Examining How Emojis Affect Stress Levels

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Introduction

Of the 2 billion smartphone users worldwide in 2014, 6 billion emojis or stickers were sent around the world every day on mobile messaging apps, according to Swyft Media (Dua, 2015). There are thousands of emojis that express a wide range of emotions. According to Unicode CLDR data, there are 1,507 people and/or smiley emojis (Smith, 2017). An "emoji" (n.d.) is "a small digital picture or pictorial symbol that represents a thing, feeling, concept, etc., used in text messages and other electronic communications" deriving from the Japanese language, literally meaning "picture letter." The emoji though began with the "emoticon" (n.d.), which is "a digital icon or a sequence of keyboard symbols that serves to represent a facial expression." The first emoticon was invented on September 19, 1982 by Carnegie Mellon professor Dr. Scott Fahlman. He called it the "humble smiley," (Baer, 2015). In 1990, the first emoji was developed by Shigetaka Kurita, an employee of the biggest mobile-phone operator in Japan. He wanted to create an image to be used that would convey emotions and make people feel happier with images (Schenker, 2016).

My research question is whether receiving a text message with a smiling emoji decreases stress levels. Not a lot of research has been done on emojis or my research question in general, but knowing how emojis affect us is important given their great presence in our everyday lives. According to research done by the emotional marketing platform, Emogi, emoji are used by 92% of the online population (Shaul, 2015). It is also timely and relevant given the mental health crisis in our society today. We want to communicate with our loved ones and want to be as supportive and helpful as possible, and we want to know the best ways of doing so. An alarming 17.9% or 43.4 million adults in the United States have a mental illness ("Any mental illness," 2015). Not only that, but according to the American Psychological Association, 75% of adults

"reported experiencing moderate to high levels of stress in the past month and nearly half reported that their stress has increased in the past year ("Stress Facts," n.d.). Stress is clearly a significant part of most people's lives. Though the effects may not be drastic, it's worth researching how much of an impact emojis have on stress in general. If family and friends knew the effects of emojis, it could help them in providing some relief for those affected.

My research is also relevant to advertising. According to a study in 2016, the number of active campaigns containing emojis has increased by 557%. This translates to more than 700 million emoji messages being sent June 2016. In that same time period, corporations increased their emoji usage by 777% (Chang, 2016). Given this trend, having even more research on this subject will be important for corporations and advertisers. Already, 51% percent of survey respondents from the same study said they had a "positive impression of brands using emojis," and even said that they perceived these brands "as being fun or relatable." They also found that the click-through rates of emoji-enabled ads were 20 times higher than the industry standard (Chang, 2016). Moreover, this research will add to the previous findings and will continue to help corporations and advertisers to market their products.

Theory and Hypothesis

To address my research question, I examined a variety of literature. A few studies concluded that when we are exposed to emotional facial expressions, our facial structure changes to match that expression (Dimberg, Elmehed, & Thunberg, 2000). One study concluded this when researchers hooked up participants to an EEG machine and measured the amplitude of N170—the level at which the event-related potential (the smiling face) reflects the neural processing of faces—and exposed them to upright and diverted faces of emoticons and meaningless strings of characters. Results revealed that emoticons showed a large N170

amplitude when upright and a decrease in amplitude when inverted. Thus, when people are exposed to upright or smiling emoticons, people's faces reflect the configuration of the emoticon (Churches, Kohler, Nicholls, & Thiessen, 2014). As well, research shows that smiling decrease our stress levels. In one study, when participants completed two different stressful tasks, participants that smiled had lower heart rate during stress recovery than the neutral group who did not smile (Kraft & Pressman, 2012). The lower the heartrate, the lower the stress level (Taelman, Vandeput, Spaepen, & Van Huggel, 2008). Thus, when your facial expression changes to match a smiling emoticon, consequently smiling will decrease stress levels.

A theory that further relates, is the vascular theory of emotional efference. It states that, "facial muscular movement, by its action on the cavernous sinus, may restrict venous flow and thereby influence cooling of the arterial blood supply to the brain. With this, the varying temperatures of the blood might influence the release and blocking of emotion-linked transmitters. (Zajonc, Murphy, & Inglehart, 1989). Thus, this could explain in part why with different facial movements, such as smiling, are felt subjectively as pleasant and others as unpleasant. These changed feelings due to smiling, premeditated by viewing smiling images, led to my hypothesis that receiving a text message with a smiling emoji will cause stress levels to decrease.

Research Design

For my research design, as mentioned I will be measuring whether receiving a smiling emoji decreases stress levels. The independent variable will be the emoji condition—whether you receive one or not. The dependent variable will be stress, specifically cortisol levels in saliva. I chose to do an experiment, verses a survey for example, because when measuring stress, it may not be consistent because people experience and report stress subjectively. They may also

not be very in tune with their emotions and cannot accurately describe their feelings. As well, there may be social desirability bias if a survey were used. People may want to appear confident with their interviewing skills (how we will be inducing stress) and could lie, even if they are very stressed.

The focus of this study will be on college students at Ohio State. I chose college students as they will be an easy target on campus. Also, though, 92% of 18- to 29-year-olds own a smartphone, and thus there would be a large pool of potential participants (Smith, 2017). As well, college students are very affected by mental illness and stress in general, as 25% of college students have a diagnosable mental illness and have been treated in the past year, according to the National Association of Mental Illness (Heck, 2015). Given these stats, college students would be interested to know the results of this study.

I will use at least 100 students for my study, but will get 150 students to sign up incase students don't show up having followed pre-instructions which I will detail later. To get participants for this study, I will have this study put up on C-REP, the online board for research study participation at Ohio State. Many communication students participate for credit or extra credit so it's likely we will get a big enough sample. To help reduce demand affects, the purpose of the experiment will be hidden from them. They will be told that they are testing how college students respond to job interviews. We cannot totally eliminate demand affects (as we will explain that stress will be measured) given the slight invasiveness of the test. However, not telling them what the saliva will be measured for, may induce more unintended stress anyways. When students sign up to participate, they will be sent a preliminary survey. The first question will ask whether or not the student owns a smartphone. Smartphones will be used to send the emoji and the participant must be able to receive it. They will then be asked a series of medical

questions. I am going to be measuring stress by the participants' cortisol levels and there are some conditions that affect these levels and could throw off the data. The following medical conditions that will be asked about include: high blood pressure, high blood sugar, obesity, osteoporosis, Addison disease, Cushington syndrome, low blood pressure. All of these are possible signs that cortisol levels are or could be higher or lower than normal ("Cortisol," 2015). If the students take certain medications or supplements on a daily basis they may not be able to participate, or must not take them for the night before or morning of. The appendix lists all of them, but a few of them include some anti-depressants, anti-anxiety meds, and ADHD medications ("Supplements and meds," n.d.). If the student answers yes to having any of these conditions or taking those medications, they will not be able to participate. If they qualify, they will be given specific instructions before showing up for the study. They will be told to avoid caffeine, alcohol and nicotine before the study. They will also be told to not eat, brush, or floss their teeth or use mouthwash 2 hours prior to the study. These are all things that can affect cortisol levels ("Saliva collection," n.d.). They will also be told to bring their phone and make sure it is at least 50 percent charged.

As mentioned above, I am measuring stress with cortisol levels, specifically saliva. I have chosen this way due to its accuracy and ease. Over 400 studies are available that suggest that the measurement of cortisol in saliva is a reliable measure. It is still known to be a significant marker of changes in psychological states in response to a stressful situation. (Kirschbaum, & Hellhammer, 1989). Cortisol is one of the two main stress hormones and is secreted after a series of biological functions. When an individual experiences a stress, it triggers the activation of the hypothalamic-pituitary-adrenal (HPA) axis, which causes neurons in the hypothalamus to release the corticotropin-releasing hormone (CRH). This release then causes the secretion of

adrenocorticotropin (ACTH) from the pituitary gland, which travels in the blood and reaches the adrenal glands. This finally triggers the secretion of cortisol, which, if significant, triggers the fight or flight response, giving rise to an increase in heart rate and blood pressure ("How to measure," 2007).

The experiment will take place between 12-4 pm because this is the time period where cortisol levels are stable. When you wake up in the morning, cortisol levels are naturally higher, but then lower and stay consistent for a period of time. After 4pm, cortisol levels begin to drop (How to measure," 2007). We want to make sure that biological processes are not affecting cortisol levels, which would throw off the data. When participants come to the study, they will be given a paper to sign, saying that they have followed all of the instructions detailed earlier. If the participant cannot answer yes to all the instructions, they will be asked to leave.

For the participants who do qualify to continue with the study, they will be put into two groups. The test group, which will receive the smiling emoji, and the control group, which will not. They will be given the "Trier Social Stress Test." This has been practiced in multiple studies to induce stress and they have seen considerable changes. In one study, it was found that cortisol levels increase by about 40% when this test was used (Kirschbaum, Pirke & Hellhammer, 1993). In the Trier Social Stress Test, participants are sent into a room where three people are sitting at a table, and a video camera and tape recorder are installed. They will be asked to stand at a microphone in front. They will then be asked to assume the role of a job applicant and are told to give a free speech of 5 minutes and convince the managers they are perfect for the job. The participants will be given paper and a pencil and will have 10 minutes to prepare. At the end of the prep time, their materials will be taken away from them and they will present. If the subjects finish their speeches in less than 5 minutes, the interviewers will tell them, "You still have some

time left. Please continue!" After it is over, they will be asked to serially subtract the number 13 from 1,022 as fast and accurately as possible. If they mess up, they will be forced to start again and one of the interviewers will say, "Stop. 1,022." The participants will be lead into another room and be told to wait for 10 minutes. They are waiting for this period of time because that is about how long it takes for cortisol levels to peak (Kirschbaum, Pirke, & Hellhammer, 1993).

After the 10 minutes are up, the experimenter will take a sample of the participant's saliva to measure its cortisol level. A salivette device will be used, which is one of the most common practices. This is a cotton dental roll placed in a pierced tube, fitted in an external tube. The participant will put the device in their mouth and roll it over the tongue from cheek to cheek for 3-4 minutes until saturated, and it will be put in a bag ("How to Measure," 2007). They will then be asked to go to a room to wait for a few minutes so they can look over the interview, being told that they would receive a text message when they could return. For the people who will be in the test group, the interviewer will send the participant a text message that says "Thanks for taking part in the study. You can now return" with a smiling emoji. The people in the control group will receive the same message but without an emoji. I chose that message because it is a general statement and does not seem out of the ordinary. The hope is that this could help reduce demand affects, that the participant would not think this was part of the experiment. When they returned, they would take another saliva test.

Despite all of these measures taken, there are some potential confounds. We may not be able to account for all of the biological processes that occur, even the ones that we rule out. People's cortisol levels could raise or lower due to reasons we cannot know. As well, some people, despite thorough efforts, may sign up and participate in the study even if they do not meet some of the qualifications. Because there are so many medical qualifications, people may

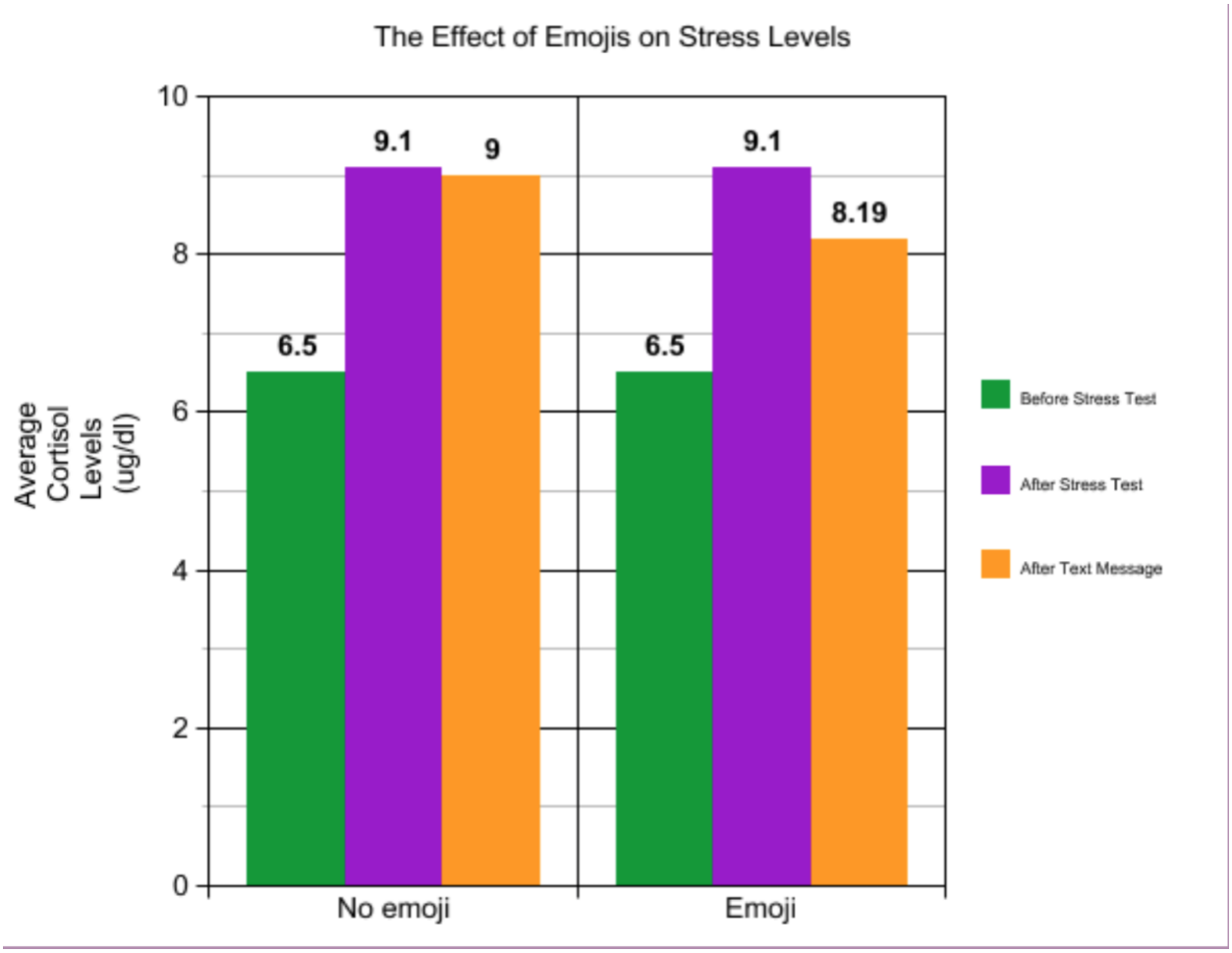
skim over some of the information and miss something. They also may show up, not having followed some of the instructions but still participate anyways.

Expected Outcomes

My hypothesis is that receiving a text message with a smiling emoji will cause stress levels to decrease. The independent axis is the emoji treatment and the dependent axis is the cortisol level, which is measured in micograms per deciliter (ug/dl). Before the experiment, I predict that both groups' stress levels will be about 6.5 ug/dl, the average of the range of cortisol levels in the middle of the day when we will be testing, which is 3-10 ug/dl ("How to Measure," 2007). As previously mentioned, the Trier Stress Test increased cortisol levels by 40%, so that is where I got 9.1 ug/dl for both groups (Kirschbaum, Pirke, & Hellhammer, 1993). I expect the test group will decrease their stress levels by 10% when sent an emoji, while the control group will not change. I do not expect to see a huge change because an emoji, especially by someone they do not know, is not a huge treatment. However, I do expect there to be a change given previous theories and experiments that I have already outlined. In order for this hypothesis to be supported, the decrease with the emoji must be 10%.

If this experiment yielded a supported hypothesis, this could have an impact in a variety of areas. On a mental health level, this could give people more insight on how to communicate with their loved ones. While emoji use is already high and people may do this on a daily basis anyways to help them, this would further encourage people to continue doing this. These findings may also spur on other research about emoji use in general and how it affects our moods. In this study, we only used smiling emojis but there are many other ones that could evoke different responses. These results could also be useful for corporations and the business

world in general who are trying to sell certain products and want to know if using emojis are beneficial, and when further research is done, which emojis are the best to use.



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Appendix

Supplements or supports that could affect cortisol levels	**Prescription medications which do or could affect cortisol levels**
• **Adrenal glandulars** • **Adrenal Cortex** • **Licorice Root** • **5-HTP** • **Progesterone** • **Phosphatidyl serine (PS)** • **Relora** • **Jujube** • **Holy Basil** • **Zinc** • **Astragalus** • **Ashwagandha** • **Rhodiola** • **Kava kava** • **Siberian Ginseng (Eleuthero)** • **Schizandra Berry** • **Valerian** • **Melatonin** • **Cordyceps** • **Theanine** • **GABA** • **Paba** • **Magnolia root extract** • **Caffeine** *(from your coffee, tea or certain sodas, for example)* • **Over-the-counter asthma supplements** • **Over-the-counter cold supplements** *(with ephedrine and pseudoephedrine)* • **DHEA in higher amounts** *(it's recommended to be off all DHEA for at least 72 hours)***Flonase** • **Pregnenolone**	• **HC (Hydrocortisone like Cortef and other brands)** • **Prednisone or Prednisolone** • **Medrol (aka Methylprednisone)** • **Florinef** • **Anti-depressants (whether Tricyclic or SSRI)** • **Anti-anxiety meds, aka Benzodiazepines or Benzo (Xanax is an example)** • **Blood Pressure medications** • **ADHD meds (Adderall for example)** • **Beta Blockers (Lopressor or Toprol XL, Atenolol or Tenormin, Labetalol like Normodyne and Trandate)** • **Asthma prescription meds or sprays** • **Sleeping Pills (such as Lunesta, Ambien)** • **Pain killers for arthritis** • **Pain killers for Migraines (aka Imitrex)** • **Compounded Progesterone** • **Lyrica/Gabapentin**