioning at physical, emotional and mental levels, and in particular will enjoy an increased sense of energy, vigor and well-being." The means by which intentions would be used to create the treated chocolate were not described in the recruitment materials. Those who agreed to participate, a total of 75 people, signed an informed consent. Stratified random sampling was then used to create four groups, matched by gender, average age, and amount of chocolate consumed per week.

Prior to the experiment, participants received a packet containing a personality questionnaire, seven copies of a mood questionnaire, and six half-ounce packages of dark chocolate. They were instructed to fill out the personality questionnaire on day one of the test, and later that evening to fill out the first

mood questionnaire based on their mood over the course of that day. On day two in the evening, they filled out the second mood questionnaire. On days three through five, they were asked to eat one half-ounce package of chocolate at 10 AM and another at three PM, and then in the evening to fill out the mood questionnaire. They were requested not to gulp down the chocolate, but to mindfully savor each piece.

Three days of chocolate consumption were planned to avoid possible desensitization effects. On the evenings of days six and seven, they also filled in the mood questionnaire, and then they mailed or brought the completed questionnaires to the investigators. Shortly thereafter, participants who completed the experiment received a summary of their personality questionnaire results along with \$20 in compensation for their time. About a month later, they also received a summary of the experimental results and the identity of the group to which they were assigned.

Chocolate was consumed three days in a row because of the expectation that intentional effects on mood might be small and thus require a repeated application of the treatment to show an effect. The primary effect was specifically predicted to appear on the third day of eating chocolate, based on results of an earlier experiment involving intention repeatedly applied to cell cultures *in vitro* over three days.<sup>16</sup>

### Mood and Personality Measurements

To measure daily mood, the Profile of Mood States (POMS Brief Form, MHS Inc, Toronto, Canada) was used.<sup>38,39</sup> Profile of Mood States is a self-report questionnaire that measures six factors associated with mood: tension, depression, anger, vigor, fatigue, and confusion.<sup>40</sup> The POMS Brief Form consists of 30 adjectives describing feeling and mood states, which are answered on a five-point scale ranging from "not at all" to "extremely." An overall score for mood disturbance can be calculated from the six factors by subtracting the score obtained for the factor of vigor from the sum of the other five subscales. Mood improvement in this scale is thus represented by lower values.

Because of a known correlation between mood and neuroticism,<sup>41,42</sup> participants filled out the NEO Five-Factor Inventory (NEO Personality Inventory-Revised, Form S, Psychological Assessment Resources, Inc, Lutz, Florida) on the first day of the test. The NEO provides five factors of personality, including neuroticism. If the expected mood-neuroticism correlation was observed, then neuroticism would be used as a covariate in the statistical analyses.

### Intentional Treatment Methods

The three intentional imprints were produced by (1) a pair of experienced meditators, (2) an electronic device imprinted by six experienced meditators, and (3) a ritual performed by a Mongolian shaman. The third author (J.W.) supervised the first two imprinting sessions, and the first and second authors (D.R., G.H.) supervised the third session. In the first case, the meditators were a pair of senior monks from the Deer Park Buddhist Center in Wisconsin, headed by the Venerable Geshe Lhundub Sopa, a lifelong teacher of the Tibetan Buddhist tradition. The meditators read the intention aloud and then for 20 minutes attempted to mentally impress those intentions into samples of chocolate placed between them.

**Table 1.** Number of Participants in the Four Conditions

Condition	Female	Male	Total
Control	11	6	17
Device	10	4	14
Shaman	10	4	14
Meditators	12	5	17
Total	43	19	62

The second method involved six meditators from the Deer Park Buddhist Center, including the Venerable Geshe Sopa. He and five other monks chanted in front of an electronic device while holding the assigned intention in mind. This device's design was based on the concept of an *intention-imprinted electrical device*, which can purportedly record an intention and later play it back, and thereby influence physical systems in the vicinity. To date, the majority of the experimental evidence for this device has been reported by Tiller and colleagues.<sup>43-46</sup> Independent replications of the concept have proven to be difficult,<sup>47</sup> but we nevertheless decided to test the idea by using a new electronic circuit design based on Tiller's publications. After 30 minutes of running the device in record mode during the chanting, it was turned off and later played back continuously for five days inside a Faraday cage along with samples of chocolate.

The third method was a ritual performed by Mongolia shaman Zorigtbaatar Banzar, chief shaman of the Shid-Boo Shaman Center, Ulaanbaatar, Mongolia. After an interpreter explained the purpose of the intentional imprinting to Banzar, he proceeded to conduct an hour-long ritual involving sacred songs, chants, and drumming. This took place at the first author's (D.R.) laboratory. The treated chocolate was then shipped to the third author (J.W.) for further preparation.

The third author (J.W.) packaged each set of chocolate samples, by condition, in half-ounce packets wrapped in aluminum foil. Each packet was identified by a randomly selected letter, A to D, to keep the first two investigators blind to the treatment conditions. He then mailed all treated and control chocolate packages to the second author (G.H.), who distributed it to the participants.

### Statistical Analyses

Analysis 1 examined the correlation between the NEO factor of neuroticism and the average level of reported mood disturbance. If this correlation was positive, as expected, then a repeated measures analysis of covariance (ANCOVA) would be employed for the remaining analyses, with the NEO neuroticism score used as the covariate and mood disturbance as the dependent variable. If the neuroticism score was not significantly correlated with mood, then a repeated measures analysis of variance would be used.

Analysis 2 examined the overall effect of mood disturbance over the course of the week. This was predicted to drop, partially in response to the placebo effect evoked by participating in this experiment, but also because of the psychoactive properties of consuming chocolate.

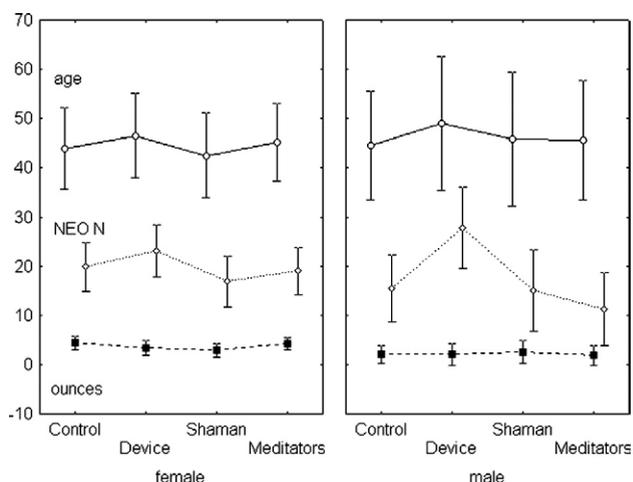
Analysis 3 tested the hypothesis that mood in the intentional condition would improve over the three days in which chocolate was consumed, as compared with the same measures in the control condition, especially on the third day on which chocolate was consumed (day five of the week). This was evaluated by examining the day  $\times$  condition interaction and by a planned *t*-test between mood in the treated and control conditions on day five.

Analysis 4 examined the intentional hypothesis in a subset of people who did not habitually consume much chocolate. This partition was planned in advance based on the expectation that people not used to eating chocolate would be more sensitive to its psychoactive properties and might therefore be more sensitive to the proposed intentional effects. As in Analysis 3, this test examined the day  $\times$  condition interaction and the treated versus control difference in mood on day five.

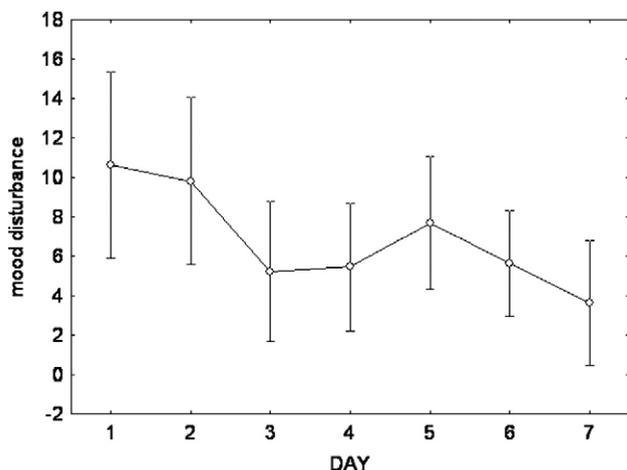
## RESULTS

The experiment took place from Sunday, October 8, through Saturday, October 14, 2006. Of 75 people initially recruited, all but three lived in the San Francisco Bay Area; this helped to reduce variance in mood due to fluctuations in local weather. Of the initial recruits, 62 completed all phases of the study and were included in the final analyses. Of them, 60 lived in the San Francisco Bay Area.

Table 1 shows the number of participants in each group and Figure 1 shows key demographics by gender. There were more female participants overall, and due to dropouts a few more people ended up in the control and meditator-treatment conditions. These participants reported that they consumed from 0 to 10 ounces of chocolate per week (average 3.2 ounces), and their average NEO neuroticism score ranged from 3 to 44 (average, 18.8). The average neuroticism scores for males in the device-treatment condition were somewhat higher than in the other conditions, but none of the differences within or across gender were significant.



**Figure 1.** Average age, NEO neuroticism scores, and ounces of chocolate consumed by participants in the four conditions, separated by gender, with 95% confidence intervals.



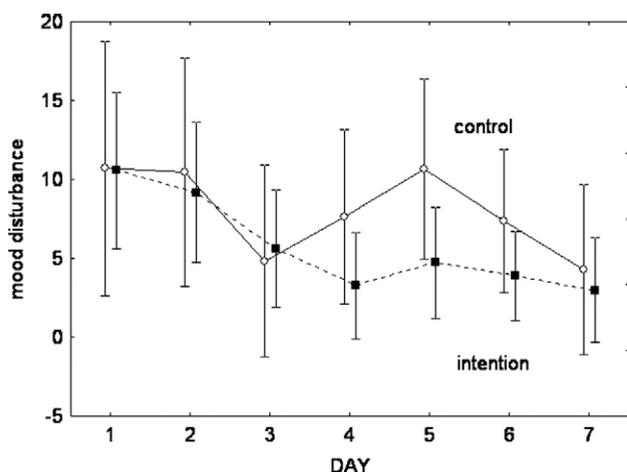
**Figure 2.** Grand average mood disturbance scores over the course of the experimental week, with 95% confidence intervals. The downward trend indicates overall improvement in mood. A Tukey HSD post hoc test shows that improvement from day 1 to 7 is associated with  $P = .00005$ .

### Analysis 1: Neuroticism-Mood Correlation

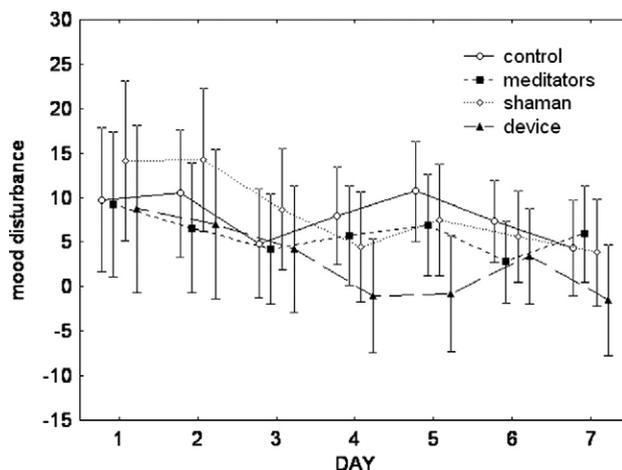
As expected, NEO neuroticism positively correlated with average mood disturbance ( $r = 0.48$ ,  $t(60) = 4.21$ ;  $P = .00009$ ). As a result, all succeeding analyses were based on an ANCOVA with neuroticism as a covariate.

### Analysis 2: Mood $\times$ Day Interaction

This analysis indicated a general improvement in mood over the course of the test week, as expected ( $F(6, 354) = 2.75$ ;  $P = .01$ ; Figure 2). A Tukey honestly significant difference (HSD) post



**Figure 3.** Average mood disturbance scores for the control condition and three intention conditions combined, with 95% confidence intervals. In accordance with the hypothesis, mood began to improve in the intention versus control condition on the second day of eating chocolate and significantly improved on the third day (day five;  $P = .04$ ; one-tailed). Mood results are shown for each day of the week to provide context for the three days of interest.



**Figure 4.** Average mood disturbance scores for the control condition and three intentional conditions, with 95% confidence intervals. An analysis of covariance on the three days in which chocolate was consumed (days three to five) showed a marginally significant difference ( $P = .09$ ) in accordance with the hypothesis.

hoc analysis showed that, as compared with day one, mood improved on the first day of eating chocolate, day three ( $P = .009$ ), and on day four ( $P = .0008$ ), day six ( $P = .002$ ), and day seven ( $P = .00005$ ).

### Analysis 3: Mood $\times$ Condition Interaction

Chocolate consumed on days three through five resulted in different levels of mood disturbance ( $F(2, 118) = 3.04$ ;  $P = .05$ ; Figure 3). This was primarily due to improved mood in the intention condition versus control condition on day five: ( $t(60) = -1.76$ ;  $P = .04$ , one-tailed). A Tukey HSD post hoc analysis showed that, as compared with day one, mood in the intentional condition on days four, six, and seven significantly improved ( $P = .003$ ;  $P = .01$ , and  $P = .001$ , respectively); no significant changes in mood were observed in the control condition.

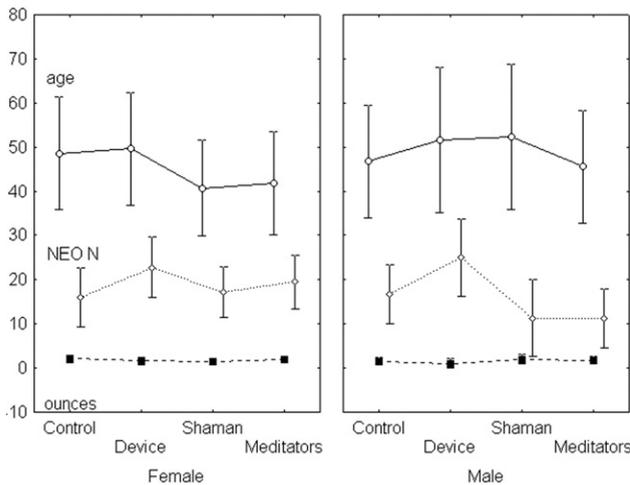
Analysis of mood  $\times$  intention split by condition for the three days of interest resulted in a nonsignificant difference in mood disturbance ( $F(6, 114) = 1.88$ ;  $P = .09$ ; Figure 4). Only the device treatment versus control comparison resulted in a significant difference on day four ( $t(29 df) = -2.12$ ;  $P = .002$ ) and day five ( $t(29 df) = -2.66$ ;  $P = .007$ ).

### Analysis 4: Subset of Chocolate-Sensitive Participants

Table 2 shows the number of participants in each group and

**Table 2.** Subset of Participants Who Consumed Less Than the Grand Mean Amount of Chocolate Per Week

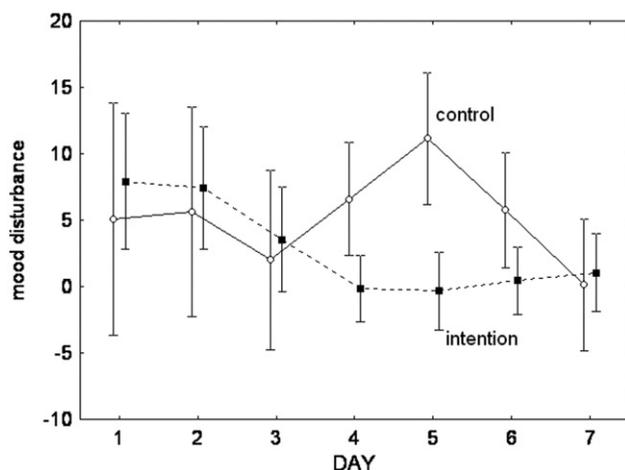
	Female	Male	Total
Control	5	5	10
Device	5	3	8
Shaman	7	3	10
Meditators	6	5	11
Total	23	16	39



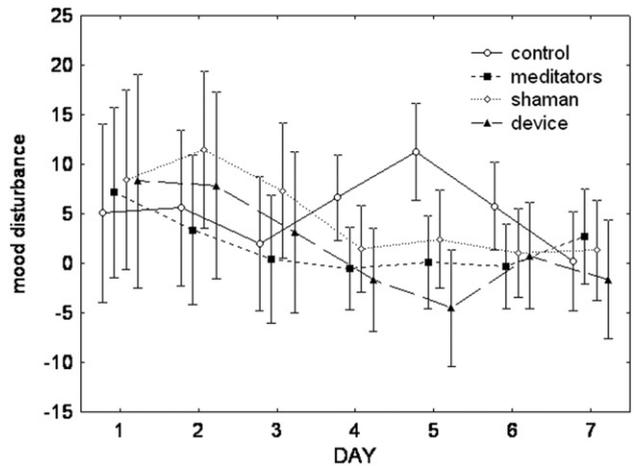
**Figure 5.** Average age, NEO neuroticism scores, and mean ounces of chocolate consumed by participants in the low chocolate-consumption subset, separately by gender, with 95% confidence intervals.

Figure 5 shows key demographics for participants who habitually consumed less than the grand mean of 3.2 ounces per week.

For this participant subset, the treatment  $\times$  control interaction was significant ( $F(6, 216) = 3.50; P = .003$ ; Figure 6). Mood in the intention condition was significantly better than in the control condition on day four ( $t(37 df) = -2.77; P = .004$ ) and much better on day five ( $t(37 df) = -4.02; P = .0001$ ). A Tukey HSD post hoc analysis showed that, as compared with day one, mood in the intentional condition on days four through six had improved ( $P = .009, P = .006$ , and  $P = 0.02$ , respectively); by comparison, no significant changes in mood disturbance occurred in the control condition.



**Figure 6.** Average mood disturbance scores for the control and intention conditions combined, for the subset of chocolate-sensitive participants, with 95% confidence intervals. Compared with the control condition, mood substantially improved in the intention condition on day four ( $P = .004$ ) and day five ( $P = .0001$ ).



**Figure 7.** Average mood disturbance scores for the control condition and three intention conditions, separately, for the chocolate-sensitive subset, with 95% confidence intervals. On day five, all three intention conditions showed significant improvements in mood as compared with the control, the largest improvement occurring in the device condition ( $t(16 df) = -4.17; P = .0004$ ).

These data split by intentional condition showed a significant interaction ( $F(6, 68) = 2.47; P = .03$ , Figure 7), principally due to differences on day five. Compared with the control condition, all of the intentional conditions on day five showed significant differences: device  $t(16 df) = -4.17; P = .0004$ , shaman  $t(18 df) = -2.58; P = .009$ , and meditators  $t(19 df) = -3.32; P = .002$ .

#### Analysis 5: Post Hoc Analysis of Mood Factors

Which of the six mood factors contributed most to the outcomes observed in Figure 7? Recall that the experimental intention was that persons eating the treated chocolate would “enjoy an increased sense of energy, vigor, and well-being.” If those particular intentions manifested more than other factors associated with mood, then we might expect that the POMS factors of fatigue and vigor would be the primary contributors. As shown in Table 3, this was the case.

**Table 3.** Analysis of POM Factors<sup>a</sup>

POMS Factor	F(6, 216)	P Value	T (Day 5)	P Value
Anger	0.87	.52	0.19	.58
Confusion	1.04	.40	-1.51	.07
Tension	1.39	.22	-0.75	.23
Depression	1.41	.21	-1.52	.07
Fatigue	2.80	.01	-2.06	.02
Vigor	3.59	.002	1.59	.06

POMS, profile of mood states.

<sup>a</sup>Analysis of covariance of each POMS factor over seven days and  $t$  score of the difference between each factor and the control condition on day five.  $P$  values are one-tailed. Mood improvement for the first five factors is reflected in the  $t$ -test as a negative value and as a positive value for the factor of vigor.

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## DISCUSSION

This experiment supports the ethnohistorical lore suggesting that the act of blessing food, with good intentions, may go beyond mere superstitious ritual—it may also have measurable consequences. From a modern perspective, this is an unexpected outcome, so it is prudent to first reconsider more conventional possibilities. For example, if participants knew which condition they were in, then these results could be explained by ordinary expectation effects. To avoid that bias, expectation was controlled through the use of a double-blind, placebo-controlled design. Perhaps the outcome was due to a statistical fluke? The overall intention versus control difference on day five resulted in a modest  $P = .04$ , which is not particularly persuasive. However, the same comparison for the preplanned subset of people who did not habitually eat much chocolate resulted in  $P = .0001$ . This is no longer easily attributable to chance, even given the small sample size of the experiment. Other conventional explanations do not readily come to mind.

One unconventional explanation is that intention influenced the biochemistry of chocolate in some way. Assessing the plausibility of this explanation will require future experiments focused on objectively measuring differences between treated and untreated chocolate. Another unconventional explanation, one that does not require intentional influence, is that the participants were fortuitously assigned to the four conditions by the experimenters in just such a way as to cause the final outcome to be in alignment with the hypothesis. Although participants were randomly stratified in advance of the experiment to avoid any ordinary assignment bias, Decision Augmentation Theory (DAT) proposes that if investigators could unconsciously perceive probable study outcomes based on their present-time decisions, then it would be possible to arrange such fortuitous assignments.<sup>48</sup> Independent experiments provide repeatable evidence in favor of such unconscious anticipatory perceptions in humans, so such an explanation cannot be dismissed out of hand.<sup>49,50</sup>

The most efficient way to distribute participants under DAT is to sort (anomalously) people who will respond poorly into the control condition and to sort participants who will respond well into the intentional conditions. Such a distribution would cause a statistical difference between mood states in those two conditions. There is a suggestion of such a differential split in analysis 4 (Figure 6), but the Tukey HSD tests show that as compared with day one, there was a significant mood improvement in the intentional condition over the course of the week, but no corresponding mood decline in the control condition. A significant effect occurring only in the treatment condition is more consistent with an influence explanation than with DAT, although it should be noted that the lack of a significant mood decline in the control condition may be due to that condition's smaller sample size. Future experiments of this type should test in more detail the potential explanatory power of DAT versus influence.

A third alternative explanation, similar to speculations about the underlying mechanisms of homeopathy,<sup>51</sup> is that the classic double-blind design is violated by intentional effects. If this is so, then participants might have guessed the condition to which they were assigned, leading to a placebo effect. To assess this possibility, all participants were asked to report, after they turned

in their questionnaires, the condition to which they perceived to be their assignment. Based on 60 people responding, 68% thought they were in the control condition, of which 27% were correct (compared with an actual 27% in the control condition), and 32% thought they were in an intentional condition, of which 74% were correct (compared with the actual 73%). Thus, there was no evidence that participants were biased by expectation effects. This finding was supported by examining subjective reports provided by 20 people before they were informed about the condition to which they were assigned. Their comments revealed a wide range of subjective experiences, including unusually strong calm, blissful, energetic, jittery, and in a few cases, ill or negative feelings. These comments were not systematically associated with condition; 15 of 20 comments were from people in the intentional group, and eight of 15 were positive. The remaining five comments were from the control group, and two of those were positive.

Although explanations for the observed effects remain uncertain, the results are supported by conceptually similar studies involving water. In those experiments, water directly or indirectly exposed to healers' intentions was used to hydrate plants, which showed greater growth than plants provided with untreated water.<sup>52,53</sup> The present study extended the notion of an intention-carrying substance from water to food, and it expanded the target of intention from measurement of plant growth to subjective mood states in humans.

Future efforts to replicate this finding should seriously consider sources of intentional enhancement and contamination that might influence the postulated effect. On the enhancement side, we recommend that the intentional imprints be provided by highly experienced meditators or other practitioners who specialize in tasks requiring intense, prolonged concentration. In addition, both the participants and investigators should approach this experiment critically—but genuinely open—to the hypothesis. Although it is necessary to maintain a skeptical stance in science, persons holding explicitly negative expectations should not be allowed to participate for the same reason that dirty test tubes are not allowed in biology experiments; if one is testing the role of intention, then vigilance is required about the intention of all individuals involved in the test. This would extend to people who are aware of the experiment but are not otherwise involved; it may even extend to people who learn about the experiment in the future after the study is completed. Given theoretical support and experimental evidence for retrocausal effects,<sup>54,55</sup> replication of intentional phenomena may be inherently limited because once conducted and published, an experiment might be influenced by a potentially infinite number of future intentions (this divergence problem is only a serious problem if intentions of all observers have the same impact, eg, see Houtkooper<sup>56</sup>).<sup>56-58</sup> Analogous to taking a flash photograph of an object in a hall of mirrors, in this realm it may not be possible to completely eliminate all sources of contamination.

## Acknowledgments

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