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Publication Date

2016

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UNIVERSITY OF CALIFORNIA,
IRVINE

Does a Smile on Picture Day Keep the Doctor Away? The Connections between Facial
Expressions in Student Identification Photographs and Health Care Center Visitation

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF ARTS

in Social Ecology

by

Marie Patrice Cross

Thesis Committee:
Associate Professor Sarah D. Pressman, Chair
Associate Professor Belinda Campos
Professor Peter H. Ditto

2016

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ACKNOWLEDGEMENTS

I would like to express my sincere thanks to my committee chair, Sarah D. Pressman, for her guidance and support. I would also like to thank my committee members, Belinda Campos and Peter H. Ditto, for their feedback on earlier drafts of this manuscript. Furthermore, I would like to thank my lab mates for their invaluable support and feedback. Finally, I would like to thank all the researchers who helped with this project.

ABSTRACT OF THE THESIS

Does a Smile on Picture Day Keep the Doctor Away? The Connections between Facial Expressions in Student Identification Photographs and Health Care Center Visitation

By

Marie Patrice Cross

Master of Arts in Social Ecology

University of California, Irvine, 2016

Associate Professor Sarah D. Pressman, Chair

Background: These two studies examined whether facial expressions in student identification photographs were connected with health care center visitation. **Method:** In Study 1, participants ($N = 267$) completed a short online survey that detailed the number of times they had visited a health care center in the last year. In Study 2, participants ($N = 435$) answered this same question, but health care center visits were divided into four categories: illness, injury, mood-related, and preventive. In both studies, the photographs on participants' student identification cards were coded as no smile, non-Duchenne smile, or Duchenne smile. **Results:** Logistic regressions revealed that in Study 1, participants with non-Duchenne or Duchenne smiles were *more* likely to have visited a health care center in the past year than participants with no smile in their photograph. However, Study 2 revealed that this finding was driven by preventive health care center visits: participants with non-Duchenne or Duchenne smiles in their photographs were more likely to have visited a health care center in the past year *for preventive purposes* than participants with no smile in their photograph. No facial expression differences were found for health care center visits for illness, injury, or mood-related concerns. **Conclusions:** Smiling in photographs is connected to preventive health care center visits, a *positive* health behavior.

Future research should continue to investigate whether smiles in photographs are connected with other important health outcomes.

Introduction

Positive emotion is intricately linked with better health outcomes, including lower rates of illness onset (e.g., Boehm & Kubzansky, 2012; Cohen, Doyle, Turner, Alper, & Skoner, 2003) and greater longevity (e.g., Kawamoto & Doi, 2002; Ostir, Markides, Black, & Goodwin, 2000). However, most studies investigating the relationship between positive emotions and health rely on self-reported emotions, which may be influenced by social desirability (i.e., the desire of participants to respond with answers that will be viewed favorably by others). In order to circumvent self-presentation considerations, some studies have turned to coding smiling in photographs as an alternative method of measuring positive emotion (e.g., Abel & Kruger, 2010; Harker & Keltner, 2001; Hertenstein, Hansel, Butts, & Hile, 2009; Seder & Oishi, 2012). Smiling is a universal indicator of positive emotion (Ekman et al., 1987), and researchers have demonstrated that smile intensity in photographs is connected with important psychosocial outcomes, such as marriage stability (Hertenstein et al., 2009), personal well-being (Harker & Keltner, 2001), and overall life satisfaction (Seder & Oishi, 2012). Little work, however, has investigated the connections between smiling in photographs and health. I investigated whether smiling in photographs was connected to a specific health behavior: health care center visitation.

Positive Emotion and Health

There is a large literature connecting positive emotion and health across a wide variety of domains (see Pressman & Cohen, 2005, for a review). Studies have demonstrated that positive emotion is connected with reduced mortality rates (e.g., Chida & Steptoe, 2008), lower risk of developing acute illnesses (e.g., Cohen et al., 2003), and reduced reports of symptoms (Pettit, Kline, Genco, Genco, & Joiner, Jr., 2001). Although there are many possible mechanistic links between positive emotion and health, one link that has been supported is health behaviors.

Individuals with higher levels of positive emotion often engage in better health behaviors, including sleep (Ong et al., 2013), medication adherence (Ogedegbe et al., 2012), and physical activity (Garcia, Archer, Moradi, & Andersson-Arntén, 2012). One specific health behavior that is common in the health psychology literature is health care center visitation, or how many times individuals go to a health care center within a specified period of time. One study found that writing about intensely positive experiences every day for three days was connected with higher positive mood and fewer visits to a health care center for illness (Burton & King, 2004).

However, in many studies that use health care center visitation as an outcome variable, it is automatically assumed that individuals who go to a health care center more often are sick more often (e.g., Pennebaker, Kiecolt-Glaser, & Glaser, 1988). Even those studies that do not automatically assume this is the case almost exclusively document visits made for illness (e.g., Campbell & Pennebaker, 2003; King, 2001). For example, a meta-analysis of expressive writing interventions determined that expressive writing reduces health care utilization in healthy samples, an outcome interpreted to mean that these people were ill less frequently (Harris, 2006). However, there are a number of reasons why individuals may go to a health care center, such as for an injury, mood-related concerns, or preventive care (e.g., picking up a regular prescription, receiving a vaccination). Preventive care is an especially important distinction to make within health care center visitation because it is a *positive* health behavior. To the best of my knowledge, possible connections between positive emotion and different reasons for health care center visitation have not yet been investigated.

Why Should Researchers Use Smiling?

Most research on the connections between positive emotion and health has relied on self-reported positive emotion from adjective checklists such as the Positive and Negative Affect

Schedule (Watson, Clark, & Tellegen, 1988) and the Profile of Mood States (McNair, Lorr, & Droppelman, 1971). However, self-report of emotion may be biased due to social desirability; participants may report emotions they think they *should* be feeling as opposed to emotions they are *actually* feeling. For example, participants completing a subjective well-being questionnaire may indicate that they are happier than they truly feel if they believe that happiness is normatively appropriate (Diener, 2000). Other factors that have been found to influence self-report include current mood (Schwarz & Strack, 1999) and self-enhancement (Wojcik & Ditto, 2014; Wojcik, Hovasapian, Graham, Motyl, & Ditto, 2015). The biases that can influence self-reports are evident from studies that combine self-report with behavioral indicators that are difficult to control voluntarily. A recent study found that conservatives are more likely to self-report happiness than liberals, but when more objective behavioral measures (coding smiling and language analysis) are used instead, conservatives are significantly less happy than liberals. Further, conservatives' reports of greater well-being were fully mediated by self-enhancing tendencies, demonstrating the important role self-enhancement plays in the process of self-report (Wojcik et al., 2015). Studies such as these illustrate that researchers should move away from relying solely on self-report by employing additional emotion measurement techniques, such as coding smiles. This may be especially important in research on the connections between positive emotion and health because almost all of this work uses self-reported emotions. It may be the case that self-presentation and social desirability are important predictors of various health variables, including health behaviors and physiology.

Types of Smiles

Although Ekman (2001) has suggested that there may be as many as 50 different types of smiles, most research on smiles investigates two main types: Duchenne and non-Duchenne.

Duchenne or “genuine” smiles are those that activate both the zygomaticus major muscles in the cheeks and the orbicularis oculi muscles around the eyes (Duchenne, 1862/1990). Non-Duchenne smiles, on the other hand, activate only muscles in the cheeks (Duchenne, 1862/1990; Ekman & Friesen, 1982). Research on the Duchenne smile has provided some of the most robust support for smiling as an indicator of positive emotion. Duchenne smiling has been associated with a variety of positive emotional experiences, including individuals watching pleasant films (Ekman, Davidson, & Friesen, 1990), and with left frontal and anterior temporal lobe activity in the brain, which are areas known to be associated with positive emotion (e.g., Davidson, 1992). Other research has shown a connection between Duchenne smiling in infants when viewing their mothers’ faces (Fox & Davidson, 1988) and a more frequent occurrence of Duchenne smiles in individuals without psychological disorders (Abel & Hester, 2002). Clearly, the connection between smiling as an expressive feature of positive emotion is well established.

Recent research has begun to determine that Duchenne smiles may be beneficial across a variety of domains, including recovery from stress. For example, one experimental study had participants either Duchenne smile, non-Duchenne smile, or maintain a neutral facial expression during two different stressful tasks. Participants who Duchenne smiled had the lowest heart rates during stress recovery compared with the non-Duchenne smile and no smile groups (Kraft & Pressman, 2012). Non-Duchenne smiles, on the other hand, may not always be beneficial. Research on customer service indicates that non-Duchenne smiling, or faking an emotion one does not genuinely feel, can increase negative outcomes such as burnout and employee error (Goldberg & Grandey, 2007; Wagner, Barnes, & Scott, 2014). Therefore, it is important for research on smiles to distinguish between Duchenne smiles and non-Duchenne smiles to understand when certain types of smiles are helpful and when they are harmful.

Research on Photographs

Recent research has found that photographs from sources such as yearbooks or social media sites may be connected with important outcomes. For example, a recent study found that individuals who viewed yearbook photographs of people who either had or had not committed suicide could perceive suicidality with greater accuracy than chance guessing (Kleiman & Rule, 2013). Another recent study found that inferences of power from photographs of participants significantly corresponded to their success as leaders, measured by profits earned in their companies (Rule & Ambady, 2011). Furthermore, photographs have been used to predict various outcomes including marriage stability and satisfaction (Harker & Keltner, 2001; Hertenstein et al., 2009), overall life satisfaction, and better social relationships (Seder & Oishi, 2012). Smile intensity has also been shown to predict divorce later in life, such that people who have less intense smiles in yearbook photographs are more likely to be divorced at some point later in life (Hertenstein et al., 2009). Thus, clearly, even photographs that are not recent can yield meaningful information. Photographs provide accurate retrospective snapshots of important emotion indicators from the past to which researchers would not otherwise have access.

Although photographs have been used to predict various psychological outcomes, little work has been conducted on the connections between smiling in photographs and health. One of these few studies investigated smile intensity of professional baseball players on their baseball cards and determined that those with Duchenne smiles were half as likely to die in any follow up year compared with those without smiles on their cards (Abel & Kruger, 2010). While provocative, this study has limitations such as its focus on only men and its simplified methodology for Duchenne smile coding (i.e., only via the presence of “crow’s feet” around the

eyes rather than coding of the full orbicularis oculi muscle). Thus, research testing the health relevance of photographs of smiling is needed.

Sex Differences in Smiling

Many of the studies that have been conducted with smiling in photographs have been conducted with only women (e.g., Harker & Keltner, 2001) or only men (e.g., Abel & Kruger, 2010), and hence cannot investigate possible sex differences. However, a robust literature suggests that there are differences in smiling between men and women. For example, a meta-analysis of 162 studies determined that women are more likely to smile than men ($d = 0.41$; LaFrance, Hecht, & Paluck, 2003), likely due to gender-based norms, situational constraints, and/or emotion salience. Gender-based norms refer to certain display rules that men and women abide by that dictate the social appropriateness of making a particular facial expression (Ekman & Friesen, 1975). For example, both sexes believe that men smile less than women (Briton & Hall, 1995), and non-smiling women are perceived to be experiencing more negative emotion than non-smiling men (Kierstead, D'Agostino, & Dill, 1988). Situational constraints refer to the fact that situations often affect expressive behavior, such as men and women occupying different social roles. Finally, emotion salience refers to the salience of negative emotion in a social situation, which women may be more likely to mitigate by smiling. Furthermore, smiles may signal different things for men and women; one study found that smiles in women signal warmth, but smiles in men signal confidence (Vazire, Naumann, Rentfrow, & Gosling, 2009). Sex differences may help us better understand the possible mechanisms connecting smiling to better outcomes. Due to these important sex differences in smiling, a secondary aim of my study was to investigate sex differences in my sample, since sex differences may exist in natural environments but not in posed photographs.

Current Study

The goal of these studies was to investigate the connections between type of facial expression in student ID photographs and the number of health care center visits in the past year. I was interested in whether there were differences between not smiling and smiling, and whether there were differences between types of smiles (Duchenne vs. non-Duchenne). I hypothesized that individuals who were smiling in their student ID photographs would have fewer health care center visits in the past year than individuals who were not smiling in their student ID photographs. Furthermore, I hypothesized that individuals who displayed Duchenne smiles would have fewer health care center visits in the past year than individuals who displayed non-Duchenne smiles. The purpose of Study 1 was to determine initial connections between three types of facial expressions (no smile, non-Duchenne smile, and Duchenne smile) in student ID photographs and visits to a health care center over the past year for any reason. The purpose of Study 2 was to further investigate this association by distinguishing the *purpose* of past health care center visits.

Study 1

Method

Participants. Participants were 267 undergraduate students at the University of California, Irvine (80.1% female), who completed the study for course credit.

Procedure. Participants were asked for their permission to release the photographs on their student identification cards to the researchers. After their agreement, they completed a short online survey.

Measures. Participants completed a shortened version of the Profile of Mood States (POMS) that included 9 positive emotion items (at ease, calm, cheerful, energetic, full of pep,

happy, lively, pleased, relaxed) and 16 negative emotion items (afraid, angry, depressed, fatigued, fearful, frightened, hostile, nervous, on edge, resentful, sad, sleepy, sluggish, tense, tired, and unhappy; McNair et al., 1971; Usala & Hertzog, 1989). This version of the POMS has been used in past studies on the connections between emotions and health (e.g., Cohen et al., 2003). Participants were asked to indicate the extent to which each item reflected how they felt in general from 0 (not at all accurate) to 4 (extremely accurate). Three subcomponents of positive emotion were calculated: low arousal positive emotion (at ease, calm, relaxed), mid arousal positive emotion (happy, pleased, cheerful), and high arousal positive emotion (energetic, full of pep, lively). Internal reliability for the full-length POMS is high (Shacham, 1983), and shortened versions of the POMS similar to the version used in the current study have been found to have similar internal consistency (e.g., Bourgeois, LeUnes, & Meyers, 2010). Internal consistency among the positive emotion items in this study was .89.

Participants also indicated how many times they had visited the student health center within the past year.

Facial coding. Three undergraduate research assistants were trained to code facial expressions on a trichotomous scale (1 = no smile, 11.6% of sample; 2 = non-Duchenne smile, 18.3% of sample; 3 = Duchenne smile, 70.1% of sample), a scale that is used frequently in the literature (e.g., Abel & Kruger, 2010; Freese, Meland, & Irwin, 2006). Coders were trained to recognize muscle activation using two action units (AUs) from the Facial Action Coding System: AU 6 (orbicularis oculi), which is only active in Duchenne smiles, and AU 12 (zygomaticus major), which is active in both Duchenne and non-Duchenne smiles (Ekman, & Friesen, 1978). Although coders were aware of study hypotheses, they did not have access to any data other than the photographs. In cases where two coders agreed and one coder did not agree, the agreement

from the two coders was used. In cases where all three coders did not agree (often because the photograph was of too poor quality to determine accurate facial expression), the photograph was discarded from the sample (5 photographs; 1.9% of sample). In addition, 11 photographs (4.1% of sample) were removed from the sample for various reasons, including poor quality or obscured facial muscles (by hair or glasses). Therefore, the final sample was 251 participants.

Statistical approach. An analysis of variance was conducted in order to determine whether the number of times participants visited the student health center in the past year differed among the three facial expression groups (no smile, non-Duchenne smile, and Duchenne smile). Multiple comparisons were run using a Bonferroni correction to determine which groups were significantly different from each other.

Logistic regressions were conducted to determine whether participants in different facial expression groups were more likely to have ever visited the student health center over the past year. The number of visits to the student health center was dichotomized (0 = did not visit the student health center over the past year, 1 = did visit the student health center over the past year), and the three facial expression groups were dummy coded.

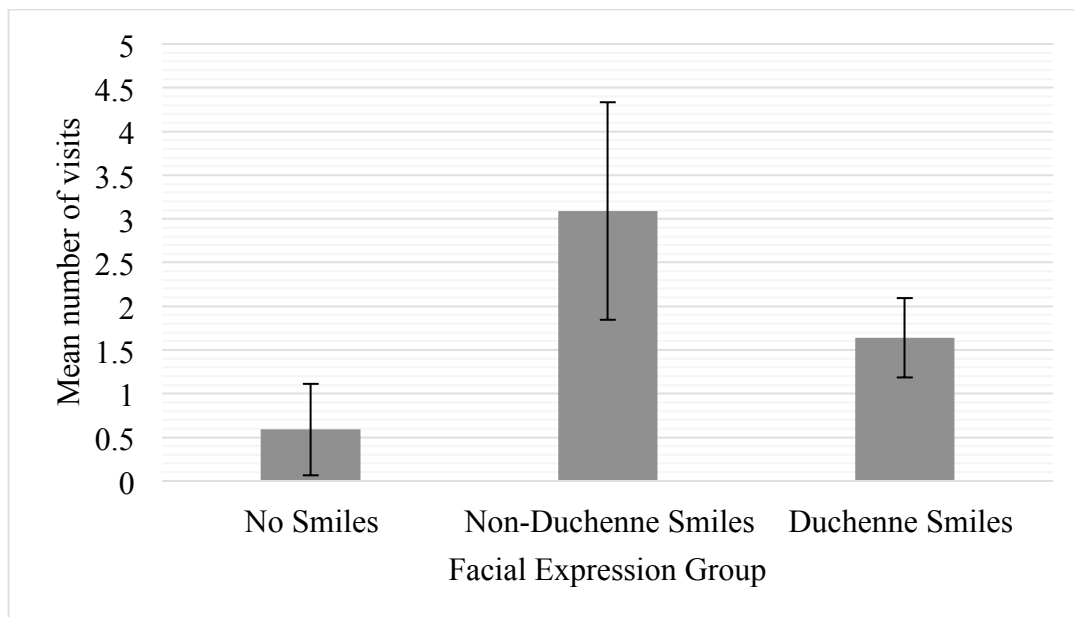
In order to determine possible sex differences, an independent t-test was conducted to determine if mean number of visits differed between males and females. A logistic regression was also conducted to determine whether males or females were more likely to have ever visited the student health center in the past year.

Analyses of variance were conducted to determine whether total, low arousal, mid arousal, and high arousal positive emotion was associated with facial expression group. Finally, correlations were conducted to determine whether total, low arousal, mod arousal, and high arousal positive emotion was associated with health care center visitation.

Results

Was smiling related to health care center visits in the last year? An analysis of variance revealed that the number of visits to the student health center was significantly different among the three facial expression groups, $F(2, 248) = 6.24, p = .002$. Post hoc comparisons using the Bonferroni correction with adjusted alpha levels of .0167 per test ($.05/3$) indicated that participants who displayed non-Duchenne smiles visited the student health center significantly more in the past year ($M = 3.27$ visits, $SD = 4.27$) as compared with those who displayed no smile ($M = .59$ visits, $SD = 1.38$) or Duchenne smiles ($M = 1.74$ visits, $SD = 3.2$). However, the Duchenne smile group and no smile group were not significantly different ($p > .05$; Figure 1).

Figure 1. Mean Number of Visits to the Student Health Center by Facial Expression Group



A logistic regression revealed that the odds of visiting the student health center over the past year were 5.45 times higher for the non-Duchenne smile group ($b = 1.7, p = .002$) and 3.12 times higher for the Duchenne smile group compared with the no smile group ($b = 1.14, p =$

.018). The odds of visiting the student health center over the past year were not significantly different between the non-Duchenne smile and Duchenne smile groups ($p > .05$).

Sex differences. An independent samples t-test revealed that the mean number of visits to the student health center was not significantly different between males and females, $t(249) = 1.23, p = .219$. However, a logistic regression revealed that the odds of visiting the student health center over the past year were 1.94 times higher for women than for men ($b = .664, p = .047$). After controlling for sex in the initial analysis, the odds of visiting the student health center over the past year remained significantly higher (OR = 4.59) for the non-Duchenne smile group compared with the no smile group ($b = 1.52, p = .007$). The odds of visiting the student health center over the past year for the Duchenne smile group were no longer significantly different from the odds for the no smile group after controlling for sex ($b = .960, p = .059$), although they remained marginally related in the same direction.

Did self-reported positive emotion differ across the three facial expression groups?

Analyses of variance revealed that total, low arousal, mid arousal, and high arousal positive emotion were not significantly associated with facial expression group ($ps > .05$).

Was self-reported positive emotion related to health care center visitation?

Total ($r = -.089$), low arousal ($r = -.097$), mid arousal ($r = -.099$), and high arousal ($r = -.031$), positive emotion were not significantly associated with health care center visitation.

Discussion

Study 1 found a surprising relationship between facial expression in student ID photographs and visits to the student health center over the past year. Participants with non-Duchenne smiles visited the health care center *more* over the past year than participants with Duchenne smiles or no smiles. Furthermore, the odds of visiting the student health center over

the past year were significantly greater for those with non-Duchenne smiles or Duchenne smiles in their photographs than those with no smiles. Even after controlling for sex, the pattern of results remained the same. Interestingly, positive emotion did not play a role in these findings.

However, there were a number of limitations to this study. First, I did not collect information regarding the ethnicity of participants, and this information could not be accurately coded via the photographs, so I could not investigate cultural differences in smiling. Although many early studies supported the universality of facial expressions (e.g., Ekman et al., 1987; Izard, 1971), current researchers argue that there are also culture specifics of facial expressions of emotion (e.g., Elfenbein & Ambady, 2003). Recent research has determined that smiling may differ across cultures. For example, one study presented preschool children with pictures of faces with either a big (“excited”) smile or a smaller (“calm”) smile and asked them which face they would rather be. European American preschool children were 3.5 times more likely to prefer an excited smile over a calm smile compared to Taiwanese Chinese preschool children (Tsai, Louie, Chen, & Uchida, 2007). Social norms for smiling differ across cultures, which may translate into differences between ethnicities within the United States, so I also sought to investigate cultural differences in Study 2.

I also did not collect information on personality traits such as extraversion, conscientiousness, or agreeableness, which could be related to the expression of emotion in a photograph. Furthermore, there may be personality traits that are related to how often individuals go to a health care center. For example, higher levels of neuroticism have been connected with more frequent visits to the doctor (e.g., Jerram & Coleman, 1999). For these reasons, I included a personality measure in Study 2 to determine whether personality moderates the relationship between facial expression and health care center visitation.

Most important, I did not distinguish *for what purpose* individuals visited the student health center. There are many reasons why an individual may choose to go to a health care center. While many researchers infer that these visits are for illness (e.g., Pennebaker et al., 1988), health care center visits is a broad construct that also includes visits for *preventive* reasons, an outcome that is rarely studied. Therefore, in Study 2, I investigated *why* individuals visited a health care center.

Study 2

Method

Participants. Participants were 435 undergraduate students at a large Western university (85% female, mean age = 21.45 years) who completed the study for course credit. The ethnicity of the participants was 37% Asian or Pacific Islander, 30.7% Hispanic/Latino, 19% White, 2.4% African American, and 11% biracial/other.

Procedure. The procedure for Study 2 was identical to the procedure for Study 1, with some additional questionnaires in order to address the limitations of Study 1. The photographs were coded on the same trichotomous scale: 15.1% of the sample was not smiling in their student ID photographs, 36.5% displayed non-Duchenne smiles, and 48.4% displayed Duchenne smiles. Five photographs (1.1% of sample) were discarded due to disagreement by coders, and an additional 19 photographs (4.4% of sample) were removed for various reasons, including poor quality or obscured facial muscles (by hair or glasses). Therefore, the final sample was 411 participants.

Measures. Participants completed the shortened version of the POMS used in Study 1; internal consistency among the positive emotion items in this study was .89. Participants also completed demographic information and the Big Five Inventory, a 44-item measure of five

personality traits: agreeableness, conscientiousness, extraversion, neuroticism, and openness (John & Srivastava, 1999). Individuals selected how strongly certain characteristics (e.g., Is talkative, Is a reliable worker) described them on a scale from disagree strongly (1) to agree strongly (5). Furthermore, participants were asked how many times they had visited a health care center over the past year for each of the following four reasons: preventive purposes (e.g., a regular check up, filling a regular prescription, vaccination, allergy shots), due to illness (e.g., infection, flu, strep throat, chronic illness, disease), due to injury (e.g., broken bone, sprained ankle, burn), and due to mood-related concerns (e.g., anxiety, stress, depression, attentional issues).

Statistical approach. The statistical approach for Study 2 was identical to the statistical approach for Study 1, except that analyses were conducted for all four of the health care center visit categories. Furthermore, analyses of variance were conducted to determine whether any personality traits were associated with facial expression group.

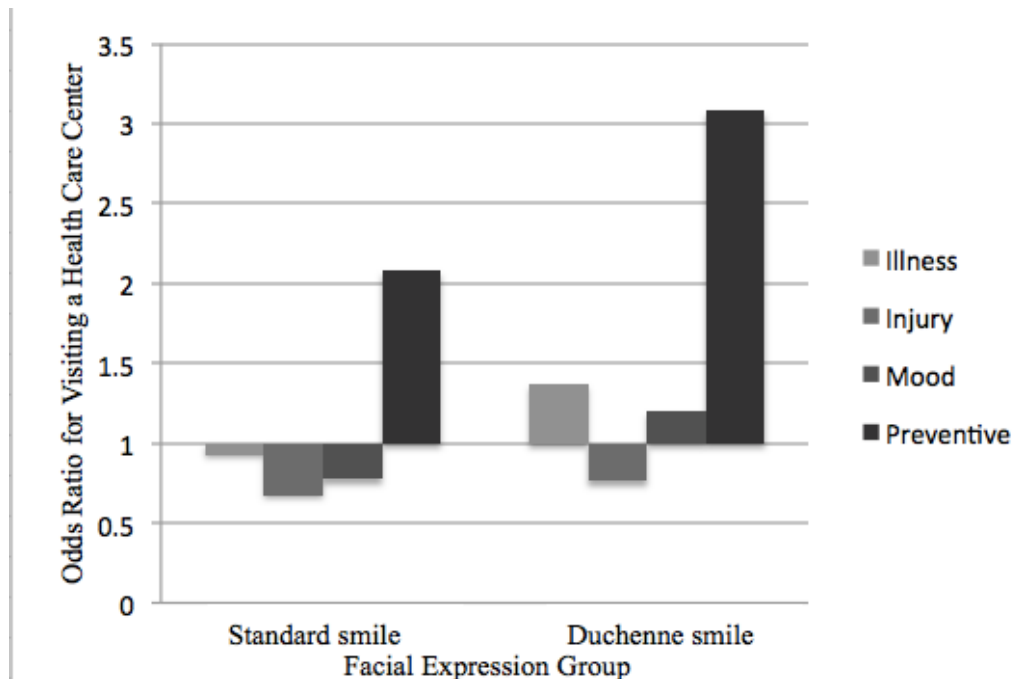
Results

Was smiling related to health care center visits in the last year?

Analyses of variance did not indicate differences in number of health care center visits over the past year for any of the four reasons among the three facial expression groups ($ps > .05$).

Preventive Visits. As seen in Figure 2, the odds of visiting a health care center for preventive purposes over the past year were 2.08 times higher for the non-Duchenne smile group ($b = .73, p = .029$) and 3.08 times higher for the Duchenne smile group ($b = 1.125, p = .001$) than for the no smile group. The odds of visiting a health care center for preventive purposes over the past year were not significantly different between the non-Duchenne smile and Duchenne smile groups ($p > .05$).

Figure 2. The Odds of Visiting a Health Care Center Over the Past Year by Facial Expression Group



Sex differences. A logistic regression revealed that the odds of visiting a health care center for preventive purposes over the past year were 2.11 times higher for women than for men ($b = .746, p = .017$). After controlling for sex in the initial analysis, the odds of visiting a health care center for preventive purposes over the past year remained significant ($OR = 2.67$) for the Duchenne smile group compared with the no smile group ($b = .981, p = .005$). However, the odds of visiting a health care center for preventive purposes over the past year for the non-Duchenne smile group were no longer significantly different from the odds for the no smile group, although the pattern remained the same ($b = .577, p = .099$).

Ethnicity differences. A logistic regression revealed that the odds of visiting a health care center for preventive purposes over the past year are .272 times higher for Latino Americans than for European Americans ($b = -1.3, p = .002$). After controlling for ethnicity in the initial analysis, the odds of visiting a health care center for preventive purposes over the past year remained

significant for the non-Duchenne smile group (OR = 2.35, $b = .855$, $p = .013$) and the Duchenne smile group (OR = 3.1, $b = 1.13$, $p = .001$) compared with the no smile group.

Was positive emotion different across the three facial expression groups? Analyses of variance revealed that total, low arousal, mid arousal, and high arousal positive emotion were not significantly associated with facial expression group.

Were personality traits different across the three facial expression groups? Analyses of variance revealed that none of the five personality traits (extraversion, conscientiousness, openness, agreeableness, neuroticism) were significantly different across the three facial expression groups ($ps > .05$). In addition, none of these variables were related to preventive health visits, and, therefore, were not controlled for in analyses.

Non-Preventive Visits. Logistic regressions demonstrated that the odds of visiting a health care center over the past year due to illness, injury, or mood-related concerns were not significantly different between the facial expression groups ($ps > .05$).

Discussion

Study 2 demonstrates that there is a connection between type of facial expression in student ID photograph and visits to a health care center over the past year. Specifically, participants displaying smiles in their photographs (either Duchenne or non-Duchenne) were more likely to have visited a health care center for preventive purposes over the past year than participants not displaying smiles in their photographs. This clarifies the surprising finding from Study 1 in which participants with either non-Duchenne smiles or Duchenne smiles in their photographs were more likely to have visited the student health care center within the past year. After controlling for sex, the odds of visiting a health care center over the past year remained significantly greater for those with Duchenne smiles as compared with no smiles, but the odds

for those with non-Duchenne smiles as compared with no smiles were no longer significantly different. Therefore, it seems that females with non-Duchenne smiles partially drove the observed findings. Furthermore, positive emotion and personality traits were not different among the three facial expression groups, meaning that personality did not play a role in the relationship between facial expression and health care center visits in this sample.

General Discussion

To my knowledge, these studies are the first to show that smiling in photographs is connected with current health-relevant behavior in a young, healthy population. Study 1 provided evidence that individuals with non-Duchenne smiles or Duchenne smiles in their photographs were more likely to visit the student health center over the past year than people without smiles in their photographs. Study 2 further clarified this association by replicating the initial finding and revealing that those with non-Duchenne smiles or Duchenne smiles were more likely to visit a health care center over the past year *for preventive purposes* than individuals without smiles in their photographs, and not for an illness, injury, or mood-related concern. I also found that self-reported positive emotion and personality traits did not play a role in the connections between facial expression group and preventive health care center visits.

It is important to note that although I originally conceptualized health care center visits as health *outcomes* indicative of poor health (in line with previous research; e.g., Pennebaker & Beall, 1986), preventive health visits are indicative of *positive* health behaviors. Past research has shown that positive health behaviors could serve as connections between positive emotion and health (e.g., Pressman & Cohen, 2005). Hence, positive health behaviors like preventive health care visits could lead to better health over time, especially since my study was conducted with a young, healthy population. The distinction between preventive health visits and visits for illness,

injury, and mood-related concerns is an important one for researchers to make, and future studies using health care center visits as an outcome variable should continue to ask *for what purpose* individuals visited a health care center.

After controlling for sex in Study 1, the relationship between Duchenne smiles and health care center visits for preventive purposes compared with no smiles became non-significant, although still trending in the same direction. After controlling for sex in Study 2, however, the relationship between *non-Duchenne* smiles and health care center visits for preventive purposes compared with no smiles became non-significant. I do not currently have an explanation for these disparate findings, but future research should continue to investigate sex differences in smiles in posed photographs.

Possible Mechanisms

There are a number of possible mechanisms underlying the association between facial expressions in photographs and health care center visitation. One possible explanation is that participants who visit a health care center more often for preventive purposes and smile in photographs are more likely to be susceptible to social desirability, since it is socially desirable to both maintain one's health and smile in photographs (in American culture). My study did not include a measure of social desirability, so it was impossible for us to test this mechanism. However, I would hypothesize that participants who were more susceptible to social desirability would also self-report higher levels of positive emotion, since this is also socially desirable in American culture. Positive emotion would then have been related to preventive health care visits, but this relationship did not exist in my study. Therefore, although social desirability may play a small role in my findings, I do not believe it is the driving mechanisms of my results.

Another possible mechanism is self-presentation. Individuals who place a high value on presenting themselves well to other people may be more likely to both smile in photographs and take care of themselves by visiting a health care center for preventive purposes. Although I did not have a measure of self-presentation in these studies, future research should investigate this possible mechanism.

A final possible mechanism is emotional expressive skill (e.g., smiling when told to smile, such as when taking a photograph). For example, a recent study asked participants to make specific facial expressions as quickly and accurately as possible and hold the pose for five seconds. Skill in expressing happiness was associated with fewer depressive symptoms, better global health, and fewer symptom reports (Tuck, Grant, Brooks, Jackson, & Consedine, under review). One pathway through which emotional expressive skill may be connected with these outcomes is through social relationships; people who are more adept at expressing happiness may have better social relationships, which are connected with a variety of better health behaviors and outcomes. However, because I did not measure emotional expressive skill in this study, I cannot test this hypothesis. Future research should investigate the connections between emotional expressive skill, various health outcomes, and possible mediating mechanisms such as social relationships.

The Case for Multi-Methods

There are multiple possible explanations for the finding that positive emotion and personality traits do not play a role in the connection between smiling and preventive health center visits. One explanation is that facial expressions tap a positive construct that is not captured by self-reports of positive emotion. It may be that various methods, including coding facial expressions, self-report of positive emotion, and coding positive words in text analysis all

measure positive emotion but do not overlap with each other. For example, one study found that self-reported dispositional positive affect was not related to positive affect word count from short autobiographies written by participants (Pressman, 2006). Other research has found only modest overlap between specific word use and self-report in the field of personality (e.g., Pennebaker & King, 1999), and these low correlations may also be true among various methods within the field of positive emotion.

Limitations

One variable that would have been interesting to consider in analyses is how long ago the student ID photograph was taken. It may be the case that photographs that were taken more recently (for incoming students) are more indicative of current health than photos that were taken less recently (for older students). However, I did not collect information about what year in school the students were (e.g., freshmen, juniors), so I do not know how long ago the photographs were taken. Another limitation was that most of the photographs were of poor quality, so it was sometimes difficult to ascertain whether certain muscles were being activated. Furthermore, an example of a neutral face for each participant was not available as it would have been in a video, also making it difficult to detect facial muscle activation. That being said, ratings were only used if two out of the three raters agreed, and photographs of exceptionally poor quality were not used in this study. There are also variables I could not control for in analyses, such as who the photographer was that day and what the mood of the participant was on the specific day they had their photograph taken.

Conclusion

Coding facial expressions in photographs can provide important health-relevant information, especially regarding positive health behaviors. Researchers should continue to use this method in order to investigate additional health outcomes as well as health behaviors.

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