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# Reduction of Cortisol Levels and Participants' Responses Following Art Making

Girija Kaimal, Kendra Ray, and Juan Muniz

## Abstract

*This quasi-experimental study investigated the impact of visual art making on the cortisol levels of 39 healthy adults. Participants provided saliva samples to assess cortisol levels before and after 45 minutes of art making. Participants also provided written responses about the experience at the end of the session. Results indicate that art making resulted in statistically significant lowering of cortisol levels. Participants' written responses indicated that they found the art-making session to be relaxing, enjoyable, helpful for learning about new aspects of self, freeing from constraints, an evolving process of initial struggle to later resolution, and about flow/losing themselves in the work. They also reflected that the session evoked a desire to make art in the future. There were weak associations between changes in cortisol level and age, time of day, and participant responses related to learning about one's self and references to an evolving process in art making. There were no significant differences in outcomes based on prior experiences with art making, media choice, or gender.*

## Introduction

Efforts have been underway in the past decade to examine the biological substrate of creative self-expression (Pennebaker, 1997; Smyth, Hockmeyer, & Tulloch, 2008). In particular, salivary cortisol has been examined as a noninvasive biomarker and a proxy measure for the experience of

stress in humans (Smyth et al., 1997; Smyth et al., 1998). Cortisol is a glucocorticoid hormone and one of the most widely studied markers of stress (Staufenbiel, Penninx, Spijker, Elzinga, & van Rossum, 2013). The hypothalamic-pituitary-adrenal axis (HPA axis) regulates reactions to stress and HPA axis dysfunction is associated with physiological stress in the body (Engelmann, Landgraf, & Wotjak, 2004). Measurement of cortisol levels is indicative of HPA dysfunction and a stress response is typically associated with increases in cortisol levels.

Several clinical studies have reported reductions in salivary cortisol levels after behavioral interventions to reduce stress (Aboulafia-Brakha, Suchecki, Gouveia-Paulino, Nitrini, & Ptak, 2014; Galvin, Benson, Deckro, Fricchione, & Dusek, 2006; Miluk-Kolasa, Obminski, Stupnicki, & Golec, 1993). Specifically, saliva contains free, biologically active cortisol as opposed to total cortisol present in serum or plasma. Importantly, the concentration of cortisol in saliva is independent of the salivary flow rate and is strongly correlated with serum cortisol concentrations (Bozovic, Racic, & Ivkovic, 2013). Salivary cortisol levels increase 5 minutes after an increase in plasma levels and are strongly correlated with plasma levels (Lucassen & Cizza, 2012). Expressive writing has been found to be related to long-term improvements in health (Pennebaker, 1997) and lowered stress levels (Smyth et al., 2008). Like expressive writing, evidence suggests that music and art are two interventions that may have a positive effect on psychological states and on biomarkers (Chanda & Levitin, 2013; Lai & Li, 2011; Stuckey & Nobel, 2010). Patients with serious health issues have used art as a therapeutic approach to help reduce stress and anxiety and express emotions (Reynolds & Lim, 2007). In a randomized controlled trial, individuals with breast cancer displayed improved well-being through the reduction of negative emotions and the enhancement of positive emotions using art (Puig, Lee, Goodwin, & Sherrard, 2006). In a qualitative study, researchers provided descriptive accounts of how caregivers used art to lessen symptoms of compassion fatigue and reduce their stress (Samoray, 2006). For patients with chronic illness, art has aided in improving overall health and well-being by distracting individuals from thoughts of illness, improving self-identity, and providing a social network (Reynolds & Prior, 2003).

There are a small number of studies indicating reduced stress resulting from visual art making. Artistic expression appears to lower stress in various health settings for both patients and family caregivers. For example,

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Lawson et al. (2012) found in their wait-list control study (pretest/posttest crossover design) that 1 hour of art making, which consisted of using brushes and paint to decorate a tile under the supervision of a student volunteer, decreased cortisol levels and helped to reduce feelings of sluggishness and improve concentration in people receiving blood and marrow transplants. In another pilot study, Walsh, Radcliffe, Castillo, Kumar, and Broschard (2007) tested the effects of an art-making class on family caregivers ( $N = 69$ ) of patients diagnosed with various forms of cancer. Their quasi-experimental pretest/posttest study employed a 2-hour art class. The results, although not statistically significant, did show a reduction in stress as measured by levels of salivary cortisol.

Research shows promise for studying art making with cortisol as a biological indicator to measure changes in stress response in patients and their caregivers. Most studies, however, have tested art activities (Lawson et al., 2012; Mercer, Warson, & Zhao, 2010; Walsh et al., 2007) and used a specific art task or directive that may have influenced the outcomes. Thus it is unclear how structuring the session for free creative self-expression, viewed as similar as possible to an actual therapy situation and facilitated by an art therapist, would lower the stress response. In addition, the role of media, theoretically identified as ranging from structured to unstructured and having differential effects (Lusebrink, 1990), has not yet been examined empirically. With the limited understanding of the physiological and concurrent psychological changes that result from art making, these gaps demonstrate a need for further research using biomarkers as a measure of stress. In addition, given that there are some potential emergent differences between artists' and non-artists' physiological responses to art making (Belkofer, Van Hecke, & Konopka, 2014), there is a need to better understand the role of prior experiences with art making on stress-related outcomes following art making.

The purpose of this study was to examine the outcomes of art making in the context of making art with a facilitating art therapist who was also the primary researcher. The first author provided the structure of time and art materials and participants were free to create imagery of their choice. The study design was a quasi-experimental (pretest/posttest with no control group) study. The hypotheses guiding our study were that art making would result in reduced cortisol levels; greater changes in cortisol reduction for those with prior art-making experience; and greater changes in cortisol reduction for participants who used art media such as clay compared with participants using more structured media such as collage or markers. We also collected brief written responses from participants in order to better understand their individual subjective experiences related to art making. These narrative responses were collected as the qualitative component of the study in order to determine whether and how the subjective experiences might relate to changes in cortisol levels.

## Method

### Participants

Participants included 39 students, staff, and faculty ages 18 to 59 years, ( $M = 38.88$ ,  $SD = 12.69$ ) from a large university in an urban area. There were 33 women and 6 men. The racial/ethnic makeup of the participants was African American ( $n = 2$ ), Asian American ( $n = 13$ ), White ( $n = 13$ ), and multiracial ( $n = 3$ ). There were 18 participants who reported that they had limited prior experience with art making, 13 who reported some experience, and 8 who reported extensive experience.

### Materials and Procedures

The Institutional Review Board of the University approved the study. After receiving this approval, we recruited participants using both an e-mail sent to university listservs and printed flyers posted around campus. The flyer described the study as examining the health outcomes of visual self-expression, and participants were invited to schedule a time to take part in the study led by an art therapy faculty member. The study was described as including a 1-hour session that included approximately 45 minutes of art making and an additional 15 minutes for consent and data collection before and after the session. Data were collected over a 4-month time period in a dedicated art-therapy studio space in one of the university buildings. Given that this was a pilot study, a sample of 35 was identified as the minimum number of participants required for a medium effect size.

Each participant first completed procedures for informed consent. Previous levels of art-making experience were determined by verbally requesting this information prior to the intervention. Responses were coded as limited or no art-making experience, some prior art-making experience, or extensive prior art-making experience. Participants also provided a small sample of saliva using the Sarstedt Salivette saliva collection tool prior to art making.

After the completion of these pretest procedures, participants were invited to make art using collage materials, modeling clay, and/or markers. Participants were told that they had the option of creating any kind of imagery using the three media choices individually or in combination. They were also told that there was no expectation of creating a final artwork but that they were welcome to work with the materials as they chose. Most participants created their own artwork without any directive but the first author was available to provide any assistance and followed the lead of the participants regarding the level of conversation and interaction they sought while making art. For example, if participants chose to talk during the session, the first author responded in conversation and if they chose to work silently, the first author remained quietly present. Similarly if they requested help with executing an idea for their work, the first author helped them and, if not, stayed present and available. After they had completed their work, participants

were invited to share any aspect of their work and/or experiences verbally. After the art-making experience a second saliva sample was collected, using the same procedure, and participants then were asked to share a brief (one to two line) written description of their experience with the art making and the imagery in their art.

The study's pretest and posttest saliva samples were then transported on ice to a certified lab at the university where they were analyzed using the ELISA kit method. The data from the lab analysis of the saliva were available in unit measures of ng/ml (nanograms/milliliter). To further ensure against any potential bias in the analysis, the analyst in the lab was blind to the source of the samples and did not know whether they were pre or posttest data. The samples were also analyzed in duplicate in order to reduce any errors in single sample analysis.

### Data Analysis

The data from cortisol levels and participant demographics were entered into an Excel file and imported for analysis into SPSS. The data were first summarized using descriptive statistics. Next, the mean pretest and posttest data cortisol values were compared using a paired samples *t* test. The changes in cortisol levels were also examined in relation to participants' self-reported levels of expertise with art making and media choice using a one-way ANOVA. An independent *t* test was performed to compare changes in cortisol based on gender. Correlations were also computed to assess changes related to age of participants and time of day.

The written responses were compiled in response to the question, "What was it like to make art during this session?" These were collected and entered into a textual document and analyzed using Riessman's (2008) method for thematic analysis. The narratives were coded independently for open codes by the first and second authors. The codes generated were compared and those that were similar were combined. Those that differed were resolved through discussion and combined into a mutually agreed upon set of codes. The first and second authors then coded the responses again and identified seven distinct themes. Once the responses were coded, each theme was attributed a dichotomous numerical value (1 = theme present or 0 = theme not present) for each participant. The qualitative responses were thus converted into numeric data and then entered into the quantitative database to examine how and to what extent the narrative responses related to changes in cortisol levels.

### Results

Changes in participants' pretest/posttest stress levels were measured via salivary cortisol (measured in nanograms/milliliter). A paired-sample *t* test indicated significant reductions in cortisol following the intervention. Mean scores for cortisol levels pretest ( $M = 17.85$ ,  $SD = 5.11$ ) and posttest ( $M = 14.77$ ,  $SD = 5.06$ ),  $t(38) = 4.54$ ,  $p < .01$ , differed significantly. Cortisol levels ranged from 32.40 ng/ml to 5.05 ng/ml at pretest and from

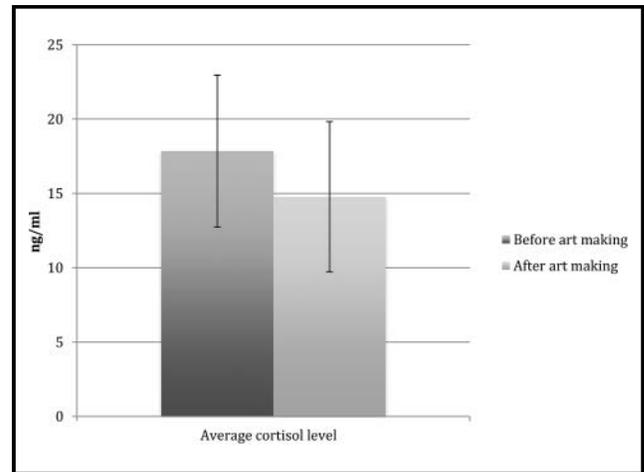


Figure 1. Average Salivary Cortisol Levels Before (Dark Grey) and After (Light Grey) Art Making

25.00 ng/ml to 5.01 ng/ml at posttest. See Figure 1 for the changes in mean cortisol levels before and after art making.

As can be seen in Figure 1, the mean cortisol levels were significantly lower after art making, even though the change was not consistent across participants. The levels were lowered more for some than for others. The area graph in Figure 2 reveals the changes in cortisol levels as they varied across all participants. The pretest and posttest levels were, however, strongly correlated,  $r = 0.61$ ,  $p < .001$ . This indicates that overall those with higher pretest cortisol levels had higher posttest scores and similarly those with lower pretest scores also had lower posttest scores. Overall, the cortisol levels were lowered after art making for approximately 75% of the sample. Cortisol levels stayed unchanged or were elevated for about 25%. Figure 3 highlights this range in change of cortisol levels with an area graph showing changes across all participants.

As can be seen in Figures 2 and 3, there was considerable variation across participants even though the overall results indicated a statistically significant reduction in

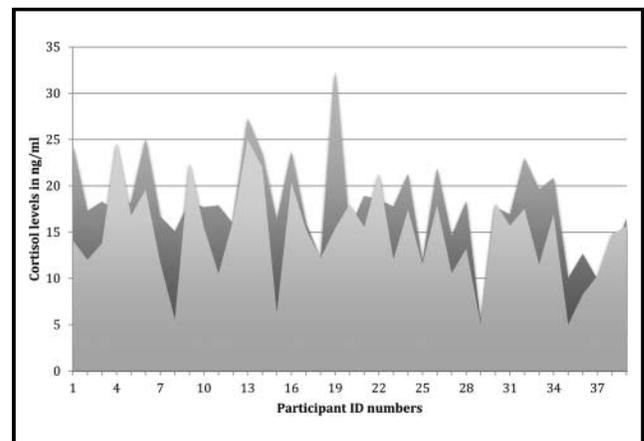
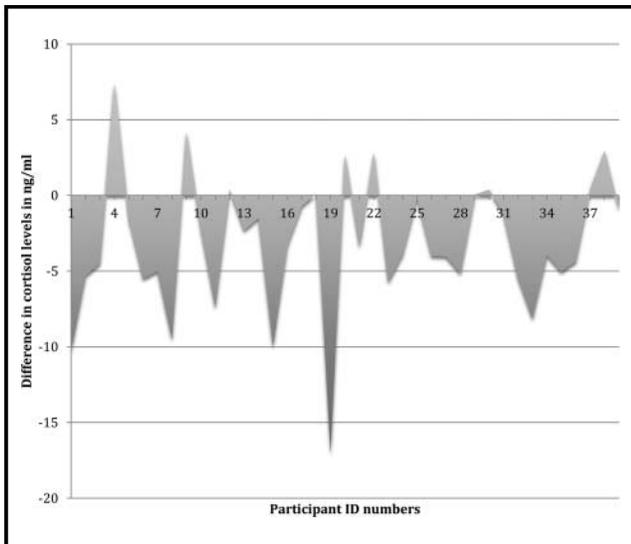


Figure 2. Individual Salivary Cortisol Levels Before (Dark Grey) and After (Light Grey) Art Making



**Figure 3.** Range of Changes in Salivary Cortisol Levels Across Participants as a Result of Art Making

cortisol. We further sought to examine whether these differences between participants might be related to other variables like age, gender, race/ethnicity, time of day, prior experience with art-making, or type of art media used.

### Prior Experience With Art Making

The relationship between prior experience with art making and cortisol levels was examined using a one-way ANOVA. Results indicated that there were no significant differences based on prior experiences (limited experience,  $M = -2.43$ ,  $SD = 3.91$ ; some experience,  $M = -4.24$ ,  $SD = 5.59$ ; and extensive experience,  $M = -3.0$ ,  $SD = 3.99$ ) on cortisol levels,  $F(2, 36) = 0.64$ ,  $p = .53$ .

### Media Choice

Participants had the option of using collage, model magic clay, fine-tip markers, or any combination thereof. Given these, 13 participants used collage, 9 used clay, 6 used markers, 4 used a combination of markers and clay, 3 used a combination of collage and clay, 3 used a combination of collage and markers, and 1 used a combination of all media. The relationship between media choice and change in cortisol was examined using a one-way ANOVA. Results indicated that there were no significant differences based on media choice on change in cortisol level,  $F(7, 31) = 0.47$ ,  $p = .85$ .

### Race/Ethnicity

The relationship between race and ethnicity and change in cortisol was examined using a one-way ANOVA. Results indicated that there were no significant differences between race/ethnicity, Asian American,  $M = -2.51$ ,  $SD = 4.47$ ; African American,  $M = 1.45$ ,  $SD = 8.41$ ; White,  $M = -3.53$ ,  $SD = 4.26$ ; and

multiracial,  $M = -5.40$ ,  $SD = 4.13$ , on changes in cortisol levels,  $F(3, 35) = 1.08$ ,  $p = .37$ .

### Gender

The relationships between gender and change in cortisol levels for men ( $M = -3.86$ ,  $SD = 2.12$ ) and women ( $M = -2.93$ ,  $SD = 4.83$ ) were examined using an independent  $t$  test. The results indicated that there were no significant differences based on gender on changes in cortisol,  $t(37) = .456$ ,  $p = .65$ .

### Age

The relationship between age and changes in cortisol levels was examined using a bivariate correlation. Results indicated that there was a weak positive correlation between age and changes in cortisol levels,  $r(37) = 0.22$ ,  $p = .18$ . This indicates that younger participants were more likely to demonstrate lowering in cortisol levels compared with older participants. The relationship was very weak so this difference needs to be interpreted with caution.

### Time of Day

Because cortisol levels tend to be highest in the morning and steadily decline throughout the day (Debono et al., 2009; Lupien, King, Meaney, & McEwen, 2000), we wanted to determine the influence of time, if any, on relationships between variables. Time of day was coded using a continuous scale mapped onto the 24-hour day (e.g., 1 pm was coded as 13, 2 pm as 14, etc.). Using a bivariate correlation, we found that there was a moderate positive relationship between the time of day that cortisol was collected and difference in cortisol scores before and after art making,  $r(39) = .29$ ,  $p = .038$ .

Taken together these findings indicate that changes in cortisol levels were seen across demographic characteristics and were not related to age, gender, or race/ethnicity. In addition, changes in cortisol levels were also unrelated to participants' prior experiences with art making or media choice.

### Participant Responses to Art Making

In order to assess whether the individual level variation in the changes in cortisol levels could be explained further based on participants' narrative responses, the data were examined for content related to the self-reported perceived impact of art making. The written responses indicated that participants' perceptions of the art-making experience were varied. Some referred to it as relaxing, a stress reliever during a busy work day; others referred to it as being fun and enjoyable, a form of distraction, and a reminder of childhood. Several participants reflected on the absence of art in their adult lives and how the experience reminded them of a time when they had last made art as a child. Seven themes emerged from analysis of participants' responses to art making: feeling relaxed ( $n = 19$ ); feeling pleasure/enjoyment ( $n = 19$ ); learning something new about one's self ( $n = 15$ ); feeling free from constraints ( $n = 13$ );



**Figure 4.** Artwork Made Using Modeling Clay, Collage Materials, and Markers

experiencing an evolving process of change in art making from initial struggle to later resolution ( $n = 12$ ); feeling a sense of flow/losing themselves in the work ( $n = 11$ ); and having a desire to make art in the future ( $n = 3$ ). Some narratives included more than one theme.

To examine whether responses could be related to changes in cortisol levels, we attributed a numeric value for the occurrence of each theme and checked for correlations with individual changes in cortisol levels. This indicated that themes were not strongly correlated with changes in cortisol levels. Controlling for time of day, two themes correlated with changes in cortisol: evolving process,  $r(39) = 0.27, p = .11$ , and learning about one's self,  $r(39) = 0.22, p = .19$ . Participants who reported going through a process of initial struggle to later creating something they liked and those who reported learning about self through the process of art making were slightly more likely to demonstrate lowering of cortisol levels.

Images and titles of three participants' artwork are provided in Figures 4, 5, and 6. Figure 4 depicts artwork created by a 24-year-old White man, which he titled *The Evolution of a Seed of an Idea*. Referring to the art-making experience, he said, "I was tentative and careful at first, but once I found my concept in the magazine materials



**Figure 5.** Artwork Made Using Modeling Clay



**Figure 6.** Artwork Made Using Magazine Images for Collage

everything flowed naturally and freely. I actually went from perceiving too much to feeling like time moved too fast." He went on to say: "My imagination was fully engaged by the end." A 29-year-old Asian American woman created Figure 5, which she described by writing, "This is my representation of City Hall. I see it every day on my way to work," going on she said, "I found the experience of making this piece to be enjoyable and 'liberating' in that I didn't have to be restricted by rules or procedures." A 38-year-old African American woman created Figure 6, which she said was about the idea of homes/homelessness. She described the art-making experience as follows: "It was very relaxing. After about 5 minutes, I felt less anxious. I was able to obsess less about things that I had not done or need[ed] to get done. Doing art allowed me to put things into perspective."

## Discussion

Our main hypothesis, that there would be a lowering of salivary cortisol as a result of visual art making, was supported by the results. Additional hypotheses were not supported: Those with prior levels of experience with art making or who used less structured media did not show greater reductions in cortisol. Also, there were no associations between reduction of cortisol and age, gender, or race/ethnicity. We found weak correlations between changes in cortisol levels and age of participants and time of day. Controlling for age and time of day, weak positive correlations were found between changes in cortisol levels and the themes of evolving process and learning about self. Results indicate that a brief experience of art making produced physiological changes in most participants, indicating that art making can lower cortisol levels regardless of prior experience with art, media type, or demographics.

Previous studies have demonstrated some change in cortisol levels as a result of an art task (Lawson et al., 2012; Walsh et al., 2007). To the best of our knowledge, this is the first study to demonstrate reductions in cortisol levels in

healthy adults as a result of art making in a format structured to be similar to an art therapy session. We also examined participants' written responses to the experience, which allowed for a more complete understanding of its impact. Written responses indicated that some themes (evolving process and learning about self) were associated with greater lowering of cortisol than other themes, though the correlations were weak. These results have to be viewed with caution because of this, together with the small sample size.

Art making is an enjoyable or relaxing experience for some, whereas for others it is associated with freedom of expression, evokes a flow experience, stimulates insight, and provides a way to learn about one's self. Further research is needed to better understand how these experiences are related to changes in cortisol levels and stress reduction.

Although results overall were statistically significant, reductions in cortisol levels were not consistent for all participants. Levels were lowered for about 75% of the sample ( $n = 30$ ). This does not seem to have been related to the type of media used or to gender. There was a weak correlation with age such that younger participants demonstrated a greater lowering of cortisol than older participants. This might be because older individuals may have a more practiced response to their stress levels and are able to tap into problem-solving strategies more readily compared with younger individuals. In addition, lowering of cortisol levels was more likely to be seen earlier in the day, rather than later, which has implications for the timing of studies of these kinds of interventions, as well as for patient interventions.

It is of note that for a little less than 25% of the sample ( $n = 9$ ), cortisol levels stayed about the same or actually went up by a few ng/ml after art making. The narrative responses of these individuals did not indicate any negative reflections about the art-making process. This finding raises several questions. It could be that art making resulted in a state of arousal and/or engagement, which resulted in higher stress for this small group. This might not necessarily be a problem, because arousal may lead to increased self-awareness or new learning. In fact, we did find some correlations between changes in cortisol and participants' narrative experiences. Those who spoke about an evolving process from initial struggle to later resolution and those who reported learning about self were slightly more likely to demonstrate a decrease in cortisol. It is also possible that 45 minutes of art making was not adequate time for some to experience reduced stress or notice any benefits. In addition, for a few participants, the art making was possibly stressful and/or stimulating; and as a result, their cortisol went up instead of down even though their narrative response suggested a positive experience. It is also possible that given the small sample size and the nature of the sessions, participants were reluctant to report negative responses. Another likely reason for the lack of a relationship between many of the themes and the changes in cortisol might be that we did not use the appropriate psychological parallels for this biomarker. In future studies, participants could be administered a psychological measure of stress which might be more closely related to cortisol change rather than narrative responses. Future research

might also consider assessing levels of salivary alpha amylase, a biomarker increasingly being considered a more accurate measure of short-term changes in stress levels (Nater & Rohleder, 2009). Further research is also needed to better understand the differences in outcomes between psychological and physiological measures, differences related to type of media, differences in outcomes based on art making with and without an art therapist, and differences with clinical populations.

There are several limitations of this study to consider. The primary limitation was the absence of a control group. Thus it is hard to determine at present which factors in the session (art making, interactions with the researcher, or something else) contributed to the lowering of cortisol. Moreover, participants varied in their level of interaction with the researcher and need for structure during art making, which again made each experience somewhat variable. The study also used a healthy (nonclinical) sample and thus it is not clear if the same patterns would be seen in clinical groups. In many of the between-group analyses, the subgroups were not very large. Therefore results in these cases must be interpreted with caution. Lastly, 85% of the participants were women and nearly 80% had moderate to high levels of experience with art making, which further limits the generalizability of the findings.

Our pilot study provides preliminary evidence for the use of art making for lowering cortisol, a proxy measure of stress, among healthy adults. To the best of our knowledge this is the first study to demonstrate lowering of cortisol levels after a short session of art making structured to be similar to an art therapy situation. In our sample, reduction of cortisol was not related to gender, type of media used, race/ethnicity, or prior experience with art making, although it was related slightly to age and time of day. There were weak to moderate correlations between the lowering of cortisol and the narrative response themes of learning about self and the evolving process of art making. It is of note that cortisol levels were lowered for most participants but not all, indicating a need to further explore stress reduction mechanisms.

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