Physical Presence Impacts Perceived Stress in Performance Settings

Kaitlin Heffron

Distinguished Major Thesis

University of Virginia

April 25th, 2011

Advisor: James Coan

Second Reader: Jamie Morris
Acknowledgements

I would like to thank the Department of Psychology at the University of Virginia for instituting the Distinguished Major Thesis Program and enabling me to engage in research that enriches and challenges me. I would also like to thank Professor Jim Coan and Blair Gross for assisting me with data analysis, Hillary Schaefer and Heather Hankley for coding the task videos and Amanda Steiner for designing the karaoke task program. Lastly, I would like to thank Professor Gerald Clore for organizing the Distinguished Major seminars and providing valuable revisions to my manuscript.
Abstract

The physical presence of other people can be stressful during performance tasks. The current study predicts that the physical presence of a single stranger will relate to physiological, self-report and bodily indicators of perceived psychological stress as compared to a control condition with no experimenter physically present. Undergraduate students completed a series of questionnaires related to life stress and personality dimensions, after which they performed a karaoke song. Both conditions performed the karaoke song to a video recorder while heart rate and breathing were recorded, but in the experimental condition the experimenter was physically present during the karaoke performance. The results support the hypothesis that physical presence can be unseen yet still impact stressful situations, suggesting that physical presence induces psychological stress even without participant access to experimenter social feedback. Research into physical presence holds broader applications for stress mitigation in public speaking and performance situations.

Key words: physical presence, psychological stress, karaoke task, performance anxiety
Physical Presence Impacts Perceived Stress in Performance Settings

Performances and interviews can be stressful experiences, especially when evaluation by others is involved. In particular, the hidden physical presence of a stranger may elevate the psychological stress that a person experiences. For discussion purposes, psychological stress involves mental strain or anxiety about a threat that may manifest itself through measurable physical reactions. To determine the impact of physical presence on a performer or interviewer’s experience, the present study investigates how the physical presence of an evaluator may attenuate the physiological effects of psychological stress and may relate to self-report measures on stress management and observed behaviors. Physical presence, which is the physical presence of an experimenter during participant performance, was manipulated to determine its potential influence on the latent variable of psychological stress. The dependent variables of questionnaire reports, heart rate beats per minute, heart rate variability, body movement, breaths per minute, laughter, smiling, as well as reported happiness and excitement were measured in both conditions to capture the construct of psychological stress. Although these dependent variables have been investigated in general performance contexts (Jackson & Latané, 1981; Guerin, 1986; Pertaub, Slater, & Barker, 2002), current research examines their relation to psychological stress in performance situations where only one evaluator is physically present.

The independent variable of physical presence was recently shown to augment perceived stress during public speaking (Pertaub, Slater, & Barker, 2002), with a virtual audience manipulated to determine how social feedback influences psychological stress during a public speaking task. Physical presence is also shown to influence musical performance, where the number of individuals observing an individual’s performance mediates perceived stage fright. Taken together, previous research concludes that the psychological stress experienced by a
performer varies as a function of the number of individuals jointly performing and the size of the audience (Jackson & Latané, 1981).

Previous literature links heart rate, heart rate variability, body movement and breathing rate as reliable predictors of psychological stress. During stress, the body increases blood and supply in anticipation of an impending threat. Although heart rate and breathing do not cause stress or demonstrate a specific range due to perceived stress, heart and breathing rate are reliably associated with stress arousal (Grossman, 1983). Heart rate and heart rate variability indicate psychological stress by increasing beats per minute and decreasing the range of beat amplitudes, resulting in lower heart rate variability and body movement (Dishman et al., 2000; Schubert et al., 2009). Similarly, breathing rate indicates psychological stress by increasing breaths taken per minute (Abelson, Khan, & Giardino, 2010). Body movement is a suspected predictor of perceived psychological stress, but limited research exists on its incidence in performance settings.

In addition to physiological measures, laughter in stressful contexts may relate to either an increase or decrease psychological stress. For example, laughter was shown to increase in response to stress in Rutkowski, Rijsman, & Gergen (2004) to nonverbally signal suffering to non-victims. Consequently, laughter may serve as a form of communication instead of stress reduction. However, laughter can also be a mitigating influence on stress. In Kuiper, Martin, & Rod (1998), increased laughter frequency correlated to greater emotional stability and a reduction in self-reported negative affect when experiencing unpleasant life events, particularly for female participants. Laughter similarly reduced stress in baseline situations, but was not as effective as relaxation techniques (White & Winzelberg, 1992). Hence, the impact of laughter on
stress depends on the type of laughter and the context in which the laughter occurs (Davidhizar & Bowen, 1992). For performance stress, the influence of laughter is yet unknown.

Like laughter, the effect of smiling on stress varies by the context and individual perceiving stress. Smiling is shown to reduce self-reports of anger and distress when individuals experience negative psychological stress (Bonanno & Papa, 2008). However, smiling can also indicate an increased level of stress. Especially among females, smiling increases when a situation is evaluated as ambiguous or negatively emotional (LaFrance, Hecht, & Paluck, 2003). Smiling in stressful situations may socially reassure the other party of an individual’s amiable intentions and fulfill gender roles of sociability. Although physical presence in the current research is not a social exchange, smiling in the presence of a stranger may indicate an unconscious desire to reduce social tension.

The influence of personality traits and coping measures on participant stress reactions was assessed by both the State-Trait Anxiety Inventory (STAI) and the COPE inventory. The State-Trait Anxiety Inventory is a self-report survey designed to measure anxiety in adults, with higher scores predicting greater anxiety. High state anxiety indicates intense anxiety that is the result of a specific context, whereas trait anxiety measures the more stable anxiety experienced across situations as a function of personality. The State-Trait Anxiety Inventory correlates with stress during public speaking tasks (Noto, Sato, Kudo, Kurata, & Hirota, 2005), but is untested in situations where only one other person is present. In addition to the State-Trait Anxiety Inventory, the COPE inventory measures styles of stress management (Lyne & Roger, 2000, 321-322) and is measured in participants to assess the potential relation of coping strategies and physical presence.
The present study introduces a new paradigm to determine if the physical presence of a stranger may increase perceived psychological stress. Although previous research explored the impact of laughter and smiling presence in coping with stress (Kuiper et al, 1998; Rutkowski et al, 2004; Bonanno & Papa, 2008; LaFrance, Marvin, & Paluck, 2003), no study has yet recorded stress arousal in relation to laughter in a private performance setting. Unlike most experiments, the participants were not influenced by experimenter or audience member social reactions to the performance since they could not see the experimenter during the task. Hence, laughter and smiling would not be elicited or encouraged by the social context. Because laughter and smiling are not part of a social interaction, observed laughter and smiling are recorded as indicators of psychological stress. Similarly, the physiological variables discussed are understood as general correlates of stress perception, but are unexamined in a private performance context with only one other individual present.

To improve the existing literature on psychological stress, we tested the hypothesis that the physical presence of a stranger in a private setting may induce psychological stress in the absence of visual or auditory social feedback from the experimenter. Specifically, we predict that physical presence will significantly increase perceived stress, as measured as an increase in breaths per minute, heart rate, smiling, and laughter, while heart rate variability and body movement will decrease (Dishman, 2000). Self-reported levels of excitation and happiness are predicted to increase in range from before the task to after the task, as self-reports of happiness and excitation are anticipated to increase after individuals complete the task and decrease before the task. Based on previous research, we also predict above average scores on the COPE and State-Trait Anxiety Inventory assessments for participants who subjectively experienced high psychological stress due to physical presence.
Method

Participants

The study was completed by 40 participants between the ages of 17 and 24. All 14 men and 26 women agreed to the informed consent sheet and provided demographic information on age, gender and their current year at the university. The experiment was conducted by undergraduate students during 60-minute periods in a psychology research lab where each individual participated voluntarily. The participants consisted of 30 first year students, 5 second year students, 4 third year students, and 1 fourth year student. No material inducements were offered to participants, and all responses and videos remained anonymous.

Design

The study was an ANOVA between-subjects mixed methods design. Physical presence was compared to perceived stress by measuring dependent correlates of psychological stress, which included physiological, self-report, and behavioral coding. Laughter presence is the degree of observed laughter as measured by separate instances of observed laughter. Smiling is measured as both the number of separate smiling instances and the total seconds spent smiling compared to the total recorded time. Heart rate and breathing are the number of beats or breaths recorded during the 60-second countdown, song performance or 60-second cool down periods. The song performance period was the time during which the song background music and lyrics were playing. Questionnaire measurements on coping and personality were assessed through the State-Trait Anxiety Inventory, COPE and a demographic survey to determine participant self-reported stress management and personal characteristics. The State-Trait Anxiety Inventory inventories were electronically scored by utilizing the National Stress Relief State-Trait Anxiety Inventory Scoring Tool (http://www.nsrusa.org/score.php).
Materials

Laboratory computers were utilized to record physiological data, present a PowerPoint presentation to instruct participants during the karaoke task, and record participant levels of happiness versus sadness (emotional valence) and excitement versus calm (emotional arousal) ratings before and after task completion. Degrees of happiness and excitement were assessed on 7 point Likert scales with corresponding digital renditions of faces indicating states of arousal and valence. The physiological measurements were measured through the LifeVest system created by the company VivoMetrics. Each participant received an informed consent sheet, 3 electronic questionnaires and a debriefing form. The State-Trait Anxiety Inventory, COPE and demographic questionnaires were completed electronically.

Procedure

For the karaoke task, each participant viewed a timed slide presentation containing a description of the singing task to be performed along with the title of the song they selected from the presented list. Participants were exposed to identical song lists and experimental rooms in which to perform their song while sitting in front of a camera, with the only variation between participants being the song they selected. The task explanation was followed by lyrics visually presented on a computer monitor to guide their performance of the single song and a slide indicating completion of the task. Calm-excited and happy-sad ratings were asked prior to the countdown and after the cool down periods to measure the self-reported arousal and valence of emotion experienced during the task. Heart rate and breathing data were measured during all three periods, but smiling and laughter were only coded during the song period. All video coders were checked for inter-rater reliability on the coding system.
In the control condition, the experimenter was not present in the room during the karaoke task. Instead, participant performance was observed by the experimenter in an adjacent room via a television monitor recording the performance. In the experimental condition, all aspects of the study were identical except that the experimenter was standing behind the chair of the participant during the task rather than in another room. The experimenter did not interact with the participant during the task and could not be seen or intentionally heard. Each recorded session of karaoke was coded by multiple undergraduate experimenters using an identical coding system after the performance was completed.
Results

Linear mixed models were computed to assess interactions between control and experimental groups at reporting arousal (excitement versus calmness) and valence (happiness versus sadness) in predicting physical presence in both between- and within-subjects tests. These models compared 1) heart rate median and maximum measurements of individuals and experimental groups (indicating physiological arousal during the karaoke task); 2) participant reports of state-trait anxiety and coping strategies with physical presence and 3) nonverbal gestures of laughter and smiling during the karaoke task and physical presence. All models included a condition variable referring to the conditions under which dependent measurements of stress were recorded (countdown, song and cool down periods).

Between-subjects tests analyzed experimental versus control group indicators of stress. Evidence for the impact of physical presence on stress perception was also revealed through a significant main effect of self-reported arousal and mean heart rate, $F(1, 99.98) = 5.792, p = .018$, with the experimental group displaying significantly higher positive arousal. A main effect between maximum heart rate and arousal was also reported, $F(1, 101.771) = 8.687, p = .004$, with a higher max HR in the control condition and higher reported arousal in the experimental condition. Significant main effects were observed for maximum heart rate and condition, $F(2,69.354) = 8.430, p < .001$; and maximum heart rate and group, $F(1,101.771) = 8.687, p = .004$. Two significant interactions were also observed: group by happiness difference and mean heart rate with greater happiness reported in the experimental condition, $F(1, 99.981) = 4.857, p = .030$; and group by happiness difference and maximum heart rate with greater happiness reported in the experimental condition, $F(1,101.771) = 4.686, p = .033$. These results are described in Tables 1 and 2.
In addition to heart rate differences, main effects between mean body movement and group, $F(1, 97.682) = 6.566, p = .012$; maximum body movement and group, $F(1,111.158) = 9.233, p = .003$; and minimum body movement and condition, $F(2,80.821) = 80.821, p = .004$ were reported. Body movement significantly differed in degree and amount between groups and by the task period in which it was recorded. The control group elicited significantly higher median and maximum movement, meaning that control participants moved in their chair more frequently and their individual movements were larger than those in the experimental group. The song period contained the lowest minimum movements in both groups, potentially as a function of singing. Regrettably, breathing measures and heart rate variability did not significantly differ between groups or conditions. No significant effects were observed for smiling or laughter between groups or conditions.
Discussion

As predicted, the positive arousal measured in the experimental group was significantly greater than the control condition. Greater happiness and excitement when the experimenter was physically present correlated with significantly increased maximum heart rate, decreased frequency of body movement and decreased magnitude when movement did occur. Maximum heart rate for both groups was significantly higher during the song itself, supporting the assumption that the karaoke task increased perceived stress. These findings suggest that social facilitation occurred during the karaoke task as a result of the physical presence of the experimenter, which was reflected through greater heart rate, greater happiness and less bodily agitation.

The social facilitation of physical presence supports the predictions of the mere presence effect. The mere presence effect states that the physical presence of another person is a minimal condition for social facilitation to occur during performance situations. This effect occurs either when the actions of an observer are uncertain to the performer or there is pressure to conform to a social norm (Guerin, 1986). Social facilitation in these conditions is suspected to result from a desire to control social approval or determine the safety level of an ambiguous situation. In the karaoke study, the positive arousal measured in the experimental condition suggests that another person being physically present during a performance task is socially supportive. That is, physical proximity without observable social feedback or interaction increased the excitement and happiness experienced by participants. Despite the judgmental purpose of the experimenter's presence, the performers reported social facilitation during the task.

The featured study also supports the predictions of social baseline theory. Social baseline theory states that the primary way individuals regulate their emotions is through social
interaction and physical closeness to other people. The social regulation of emotion is suspected to conserve more metabolically costly forms of self-regulation (Coan, 2010). As a result, this theory predicts performers to derive emotional support from the physical presence of others. No previous research has applied social baseline theory to a performance context or to a situation where the social presence of another person was not observable or available for social interaction, but the social means of emotion regulation applied. Our data suggest that physical presence allows greater enjoyment during a performance task due to social support. As a result, social feedback may not be necessary to significantly increase perceived social support. Individuals may not need to socially interact or see another person in order to benefit from their presence.

Participant variation in the perceived stress of the karaoke task is a potential limitation of our research. Every individual reacts differently to both positive and negative stimuli (Lovallo et al., 1990), with singing and public performance demonstrating great variability. In particular, gender differences show higher male cortisol responses to public speaking whereas women respond more to the situation's social cues (Kliecunt-Glaser et al., 1996). In addition to perception, individuals vary in singing and acoustic proficiency, with skill level further influencing the perceived stress of the task. Fortunately, the degree of confidence in singing ability was self-reported to account for the anticipated variation and degree of participation considered when analyzing physiological arousal to the task. The karaoke task procedure was simplified as much as possible, but individual perception was an uncontrollable variable.

If extended to groups of strangers, the physiological mechanisms related to stress arousal have practical application for public speaking and performance-based careers, which require effective self-regulation of psychological stress. Karaoke is similar to public speaking in its necessary voice projection and self-presentation to an audience of listeners. Language command
is necessary for both, in addition to pacing and anticipation of verbal performance. Oratory careers such as professors, ministers and entertainers likewise experience public performance in front of large masses of strangers. Although public performance often involves more than one silent experimenter standing out of sight, a crowd of faces affords a comparable level of social ambiguity. A common instance of psychological stress mediation in the absence of observable social reactions is musical instrument auditions. Instrumental auditions are frequently conducted with a physical barrier between the candidate and judging panel to prevent evaluator bias due to physical appearance, which creates a situation similar to the study constructed. Without access to the evaluator, no social feedback may be observed to guide interaction. Hence, these types of performance may induce a stress experience different from public performance or face-to-face interaction. Furthermore, musicians routinely exposed to the psychological stress of social performance report above average trait anxiety scores, suggesting that chronic stressors may impact the nature of individuals in certain occupations (Kennya, Davisa, & Oates, 2004). Careers requiring frequent public speaking or performance may likewise develop increased trait anxiety or attract individuals with high initial levels.

In addition to performance settings, the mediated social presence of the control condition suggests that technology-mediated observation may elicit different influences over behavior than physical presence. When applied to the workplace, employers may consider the value of in-person evaluation of employee performance instead of video monitoring. Even if assigned the same task or series of questions, an individual who is evaluated by a person that is physically present may experience a heightened stress response when compared to another individual evaluated through a recorded medium. As research demonstrates, social cues and evaluator feedback are not necessary to elicit this increase in perceived psychological stress. Potentially,
the lack of performer-evaluator exchange may have raised stress perception more than if the person physically present were observable, due to the social ambiguity of the situation when the performer could not interact with the evaluator present.

The presented research demonstrates that the physical presence of a person may significantly increase the perceived psychological stress experienced during a performance situation, although this stress was more positively interpreted when compared to the control group. The findings confirm the conclusions of previous studies (Pertaub, Slater, & Barker, 2002; Jackson & Latané, 1981) that show the impact of physical presence on perceived stress in more public performance contexts. Likewise, the results suggest that the in-person evaluation of a performance may increase perceived stress, even without observer feedback or social cues. Our research examines psychological stress in order to better understand the subjective experience of individuals during a private performance and compare findings to public performance stress. In professional settings, the consideration of physical presence during interviews, performances and social exchanges may be useful in determining what environmental factors contribute to an individual’s behavior.
References


and perfectionism. *Anxiety Disorders* 18, 757–777.


Appendix A

Informed Consent Agreement

Please read this consent agreement carefully before you decide to participate in the study.

Purpose of the research study: The purpose of the study is to investigate how the use of laughter can function as a coping mechanism in stressful situations. This will help us understand whether participants who laugh at themselves are more socially adaptive to life stressors.

What you will do in the study: You will complete a series of questionnaires related to life stress and personality dimensions, then perform a karaoke song to a video recorder and the experimenter. You will select the song from a song list included in the survey section. Heart rate and breathing will be recorded during both the 30-second countdown to the song performance and during the singing itself. Breathing will be recorded using a velcro sensor belt placed below the bust line over the participant's clothing. Heart rate data will be recorded using electrode sensors placed 1 inch below each inner crook of the elbow on the forearm, as well as one sensor on the neck for a base measurement. During the study, you may skip any question that makes you feel uncomfortable and stop the study at any time.

Time required: The study will require about 1 hour of your time.

Risks: Subjective discomfort from the activity of singing to a selected song is the only anticipated risk.

Benefits: There are no direct benefits to you for participating in this research study. The study may help us understand laughter as a therapeutic technique and coping strategy in stressful situations.

Confidentiality: The information that you give in the study will be handled confidentially. Your information will be assigned a code number. The list connecting your name to this code will be
kept in a locked file. When the study is completed and the data have been analyzed, this list will be destroyed. Your name will not be used in any report. Video tape materials will be destroyed by May of 2011, upon completion of all data analysis.

**Voluntary participation:** Your participation in the study is completely voluntary.

**Right to withdraw from the study:** You have the right to withdraw from the study at any time without penalty. The video tape will immediately be destroyed should you decide to withdraw.

**How to withdraw from the study:** If you want to withdraw from the study, tell the researcher at any time and leave the room. There is no penalty for withdrawing. If you would like to withdraw after your materials have been submitted, please contact Kaitlin Heffron at kah6y@virginia.edu.

**Payment:** You will receive 1 class participation credit for participating in the study.

**If you have questions about the study, contact:**

Kaitlin Heffron  
Psychology Department, 314 Gilmer Hall  
University of Virginia, Charlottesville, VA 22903.  
Telephone: (434) 960-0596  
Email address: kah6y@virginia.edu

Professor James Coan  
Psychology Department  
PO Box 400400, Gilmer Hall  
University of Virginia, Charlottesville, VA 22903.  
Telephone: (434) 960-7803  
Email address: jac3zt@virginia.edu

**If you have questions about your rights in the study, contact:**
Agreement:
I agree to participate in the research study described above.

Signature: ____________________________ Date: _____________

You will receive a copy of this form for your records.
Appendix B

Survey Questions

What is your current age? __________

What is your gender? __________

What is your year in college? __________

Please describe your most embarrassing moment.

______________________________________________________________________________
______________________________________________________________________________

Of the following songs, which would you be most comfortable singing?

   Song 1 by artist

   Song 2

   Song 3

   Song 4

   Song 5

   I am equally comfortable with any of the songs

On a scale of 1 to 5, with 1 being not stressful and 5 being very stressful, how stressful is it for you to sing aloud to a stranger?

   1

   2

   3

   4

   5
On a scale of 1 to 5, with 1 being poor and 5 being great, how well are you able to sing aloud to a stranger?

1

2

3

4

5
Appendix C

Debriefing Statement

Thank you for agreeing to participate in this study! The general purpose of this research is to explore the relation of physical presence in a stressful situation with overall life coping strategies and personality traits. As such, the experimenters expect physical presence to increase dependent correlates of stress.

In this study, you were asked to complete a series of questionnaires to assess basic personality measures and individual management strategies for common stressful events. The karaoke session was a stressful event to record your heart rate, breathing, and potential laughter and smiling in the situation in order to investigate the relations between laughter and smiling, self-reported stress coping patterns and physiological responses to stress. Laughter intensity in a stressful situation may positively correlate with overall life coping and adaptive personality traits. As such, participants who laugh may be able to adapt to stressful events. The results from this study will determine the importance, if any, of laughter on stress management.

Thank you for your participation in this study. If you have further questions about the study, please contact Kaitlin Heffron at kah6y@virginia.edu. In addition, if you have any concerns about any aspect of the study, you may contact Tonya Moon, Ph.D., Chair, Institutional Review Board for the Social and Behavioral Sciences, One Morton Drive, Suite 500, University of Virginia, P.O. Box 800392, Charlottesville, VA 22908-0392. Telephone: (434) 924-5999.

Additional Reading:

*Dissertation Abstracts International: Section B: The Sciences and Engineering, 68* (5B), 3432.

Appendix D

Video Coding Rubric

*Number of Laughs* – Count the separate instances of laughter during the song period.

*Number of Smiles* – Count the separate instances of smiling during the song period.

*Smiling Time Percentage* – Add up the total seconds of smiling time during the song period.

For example, if a participant smiles 12 seconds one instance and 8 seconds another instance, the total smiling time is 20 seconds.

*Song Participation Percentage* - A percentage of how much of the time a participant followed the task during the song period. For example, if a participant sang the whole time code 100%.

Only code during the karaoke song, from song start to finish (the duration of the music).

Participants sometimes laugh as the music is fading, which should be counted as part of the karaoke song.
Figure 1. Interaction Effect of Group, Max Heart Rate and Happiness Difference.
Figure 2. Main Effect of Group and Max Heart Rate.