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# All alone with sweaty palms — Physiological arousal and ostracism

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ABSTRACT

Social exclusion, or ostracism, is universally perceived as a negative emotional experience and often leads to poor social outcomes for individuals and society. Although the experience of distress associated with being ostracized is innate, there has been very little investigation of the effects on the autonomic nervous system. This study provides objective evidence for the effects of ostracism on arousal (examined with skin conductance levels) while participants played an internet ball-tossing game (Cyberball). Forty-two healthy undergraduate students participated in both inclusion and ostracism conditions. When participants were included, there was a marked decrement in arousal over the course of the task, whereas there was no evidence of habituation when participants were ostracized. The implications of these results are discussed in terms of the potential of differential autonomic activity to predict the coping strategies that people engage in following ostracism.



## 1. Introduction

Social exclusion, or ostracism, causes an immediate experience of self-doubt leading to emotional distress. It interferes with one's self-esteem, sense of belonging and even how meaningful existence is perceived to be. Furthermore, it can reduce one's sense of control over a situation and lead to negative mood states (Williams and Sommer, 1997). Ostracism is such a powerful social signal that is believed to be one of the motivations behind mass shootings in high-schools in the United States (Leary et al., 2003).

No one is immune to the pain of social exclusion. This phenomenon can be observed in adults, in children, and in the animal kingdom. Ostracism can be experienced when rejected by individuals in one's existing in-group, or when attempting to establish a new social group (Kerr and Levine, 2008). Individuals are so fearful of being socially excluded that they will comply, conform, and even change their appearance in order to manage the impression they give others (Baumeister and Leary, 1995; Maner et al., 2007; Williams et al., 2000), and ultimately protect their inclusionary status.

While a variety of paradigms have been used to examine ostracism in social psychology (e.g. Nezlek et al., 1997; Pickett et al., 2004) the most commonly used is an online ball throwing game called Cyberball (Williams et al., 2000; also see Williams and Jarvis, 2006). In this computerized task, the participant is invited to play ball with two other players who are also "on-line". In reality, the other two players are not real, rather they are *programmed* by the experimenter to ignore the real participant after the initial few throws. Participants view a computer screen which presents either three or four players (one being themself), and they are told that the researcher is interested in 'the effects of mental visualization on task performance'. The players are animated characters each with a name clearly labeled. When the participant receives the ball they can choose to throw it to any other player by using the mouse to select that player. To increase the reality of the computer generated players, each is programmed to throw the ball after varying intervals to imply different speeds of decision making. Despite the remote, artificial experience of social exclusion that occurs in this internet based computer task, the innate social signals are so powerful that after being ostracized for only a few minutes, participants reported lower scores on the four fundamental needs of belonging, self-esteem, control and meaningful existence (Williams et al., 2000; Zadro et al., 2004), as well as changes in mood (Williams et al., 2000; although not always: see Zadro et al., 2004). In fact, it does not even appear to matter whether the participants believe they are playing with real people or just the computer, being ostracized by a computer hurts just as much as being ostracized by real (or ostensibly real) people (Zadro et al., 2004).

Using Cyberball as a measure of ostracism, the robust nature of this phenomenon has been repeatedly demonstrated. For example, ostracism is just as devastating to those with high self-esteem as it is to those with low (Williams et al., 2000). It is equally affected whether the social exclusion is by a desirable or an undesirable (e.g. Klu Klux Klan) group (Gonsalkorale and Williams, 2007), and is not affected by financial losses or gains associated with gaining the ball (van Beest and Williams, 2006).

Evidence from a number of converging sources suggests that the effects of ostracism are grounded in theories of survival (Williams,

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2009). In the animal kingdom, weaker members of the group are ostracized to promote the survival of the group, often to the detriment of the ostracized individual (Gruter and Masters, 1986b). In humans, the system for monitoring social exclusion (see Gardner et al., 2005; Leary et al., 1995, 1998; Pickett et al., 2004) is so sensitive that it is more likely to over detect than under detect social exclusion, even in the presence of early, ambiguous cues (cf. Haselton and Buss, 2000; Haselton and Nettle, 2006; Williams, 2009). Early detection allows the opportunity to adjust behaviors in an attempt to rejoin the group (Aspinwall and Taylor, 1997; Williams, 2007).

Changes in sympathetic galvanic skin conductance are a biologically and psychologically relevant index of autonomic arousal that is relevant to the exclusion response, although, it has not been used in this way to date. Skin conductance is gaged in terms of either a brief phasic response to a single stimulus [skin conductance response (SCR)] or a slow tonic modulation of sympathetic arousal [skin conductance level (SCL)]. SCL is commonly used as an index of slow adjustments in physiological arousal over time, and decreases are seen during rest or sleep (Malmo, 1959). During simple habituation paradigms, in which participants are presented with a series of repetitive stimuli, SCL shows an initial increase (sensitization) with new or novel stimuli, but rapidly habituates with stimulus repetition (Barry and Sokolov, 1993; Rushby and Barry, 2007). However, when participants are actively engaged in a task, habituation slows, or does not occur (Barry, 2004; McDonald et al., 2011). Previous research has examined the autonomic response evoked by an aversive stimulus such as physical pain and found that skin conductance increases (Tursky, 1974). Recent research with Cyberball in adolescent girls has also reported a relation between skin conductance changes in response to ostracism and aggression (Sijtsema et al., 2011) although a detailed examination of the unfolding changes associated with ostracism was not reported. Nor was there a control (non-ostracized condition) provided for comparison. No studies to date have examined these effects in an adult population.

The current research aimed to determine the electrophysiological dynamics of social exclusion by measuring SCL[1] while adult participants are engaged in the Cyberball task. It was expected that there would be less habituation of SCL when participants were being ostracized (exposed to a social stressor) compared to when they were included in the game. Secondly, the study aimed to establish whether there was an association between self-reported ostracism and physiological markers of social distress using SC. As an improvement on previous research designs that were either between subjects designs (van Beest and Williams, 2006; Williams et al., 2000; Zadro et al., 2004), or, a within subjects fixed-order design in which participants were always included first (Eisenberger et al., 2003, 2007a, 2007b, 2009; Sebastian et al., 2010), this study used a within-subjects design with counter-balanced order across participants, with the aim of reducing subject variance and removing any possible order effects.

## 2. Method

### 2.1. Participants

Participants were 42 (14 male) undergraduate psychology students, aged 18 to 30 years ($M = 19.98$), participating in return for course credit in an Introductory Psychology course at the University of New South Wales, Australia. Participation was voluntary and informed consent was obtained in line with a protocol approved by the University of New South Wales Human Research Ethics Committee. Participants were screened for a history of brain injury, developmental disorder, mental illness, depression, and any medical condition or medication that may affect arousal levels. Participants were randomly assigned to complete either the inclusion or the exclusion condition first. One participant met exclusion criteria and was removed from analyses.

### 2.2. Materials

#### 2.2.1. The Cyberball

The Cyberball (Williams et al., 2000) computer based 'ball tossing' game was used for the current study. Participants were told they would be playing a game of 'catch-and throw' with two other participants over the internet with the aim of *'investigating the effects mental visualization'*. In reality, the other two players were programmed to either include or exclude the real participant from the game. Participants played two versions of Cyberball. In the inclusion condition, throws were distributed evenly to all players throughout the game. In the exclusion condition, participants received four balls at the beginning of the game and were ignored thereafter (29 tosses). In this study participants were not provided with photos of the other players or their names to avoid giving participants any other reason for disliking another player apart from the fact that they were being ostracized by that person.

#### 2.2.2. The Cyberball Questionnaire

The Cyberball Questionnaire addressed (a) the four fundamental needs (3 questions per need), and (b) current mood. These were rated on a 5-point Likert scale from 'not at all' to 'very much'. The fundamental needs questions were: *Sense of belonging* ("I felt disconnected", "I felt rejected", "I felt like an outsider"), *Control* ("I felt I had control over the course of the interaction", "I felt powerful", "I felt superior"), *Meaningful existence* ("I felt non-existent", "I felt meaningless", "I felt invisible"), and *Self-esteem* ("I felt good about myself", "I felt liked", "My self-esteem was high"). The mood questions were: "My mood is"… good, bad, happy, sad, friendly, unfriendly, tense, and relaxed, "I felt angry" and "My feelings were hurt". Four remaining questions were included to check the effectiveness of the manipulation, that is, how excluded or included participants felt: "I felt included", "I felt excluded", and, "Assuming 33% of the time you would receive the ball if everyone received it equally, what percent of the throws did you receive?". The final question thanked the participant and asked "In the space below, please list any thoughts you have about today's study. Were you ever suspicious or was there anything strange about the game? Please list any thoughts you like. You will have 3 minutes. Press the <Esc> key if you are finished early". This question gave participants the opportunity to express whether they questioned the authenticity of the social interaction.

All questionnaires were computerized versions presented in Medialab (Empirisoft Corporation, Version 2008.1.33).

### 2.3. Psychophysiology recording

Physiological data was acquired with a PowerLab 8/30 Data Acquisition System (AD Instruments, Castle Hill, Australia) at a sampling rate of 100 Hz. The PowerLab was triggered by Inquisit (Version 3.0.4.0; Millisecond Software, 2010) software that precisely synchronized timing of responses with recording of the data acquisition system. Skin conductance was recorded continuously from two dry, bright-plated bipolar electrodes placed on the distal volar surface of digits II and IV of the non-dominant hand (left in all participants).

### 2.4. Data reduction and analysis

Participants were asked to relax for 2 min to get a baseline measure of arousal (i.e. skin conductance level) prior to commencement of the task. In order to examine changes in arousal over the course

[1] SCRs cannot be examined in the Cyberball task as participants do not receive the ball during the exclusion condition, and therefore response patterns across the two conditions cannot be compared. Accordingly, tonic changes in arousal (SCL) will be examined.