Turning up the volume of stereotype threat:

Music, gender, and mathematics

An honors thesis for the Department of Psychology

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Abstract

Stereotypes are prevalent in everyday life, and even the mere awareness or implicit activation of a negative stereotype regarding a group to which an individual belongs can lead to significant performance deficits. Stereotype threat – the situational phenomenon whereby excessive anxiety about inadvertently confirming an existing negative stereotype regarding one's group ultimately hinders ability – can be elicited among any individual invested in a task associated with an identity-relevant negative stereotype. Stereotypes can be conveyed through communicative mediums such as music, which has become increasingly widespread, accessible, and influential in North American society. Thus, the present study aimed to determine whether popular songs containing female-specific negative stereotypes would be sufficient to induce stereotype threat in highly qualified young women taking a domain-relevant mathematics test. It was hypothesized that these women would perform more poorly on a difficult quantitative task while listening to background music casting females in negative stereotypical roles as opposed to background music depicting females in positions of empowerment. Furthermore, it was predicted that young men would be unaffected by the female-specific stereotypes and perform similarly across all music conditions. Support for both hypotheses was generated. Implications and future directions were discussed.

Keywords: stereotype threat, music, gender, mathematics

Introduction

Stereotype threat

Stereotype threat, defined by Steele (1997), is "the social-psychological threat that arises when one is in a situation or doing something for which a negative stereotype about one's group applies." A context-dependent phenomenon, stereotype threat develops when an individual who is invested in the stereotype-relevant domain fears judgment to the point that his or her excessive anxiety impedes ability; in short, the pressure of avoiding confirmation of an identity-applicable stereotype hinders effective functioning.

The prevalence of stereotypes in contemporary North American society has been consistently demonstrated by a variety of researchers, leading Davies (2000) to conclude, "Living in our mass-media culture, it is inevitable that members of our society become acutely aware of negative stereotypes targeted at stigmatized groups." Although awareness of extant stereotypes does not necessarily imply personal endorsement of such beliefs, the detailed knowledge of stereotypes associated with one's own social identity can lead to the disruptive apprehension that characterizes the onset of stereotype threat.

Stereotype threat and subsequent performance decrements are most likely to occur when one's stereotyped group status is made salient or conspicuous by contextual factors, which may be explicit or implicit (Steele, 2010). Interestingly, high ability and ambition regarding the task at hand do not ameliorate the effects of stereotype threat, and may in fact exacerbate the consequences due to greater levels of personal investment, a dynamic known as domain identification (Cadinu, Maass, Frigerio, Impagliazzo, & Latinotti, 2003; Good, Aronson, & Harder, 2008). In other words, simply the knowledge that one is expected to perform poorly on an important task by virtue of his or her group membership can be sufficient to seriously impair performance.

Stereotype threat has been empirically observed among a variety of different groups of stereotype-vulnerable people. Some individuals belonging to more than one traditionally stereotyped group may be subject to a combination of different stereotypes. Although the majority of widely known stereotypes are negative, positive stereotypes do exist; in a demonstration of performance facilitation through stereotype salience, Shih, Pittinsky, and Ambady (1999) demonstrated that certain positive stereotypes can offer a booster effect to individuals possessing dual group memberships. When Asian females were primed with their gender identity through a questionnaire regarding co-educational versus single-sex housing prior to taking a difficult mathematics test, they performed more poorly overall than an unprimed control group in accordance with gender-based stereotypes. However, when these Asian women were primed with their ethnic identity through a questionnaire about family traditions, their scores improved significantly, and they scored better as a group than did the unprimed controls. This pattern of results led the authors to conclude that distinct stereotypes may become salient based on the contextual dominance of one social identity, and behavior will tend to confirm the highlighted stereotype.

Although some groups consistently confront stereotypes – both more frequently and of a greater intensity – more often than others, total exemption from the effects of stereotype threat is virtually non-existent; every individual is stereotype-vulnerable under certain stressful conditions. Stroessner and Good (2010) emphasize, “Stereotype threat can be experienced by *anyone* in a domain in which one encounters stereotype-based expectations of poor performance." The impressive multiplicity of groups that are affected by correspondingly diverse stereotypes lends support to their postulation: to illustrate, stereotype threat has been observed among both White and Black individuals and among both males and females, albeit triggered by divergent population-specific stereotypes.

As the concept of stereotype threat was initially developed as a means to explain context-dependent poor academic performance of Black students (Steele, 2010), it is unsurprising that a vast portion of the stereotype threat literature concentrates on issues of race. In one early study, Steele and Aronson (1995) systematically altered the stereotype vulnerability of Black participants given a difficult verbal exam by varying whether or not participants were told that their performance was diagnostic of inborn ability, thereby modifying participant perceptions as to whether they were at risk of fulfilling a negative racial stereotype regarding intellectual talent. This paradigm has since been replicated by several researchers, with the consistent finding that Black participants feeling pressure to disprove a lack of innate and racially-based aptitude perform more poorly than those who are not burdened by that explicit stressor (e.g., Nguyen & Ryan, 2008).

Although non-White individuals are subjected to a wider variety and a stronger intensity of stereotypes in North American society (Steele, 2010), Whites are also subject to negative racially-grounded stereotypes. For example, when White males were informed that a physical activity – a simplified game of golf – was designed to identify one's natural athletic ability, they performed markedly worse than Black and Hispanic individuals; however, without any indication that the activity was diagnostic of one's inherent sport prowess, White males were just as successful as their Black and Hispanic counterparts (Stone, Lynch, Sjomeling, & Darley, 1999; Stone, 2002). Whites are also conscious of the stereotype that they possess racist attitudes, and are often strongly motivated to counteract that belief. Frantz, Cuddy, Burnett, Ray, and Hart (2004) informed some White undergraduates randomly assigned to a high-risk condition that the Implicit Association Task (IAT) was diagnostic of personal racial bias, while reassuring others in a low-risk setting that the IAT was merely a measure of knowledge about racial stereotypes. Students in the high-risk condition, fearful of confirming racial bias, received scores more indicative of racist associations than did students in the low-risk condition. Finally, high-achieving White students performed more poorly on a difficult quantitative task when informed, prior to task initiation, that Asian students typically outperform all others in mathematics (Aronson, Lustina, Good, Keough, Steele, & Brown, 1999). In a display of the impact of domain identification, only those White students who self-reported as highly identified with mathematics suffered the impact of stereotype threat.

Stereotypes, and consequently stereotype threat, regarding gender also exist. Although changes in beliefs about gender-related traits have evolved over time, gender-based stereotypes have remained reasonably stable since the 1950s (Golombok & Fivush, 1994), and some researchers have found that of all types of stereotypes, gender-based beliefs are the most resistant to change (e.g., Leuptow, Garovich, & Leuptow, 1995). The vast majority of gender-based stereotype threats are targeted toward women (Broverman, Vogel, Broverman, Clarkson, & Rosenkrantz, 1972); two of the most common and popularly endorsed stereotypes pervading North American society allege that women are inherently inferior to men in quantitative domains such as mathematics, the physical sciences, and spatial reasoning (e.g., Spencer, Steele, & Quinn, 1999; Walsh, Hickey, &

Duffy, 1999), and that women can be either attractive or intelligent, but not both (e.g., Celizic, 2008).

Both of these stereotypes lead to sub-optimal consequences. Regarding the dichotomy between attractiveness and intelligence, Panetta (personal communication, March 12, 2012), who founded a national organization designed to promote female interest in engineering, explains, "There is a myth that a woman can't be smart and attractive, that if you're intelligent you're homely … There's a stereotype that the uglier the woman, the better the science." A recent survey showed that young American females were acutely aware of the pretty-or-smart division; over one-fourth of these women reported that, given a choice, they would "rather be 'hot' than smart" (Bloom, 2011). Women also seem to be highly cognizant of the popular perception regarding the alleged inferiority of females in mathematics, oftentimes to their detriment: simply reminding women that men are supposedly better than they are at math is often sufficient to induce stereotype threat. Spencer, Steele, and Quinn (1999) showed that women's scores on a mathematics test were significantly deflated when the women were informed prior to the examination that the results tended to show gender discrepancies. Walsh, Hickey, and Duffy (1999) replicated these findings, demonstrating that young women were seriously hindered in mathematics performance by the invocation of gender stereotypes, but were able to perform equivalently to young men when the task was presented as a game unreflective of innate ability.

The discussion of potential gender differences is not the only mechanism by which researchers have manipulated levels of quantitatively-based stereotype threat among females. In a study ostensibly examining consumer preferences, Fredrickson, Noll, Roberts, Quinn, and Twenge (1998) found that the gap between male and female mathematics performance was greatly enhanced when participants were required to wear swimsuits, thereby making their bodies – and their gender – visually salient. Another study found that after watching commercials that portrayed females in traditional sex-based roles, young women not only avoided mathematics problems in favor of verbal questions on a general knowledge examination, but also reported diminished educational and vocational aspirations in quantitative domains, as well as lowered leadership interest and initiative in general (Davies, 2000). Inzlicht and Ben-Zeev (2000) found that the mere presence of a male in a testing environment can be threatening to women: they observed that women's mathematics examination scores decreased in a manner inversely proportional to the number of men in the room, especially when the women were told that their score would be made public to the other study participants. Clearly, social context can moderate the existence of stereotype threat.

The odds seem stacked against women hoping to succeed in mathematics or in a mathematics-related domain: although quantitative tests presented as non-diagnostic are typically non-threatening to women (Spencer, Quinn, Davies, & Gerhardstein, 2002), merely requiring females to indicate their gender on a demographics questionnaire prior to taking a mathematics test is threatening enough to demonstrably impair performance (Stroessner & Good, 2010). Furthermore, the more a woman is personally invested in her gender identity, the more susceptible she will be to negative stereotypes about females; specifically, research has demonstrated that these highly gender-identified women are particularly hindered by the belief that women are inherently inferior to men in mathematical fields, and are exceptionally vulnerable to stereotype threat in that domain (Marx, Stapel, & Muller, 2005; Schmader, 2002).

The phenomenon of stereotype threat epitomizes the power of context. Intelligence – and more specifically, female mathematics performance – is not a fixed entity (Dweck, 2007). Rather, it is tremendously malleable, in addition to being uniquely susceptible to and dependent upon subtle environmental factors and contextual cues; the existing research has demonstrated that, contrary to the popular belief that one's abilities are concrete, global, and stable across situations, "simple reminders of gender-based stereotypes are threatening enough to undermine actual math performance" (Sommers, 2011). Putting two and two together, it is clear that stereotype threat can be initiated through a variety of mechanisms and has negative implications for women invested in a quantitative endeavor.

Music

Music has performed major functions throughout the ages in the lives of people across the globe (Cross & Morley, 2009). As observed by Levitin (2006), both the universality and antiquity of music are noteworthy: "No known human culture now or anytime in the recorded past has lacked music" (p. 5). Musical instruments are among the oldest artifacts ever discovered; music itself likely predated revolutionary turning points in human evolution such as the development of agriculture and even language (Levitin, 2006, p. 250). In quantifiable terms, there is strong evidence that music among human beings has existed for over 35,000 years (d'Errico, 2003).

However, it is evident that music has never existed quite like it does today. With the rising popularity and availability of personal listening devices such as iPods and other

MP3 players, music today is more accessible to the general public than ever before. As a consequence of the many technical developments that have occurred in recent years, principally the improvements in miniaturization and portability, “the ubiquity of music in all its forms is unprecedented in history” (Hargreaves & North, 1997, p.1). Indeed, we are living in a time in which virtually any music can be heard by an immense portion of the world’s population.

Music has such a consistent presence, and occurs in such a wide variety of settings, that Hodges and Sebald (2011) have speculated, “It would be nearly impossible to live in America and not encounter music in some way” (p. 323). The empirical evidence suggests that this statement, bold though it may be, actually underestimates the true prevalence of music. According to Rideout, Foehr, and Roberts (2010), 94 percent of all North American homes have at least one television, 87 percent own a radio, and 76 percent possess an MP3 player. In response to these statistics, they conclude, “American homes have become media-saturated … In many homes it is possible to hear music from the first moment of the day until the last.” Music is present during nearly 40 percent of people’s waking hours (Juslin, Liljeström, Vastfjäll, Barradas, & Silva, 2008), and is used in conjunction with a plethora of activities ranging from the mundane to the spectacular: many people report feeling incomplete without background music as they go about their tasks both large and small (Deliège & Davidson, 2011).

Much of this media saturation, particularly in regard to music, is concentrated among younger populations. For the purposes of this research, it will be useful to have a working definition of adolescence. Although scholars have found it difficult to agree on a precise classification, general consensus converges on the ages of 11 to 24, and this age range is comprised of the three distinct stages of early, middle, and late adolescence (Kaplan, 2004). For the current research, the word “adolescent” will be used to encompass all three stages, whereas “teenager” will refer to early adolescence (ages 11 – 13) and middle adolescence (ages 14 – 18). The term “young adult” will refer to late adolescence (ages 19 – 24).

The average North American adolescent is exposed to between two and four hours of music each day (Arnett, 1995; Rideout, Roberts, & Foehr, 2010; Stratton & Zalanowski, 2003). Sixty-nine percent of iPod Touch users are between the ages of 13 and 24 (Elmer-Dewitt, 2009), and 76 percent of adolescents own some sort of portable music player (Rideout, Roberts, & Foehr, 2010). Even those adolescents without a portable music device to call their own can easily access music from their cell phones, download it from the Internet, or watch a music video on YouTube or through the media-enabling platforms recently incorporated into popular social networking websites.

Over a five-year period, adolescents amplified the amount of time they spent consuming media each day by an hour and seventeen minutes, from nearly six and a half hours (6:21) in 2004 to over eight and a half hours (8:33) in 2009 (Rideout, Roberts, & Foehr, 2010). The author observes that this considerable chunk of time is nearly equivalent to the amount of time most employed adults spend working each day, “except that young people use media seven days a week instead of five.” Of all types of media – video games, television content, computers, and music - music usage increased the most over a ten-year time period, jumping 47 minutes daily from 1999 to 2009. Also noteworthy is the pattern of music consumption, which tends to increase steadily with age; children between eight and 10 years of age typically used music for just over one hour each day, while 15- to 18-year olds reported spending more than three hours listening to music daily.

To college students, music matters: a 2006 survey by Student Monitor found that university undergraduates value their iPods above both beer and Facebook. In a study conducted by Goldstein (1980), 96 percent of subjects indicated that music was their most common thrill-causing experience, a finding supported by research on the typical physiological and physical responses to music (Hodges & Sebald, 2011). Gantz, Gartenberg, Pearson, and Schiller (1978) questioned American college undergraduates on their music listening habits, and found that such individuals tend to consume music to ameliorate tension, distract themselves from problems, pass time, and relieve boredom. College students also commonly listen to music while studying (Hargreaves & North, 1997), a fact that will have significant implications for the present research.

Younger adolescents are similarly accustomed to and impacted by music in their lives. The vast majority of teenagers – 80 percent – rate music as more influential than either movies or sports, and 31 percent allege that music is “more important than anything else” (Pincus, 2005). Zillman and Gan (1997) corroborated these findings, reporting that teenagers deem music to be their most important non-academic activity. Music is also one of the most common recreational endeavors: the average teenager spends over 10,000 hours listening to music prior to celebrating his or her 18^{th} birthday (North & Hargreaves, 2008).

Music is highly valued by adolescents, who use music more than any other group of people as a tool in identify formation. Not only do adolescents use music to portray their chosen ‘image’ to the outside world (Keen, 2004), they experiment with music to discover which of the many available images they want to adopt as their own, alternatively trying on, rejecting, and modifying various personas (Bandura, 2001; Primack, Dalton, Caroll, Agarwal, & Fine, 2008). Adolescents also turn to music as a problem-solving mechanism; they observe their hopes, values, and heartbreaks mirrored in the music they choose to listen to (Schwartz & Fouts, 2003).

And the music they choose to listen to is, overwhelmingly, contemporary popular music, most commonly known as "pop" music (Fox & Wince, 1975). Not only is pop "the most regularly experienced musical style," accounting for over 65 percent of all music listening episodes among adolescents (North, Hargreaves, & Hargreaves, 2004), but between 40 and 50 percent of all sales of pop music in the United States are a result of purchasing decisions by consumers under 25 years of age (Christenson & Roberts, 1998). Adolescents consider pop music to be desirable in a variety of distinct situations from being at nightclub with friends, to jogging, to doing the dishes (North & Hargreaves, 1996).

However, pop music is far from universally beloved; several researchers have criticized "the *increasingly* overt sexuality of pop music and a tendency toward sexist portrayals of males and females" (North & Hargreaves, 2008, p. 156). For example, the vast majority of pop music videos feature males exhibiting sexual dominance over females (Sherman & Dominick, 1986). Furthermore, women are quantitatively under-represented in pop music videos compared to men; when women do appear, they tend to dress scantily, dance sexily, and behave subserviently (Gow, 1996; Seidman, 1992). North and Hargreaves (2008) provide a blunt example of the sexual crassness prevalent in contemporary pop music: "For every Christina Aguilera telling young girls that 'You are beautiful, no matter what they say' there is a 2 Live Crew commanding a woman to 'Nibble on my dick, like a rat does cheese'" (p. 158). Researchers are aware of the unequal gender dynamics rampant in popular music; however, they are not yet certain as to what, if any, impact these dynamics may have on music listeners.

Overview: The Present Research

Previous empirical research has demonstrated the ability of music to instigate stereotype threat among members of a vulnerable population in the absence of any additional priming. Specifically, Johnson, Trawalter and Dovidio (2000) found that exposure to violent rap music systematically influenced dispositional versus situational attributions of Blacks: both White and Black participants primed with violent rap music, which ostensibly intimated stereotypes of Blacks, were more likely to ascribe threatening behavior by a target Black male to personality-dependent rather than to contextual factors. Participants who listened to rap music were also more likely to rely on well-known stereotypes regarding Blacks when asked to make intelligence judgments about the target male. Thus, music alone has the capability to highlight stereotypes and to induce stereotype threat.

As music is an increasingly ubiquitous force in society, this finding should not be taken lightly; however, the psychological community at large is in need of more extensive research on this timely and relevant topic. Although Johnson et al. (2000) were able to activate stereotype-relevant processes applicable to racial identities through the use of music, the author is not aware of any research that has examined music as a stereotype-threatening instrument among women; the present research aims to contribute to this domain.

The present research examines the capacity of popular music that relegates females to stereotypical roles – more specifically, that depicts females as sexual objects – to instigate stereotype threat among domain-identified young women engaged in a difficult mathematics task, thereby causing context-driven performance deficits. It was hypothesized that music objectifying women would have a detrimental effect on female performance as compared to music promoting female empowerment. It was further predicted that male performance would be uninfluenced by music type, as no stereotypes within the music were categorized as relevant to men.

Method

Participants

The sample population for the present study was comprised of 104 undergraduate students, of whom 60 were female and 44 were male. Participants ranged in age from 18 to 28 (M = 20.36, SD = 1.48).

The majority of participants (N = 87) were students from Boston-area universities who were compensated 10 dollars for their time and effort; this group of participants was recruited through campus flyers and online advertisements. The 17 remaining undergraduates were Tufts University students enrolled in an introductory psychology course who agreed to participate for partial course credit through SONA. No significant differences between paid and credited participants were found in terms of initial qualifications or final results.

An initial pre-screen ensured that all participants were significantly above the average North American student in terms of both talent and interest regarding mathematics (See Table 1). Participants were required to have earned a score of at least

650 out of a possible 800 points on the mathematics portion of their Scholastic Aptitude Test (*M* = 736.7, *SD* = 41.74), thus putting them at or above the 85th percentile. The vast majority (*N* = 86) of participants reported scores at or above the 93rd percentile, and nearly 10 percent (*N* = 11) reported perfect scores. Because some participants' SAT scores were several years old, it was determined that the inclusion of a more contemporary and relevant measurement of mathematics talent and interest was necessary. For this reason, a two-question Math Motivation Score (MMS) was developed ("It is important to me to do well at math", "I enjoy learning math"). MMS questions were answered with a seven-point Likert scale (1 = Not at all true of me, 7 = Extremely true of me), and participants were required to report a composite score of 10 or above (*M* = 11.77, *SD* = 1.42).

This research utilized a 2 (gender) x 4 (condition) between-subjects factorial design. Participants of each gender were randomly assigned to one of four conditions, three of which contained either seven or eight pre-determined popular songs. These songs were selected from the Billboard Top 100 Pop Songs (2005-2009) and pre-rated on relevant dimensions by research assistants. The control condition did not contain any music. See Table 2 for a description of songs, artists, and lyrics. The four conditions can be summed as follows:

1. *Stereotype – Female Artist:* Music objectifying women (sung by female artists)

   Sample Lyrics: "Baby, I'll love you all the way down/Get you right where you like it/I promise you'll like it"

2. *Stereotype – Male Artist:* Music objectifying women (sung by male artists)

   Sample Lyrics: "Sexy can I hit it from the front/Then I'll hit it from the back/Know you like it like that"

3. *No Stereotype:* Music empowering women (sung by female artists)

Sample Lyrics: "We didn't get all dressed up just for you to see/I'm not here for your entertainment/And you don't really wanna mess with me"

4. *No Music:* No music (control condition)

No significant participant differences were found in terms of conditions and/or gender regarding age, average SAT score, or average MMS score (See Table 1).

Every participant who began the study completed it in full.

Materials

Eligibility Questionnaire

Potential participants first completed an online questionnaire to determine eligibility based on age, student status, and SAT and MMS scores. Potential participants were initially encouraged to substantiate their recalled SAT scores with official documentation, but this step proved to be overly cumbersome and was eliminated.

Consent Form

Participants were provided with a one-page consent form briefly detailing the reasoning and relevant literature behind the present research, which was described as an examination of the effects of music on behavior. The consent form documented the expected duration of the study, the ensuing study procedures, and compensation protocol. The consent form guaranteed confidentiality or results and informed participants that they could withdraw from the experiment at any time without incurring a penalty.

Pre-Questionnaire

Participants completed a one-page questionnaire regarding their personal music listening habits. Participants were questioned about the frequency of their music listening, the situations in which they most commonly listened to music, and the overall importance of music to their everyday lives.

Quantitative Task

Participants were given a difficult mathematics task composed of 12 questions selected from the Graduate Record Examination (GRE) in mathematics. The questions were all multiple-choice with five answer options and were presented in approximate order of difficulty, with the relatively more simple problems given first. Pencils and scrap paper were provided. The use of calculators was prohibited.

Headphones

While working on the mathematics task, all participants wore adjustable Sony headphones connected to a computer in order to listen to the music condition to which they had been randomly assigned. Participants assigned to the *No Music* condition also wore headphones to ensure maximum consistency across groups. Volume was set to 35 percent. Most participants (76 percent) from music-listening conditions reported that the volume was well below the level they would select were they listening to music for its own sake, e.g., as a primary activity. Eighty percent of participants reported that the volume was roughly equivalent to the level they would choose for background noise while studying.

Music

Each music condition was composed of eight different songs, purchased through Amazon.com, lasting between three and five minutes each. These songs were “shuffled” on iTunes in order to eliminate the possibility of order effects.

The songs for each music condition had been determined through an exhaustive review of the Billboard Top 100 Popular Songs from 2005 to 2009 by which the 500 song options were eventually narrowed down to 23. The primary researcher initially listened to samples (provided from Amazon.com) of each of the 500 songs and immediately eliminated any that did not focus on gender-relevant topics, specifically issues of either female sexuality or female empowerment. The remaining 60 songs were purchased, clipped to approximately 45 seconds to include the opening verse through the chorus, and were then presented to research assistants who coded each song on relevant dimensions (e.g., perception of female objectification, perception of female competency). Strong inter-rater reliability was observed. The author then eliminated any songs rated highly on contradictory dimensions, and finally composed song combinations for each condition based on the provided ratings. (See Table 2 for a full list of songs and a sample of lyrics.)

Post-Questionnaire

The one-page post-questionnaire was designed to collect data on the mathematics task experience. Participants were asked how distracting they had found the music (if not assigned to the *No Music* condition), how difficult they had found the quantitative problems, and how much they had enjoyed the study. The two MMS questions were repeated word for word. All of the above queries were answered with the use of a seven-point Likert scale.

Manipulation Check

Potential participants completed two curbed versions of the Twenty Statements Test, filling in five “I am” statements in response to the prompt, “Who am I?” both times. Participants were required to generate 5 “I am” statements prior to participation in the present research. These statements were obtained through an e-mail that informed qualified participants of their eligibility and requested completion of the curbed Twenty Statements Task. The second curbed Twenty Statements Task was given to participants by the experimenter upon receipt of the post-questionnaire. This manipulation check served to record whether female participants' gender identities had been activated by the background music centering on female sexuality or female empowerment.

Debriefing

Before provision of the debriefing form, participants were asked what they thought the experiment was about. The experimenter recorded responses verbatim. Participants were then provided with a debriefing form that briefly described the phenomenon of stereotype threat and then explained that the present research was interested in whether stereotype threat could be elicited among quantitatively identified women asked to take a mathematics test under hostile music conditions.

Procedure

Prior to participation, all interested parties were pre-screened for sufficient SAT and MMS scores. The pre-survey also instructed them to provide their age and major. Roughly half of interested individuals were eligible for participation, and were provided with the curbed Twenty Statements Task. All personal information from ineligible participants (e.g., SAT and MMS scores) was discarded. All qualified participants were randomly assigned to one of the four music conditions, and the appropriate music condition was prepared and shuffled on iTunes prior to the experiment.

Upon arrival at the laboratory, participants were greeted one at a time by a female experimenter. Each participant was brought into a private room containing a chair, table, writing utensils, desktop computer, and headphones. The experimenter explained that she was interested in examining the effects of background music on academic behavior. Participants were informed that they would need to fill out a pre- and post-questionnaire, and would be given a mathematics task to complete while listening to one of four randomly assigned music compilations. Participants were informed that the entire task would take between 40 and 60 minutes. The experimenter answered any questions and then provided a consent form.

Upon receipt of the signed consent form, participants were given a brief paper questionnaire inquiring about their own music listening habits. Of particular interest was a question regarding the amount of time typically spent listening to music each day. Once participants had finished the questionnaire, the experimenter explained that they would have 20 minutes to work on a mathematics task, which would occur simultaneously with music listening. (Participants were unaware of the specific songs that they would be listening to, as iTunes was minimized on the computer screen.) Participants were not presented with the math task until they had put on their headphones and the experimenter initiated music playing. Participants were provided with a five-minute warning at the 15-minute mark.

After 20 minutes, the experimenter collected the mathematics task, allowed participants to remove their headphones, and then gave participants a post-questionnaire. The experimenter questioned participants as to what they believed the experiment was about; no participant was eliminated for an exceptionally accurate response (i.e., mentioning gender and/or stereotype threat). Upon completion of all tasks, participants were fully debriefed and thanked for their time. No participant expressed anger or confusion regarding the experimental procedure.

Results

All data for the present study were collected between June 2011 and February 2012. There were 60 female and 44 male participants across four experimental conditions. No significant differences between genders or conditions were found in terms of eligibility qualifications based on SAT or MMS scores among participants (See Table 1).

It was initially hypothesized that popular music depicting women in accordance with negative gender-based stereotypes, in contrast to music casting women as powerful, would undermine female performance on a difficult mathematics task through the phenomenon of stereotype threat. It was also predicted that males would be largely immune to any disruptive (or constructive) effects since the threatening stereotype did not directly target their personal gender identification or group membership.

In order to facilitate data analysis, the two music conditions depicting women as sex objects, *Stereotype – Female Artist* and *Stereotype – Male Artist,* which differed solely by gender of the primary musical artist, were collapsed into one condition, Condition 5, henceforth referred to as the *Stereotype – Overall* condition. Prior analyses demonstrated that no significant differences existed between the quantitative performances or post-examination self-report data of participants assigned to the two original *Stereotype* conditions, $t(40) = -.242$, $p = .765$. Furthermore, of the 15 songs in the two original *Stereotype* conditions, nearly 50 percent ($N = 7$) featured backup artists of the opposite gender of the primary artist, thereby rendering the original gender-based stereotype distinction less valid (See Table 2).

The researcher chose to set the number of questions answered correctly as the dependent variable, which ranged from two to 11 out of 12 possible correct responses ($M = 5.98$, $SD = 2.053$). Accuracy, computed as the number of questions answered correctly divided by the number of questions attempted, also could have been used as the dependent variable; however, several participants were observed to quickly circle answers to examination questions that had no evidence of pen-and-paper calculations immediately before handing the test to the experimenter, leading the researcher to determine that the number of questions answered correctly was the more legitimate option. Nevertheless, a Pearson correlation coefficient revealed that the two variables of correctness and accuracy correlated at the $p < .001$ level; furthermore, analyses that were significant when correctness was set as the dependent variable were also significant when accuracy was used, suggesting that either variable could have been used as the dependent variable with no change to the overall results.

Results suggest evidence to refute the null hypothesis. A two-way between-subjects ANOVA using exam correctness as the dependent variable showed that no main effect existed for gender, $F(1,103) = 0.536$, $p = .466$, or for condition, $F(2,102) = 1.917$, $p = .153$. In other words, women ($M = 5.72$, $SD = 2.140$) did not perform significantly differently than men ($M = 6.34$, $SD = 1.892$), and participants assigned to the *No Stereotype* condition ($M = 6.56$, $SD = 2.225$), to the *No Music* condition ($M = 6.28$, $SD = 1.926$), and to the *Stereotype – Overall* condition ($M = 5.54$, $SD = 1.995$) scored roughly equivalently. A significant interaction between gender and condition existed at the $p < .05$ level, $F(2,102) = 3.161$, $p = .047$ (See Figure 1).

Post-hoc analysis of condition differences for each gender was then conducted using Tukey tests. Analysis indicated that female participants scored significantly higher in the *No Stereotype* condition ($M = 6.800$, $SE = 0.513$) with music depicting empowered women as compared to the *Stereotype – Overall* condition ($M = 4.867$, $SE = 0.363$), which consisted of music delegating women to stereotypical sexual roles ($p < .01$). No other significant differences between conditions existed for female participants, although a trend for superior performance in the *No Music* ($M = 6.333$, $SE = 0.513$) condition as opposed to the *Stereotype – Overall* ($M = 4.867$, $SE = 0.363$) condition was observed ($p = .059$). See Figure 2 for a visual depiction of these results. No significant between-groups differences were observed for male participants randomly assigned to the *No Stereotype* condition ($M = 6.250$, $SE = 0.558$), to the *Stereotype – Overall* condition ($M = 6.455$, $SE = 0.412$), or to the *No Music* condition ($M = 6.200$, $SE = 0.611$). See Figure 3 for a side-by-side comparison of male and female performance.

Math motivation scores, which were collected prior to and immediately following the mathematics examination, dropped significantly post-test for both males ($M = 1.068$, $SD = 1.648$) and females ($M = 0.567$, $SD = 1.588$) as assessed through a series of paired-sample T tests ($p < .01$), perhaps reflecting the difficulty of the task; the average participant answered just 5.98 out of 12 questions correctly. However, a breakdown of these results demonstrated that females randomly assigned to the *No Stereotype* condition did not exhibit this significant drop ($M = .200$, $SD = 1.373$) in math-related interest, importance, and enjoyment, in contrast to all male participants, and to all female participants assigned to other conditions.

Several Pearson correlation coefficients were computed in order to assess relationships between observed individual differences and the dependent variable of correct responses. Self-reported ratings of mathematics test difficulty correlated negatively with the number of correct answers, $r = -.483$, $n = 104$, $p < .001$. Self-reported SAT scores ($r = .250$, $n = 104$, $p = .011$) and original MMS scores ($r = .230$, $n = 104$, $p = .019$) correlated positively with the number of correct answers. Overall enjoyment of the study, which was assessed prior to participants leaving the lab, also correlated positively with exam correctness, $r = .406$, $n = 104$, $p < .001$. These findings held true for participants of both genders. However, no correlation with exam correctness was found between the amount of time participants typically listened to music each day, the extent to which participants enjoyed the music to which they were randomly assigned (when applicable), or the extent to which participants felt distracted by the music to which they were randomly assigned (when applicable).

The manipulation check indicated that the background music was successful in priming females in the experimental conditions with their gender identity. No difference between males and females existed in terms of likelihood of mentioning gender at least once out of the five responses to the first unprompted "I am" task presented in the initial eligibility questionnaire, $F(1,103) = 1.090$, $p = .299$. However, women randomly assigned to an experimental condition containing background music (as opposed to the *No Music* condition) were significantly more likely than men assigned to the same experimental conditions to mention gender in response to the second “I am” task immediately following the mathematics examination, $F(1,82) = 4.500$, $p < .001$.

Discussion

The results of the present study appear supportive of the author’s primary hypothesis: highly qualified and mathematically identified women performed significantly more poorly on a difficult quantitative task while listening to background music describing females in accordance with restrictive and negative sexual stereotypes as opposed to music depicting empowered females. The findings of the present study also lend support to the secondary hypothesis: young men remained unaffected by the female-specific stereotypes presented in the background music and performed similarly across all music conditions.

Consistent with previous research indicating that a non-diagnostic math test is insufficient on its own to induce stereotype threat in females (Spencer, Quinn, Davies, & Gerhardstein, 2002), men and women performed similarly overall; no main effect for gender was observed. More specifically, among participants randomly assigned to the *No Music* condition, performance was virtually indistinguishable among males ($M = 6.22$, $SE = 0.562$) and females ($M = 6.33$, $SE = 0.513$). This result aligns with the work of Good, Aronson, and Harder (2008), who found that female undergraduates majoring in mathematics, although significantly fewer in number than male mathematics majors, were able to perform equivalently to their male classmates under normal testing conditions in the absence of threatening situational stimuli.

Research has established that sex differences in mathematical performance do exist – for example, a greater number of males than females perform at or above a proficient quantitative level as early as the fourth grade, and this gap widens with age (National Science Foundation, 2006). However, the empirical evidence from both the present study and earlier research suggests that the innate between-gender differences theory regarding quantitative abilities, which former Harvard University President Larry Summers controversially endorsed as the biologically-based “different availability of aptitude” hypothesis (Summers, 2005), is insufficient to independently account for the observed mathematical performance differential between males and females. Rather, contextual cues and social variables can demonstrably impact gender differences in quantitative cognitive capacity, as evidenced by the equivalent performances of males and females working under non-threatening conditions. More specifically, the evidence suggests that stereotype threat does not interfere with the quantitative performance of women unless the subject of gender is made salient through situational factors.

However, when the matter of gender is highlighted – in the case of the present study, such gender emphasis occurred through the incorporation of background music focusing on issues of either female sexuality or empowerment – stereotype threat can seriously impair the quantitative performance of highly intelligent and motivated college-age women. Importantly, these women may be unaware of the factors underlying their deflated performance – no correlation existed between female participants’ self-reported enjoyment of or distraction by the background music and the number of questions answered correctly, meaning that participants were unable to accurately assess the contribution of musical interference to their performance. This finding raises a more global issue: should women fail to partially ascribe a disappointing mathematics performance to transient situational factors, and instead wholly accredit their performance to internal factors such as their own intelligence or abilities, they may eventually conclude that they are simply not cut out for math.

It may be time to face the music: our "steady diet of gender-stereotypic media images" cannot fail to impact members of society, especially those most consistently targeted by stereotypes, in manners both explicit and subtle (Davies, 2000). In the words of Anderson et al. (2003), who contend that the debate as to whether media influences actions is "essentially over," there exists "unequivocal evidence that media affects behavior." Research germane to the present study indicates that music can impact men's attitudes and behaviors towards women: for example, Barongan and Nagayama Hall (1995) found that men who listened to misogynistic rap music during an experiment were more likely to subsequently select a sexually violent or assaultive film vignette in lieu of a neutral vignette to show to a randomly assigned female partner, even though these same participants reported awareness of their partner's obvious discomfort with the explicit images. St. Lawrence and Joyner (1991) found that the majority of male participants assigned to listen to heavy-metal rock music promoting objectification of and violent behavior towards women, as opposed to neutral classical music, were more likely to endorse sexist and rape-supportive beliefs; furthermore, exposure to the heavy-metal music increased males' sex-role stereotyping and negative attitudes towards women. This pattern of results suggests that music depicting women as subservient to men does indeed facilitate the construction of stereotypic beliefs and behavior: cumulative exposure to contemporary popular music and other forms of media appears to lead male consumers to view women through stereotype-tinted lenses. Men consistently exposed to stereotypic music media are more likely to treat women in accordance with stereotypical norms, thereby initiating a process of behavioral confirmation in which stereotypes may become self-perpetuating (Skrypnek & Snyder, 1980).

Although empirical research has examined the effects of gender-stereotypic music on men, less is known regarding the ability of similarly stereotypic music to impact women, who are the primary target of these negative stereotypes. The present study indicates that music relegating women to a restrictive stereotypical role has significant detrimental effects on subsequent mathematical performance. This result is consistent with the extant literature, which indicates that women are unlikely to benefit from any of the myriad of stereotypical beliefs that apply to them. While several implicit gender stereotypes can impact males constructively – for example, male high-school students actually comprehend chemistry readings more fully when they are accompanied by a stereotypic image as opposed to a counter-stereotypic one (Good, Woodzicka, & Wingfield, 2010) – females do not benefit from any implicit gender stereotypes and are in fact hindered by their invocation (Steffens & Jelenec, 2011). Even more damningly, women are significantly more likely than men to attribute their failures to internal – rather than situational – factors (Koch, Müller, & Sieverding, 2008).

In the present study, even music reliably rated as depicting females in an empowered manner failed to significantly boost female performance on the quantitative exam as compared to a control condition, suggesting that even the most pro-female music is insufficient to proffer any sort of demonstrable booster effect to women in the midst of a threatening intellectual situation. Although some researchers have found that positive stereotypes, when made salient through targeted priming, can enhance performance (Shih, Pittinsky, & Ambady, 1999), the stereotype of an empowered female figure may simply not be present in contemporary North American society, or may be insufficiently endorsed to demonstrably impact performance. However, the present research indicates that there is a reason for partial optimism regarding music that empowers women: the 15 women assigned to the *No Stereotype* condition were the only group of participants who were able to avoid experiencing a statistically significant drop on the Math Motivation Scale (MMS) after attempting the difficult quantitative task, raising the intriguing possibility that female resiliency may be enhanced by music empowering women, even if overall performance is unaffected.

Earlier research has demonstrated that stereotype threat regarding women and mathematics can be invoked through a variety of diverse mechanisms from requiring participants to wear a bathing suit (Fredrickson, Noll, Roberts, Quinn, & Twenge, 1998), to playing commercials depicting women in stereotypical roles (Davies, 2000), to simply asking women to indicate their gender on a demographics questionnaire prior to test initiation (Stroessner & Good, 2010). The present research indicates that background music relegating women to stereotypical roles – specifically, to the role of sexual object – has the dubious honor of being added to the list of contextual cues that are sufficient to induce stereotype threat among females attempting quantitative problems. When the increasing availability of ubiquity of music is considered (e.g., Hodges & Sebald, 2011), it is clear that the music young women listen to may have a much stronger and far-reaching influence than simply providing a temporary tune – and if this effect is cumulative, with most adolescents listening to music for two to four hours each day (Rideout, Roberts, & Foehr, 2010), the impact may be incredibly strong. After all, music listening is an inherently personal endeavor: we welcome musical artists into our bedrooms, invite them directly into our ears, and allow them to influence and inspire us when we shut the rest of the world out. As Levitin (2006) notes, "It is unusual to become so vulnerable with a total stranger" (p. 237).

The ability of the music selected by an adolescent woman listening to her iPod to quantifiably affect her mathematical performance may seem unintuitive; however, Spivey (2007) argues that the vast majority of cognitive processes are richly embedded and intertwined with their environmental context, and that it is therefore impossible to legitimately separate an act of cognition from the situation from which it arises. In other words, the relationship between female mathematical *ability* and actual female mathematical *performance* is not direct or straightforward, but rather is inextricably linked with and muddled by situational variables that may not appear obvious or even logical at first glance.

The present research, in conjunction with earlier empirical work, has demonstrated the existence of a connection between quantitative performance and situational variables such as background music. But why does this matter? Empirical evidence suggests the existence of long-lasting and wide-ranging implications of the impact of detrimental contextual factors on female quantitative performance. Women attempting to succeed in traditionally male-dominated domains must consistently "deal with the shadow of doubt that accompanies stereotypes alleging a sex-based inability" (Davis, 2000). The constant risk of experiencing gender-targeted stereotype threat, which directly accompanies female performance in fields typically controlled by males, may lead even highly talented and motivated women to disassociate with these fields in order to avoid the self-evaluative threat that they impose (e.g., Keller, 2002). After all, recourse from stereotype threat is glaringly simple: stop expending effort in the stereotyped domain. As Steele (1997) infamously stated, “Women may reduce their stereotype threat substantially by moving across the hall from math to English class.”

As an illustration of the phenomenon of female math avoidance, women – including those who are just as skilled and experienced in high school mathematics as their male peers – still tend to avoid college majors involving moderate to high levels of math (Good, Rattan, & Dweck, 2012). This translates into a noticeable dearth in females studying architecture, business, and economics, and a near-absence of women in the physical sciences, engineering, and mathematics, in which men are four and a half times more likely than women to declare a major (LeFevre, Kulak, & Heymans, 1992). Even women who intend to pursue a traditionally male-dominated quantitative field of study upon entering college are more than twice as likely as their male classmates to eventually switch their major (Steele, James, & Barnett, 2002). Choices made in college rationally inform one’s future career, and it should therefore be unsurprising to learn that strikingly disproportionate numbers of men and women work in quantitative fields (Ceci & Williams, 2010). For example, only 10 percent of employed engineers are women, and they earn just 75 percent of the salary obtained by their male counterparts (Major, Spencer, Schmader, Wolfe, & Crocker, 1998). When women as a group shun quantitative fields, they limit not only their career prospects but also their earning potential – careers in computer science, biology, chemistry, and engineering offer the largest paycheck, and mathematical literacy has become increasingly valued in terms of financial compensation (Leithauser, 2010).

It is evident that the risk of experiencing stereotype threat in quantitative domains may not just impair female performance – it may also lead women to steer clear of quantitatively-rooted areas altogether, and this avoidance can have insidious implications. Stereotype threat, which promotes heightened anxiety and thereby obstructs performance, can ultimately cause women to experience lingering unease and doubt in regard to their own quantitative abilities – a cumulative consequence that may be powerfully influential in terms of the career choices, lifestyle aspirations, and overall opportunities of women. If the contemporary popular music that young women are listening to for hours every day is subtly stereotype-promotive, women's quantitative performances – and even their mathematically relevant aspirations – may be suffering without any conscious awareness on their part: that is to say, the present study suggests that threatening gender-relevant stereotypes may be going in both ears and out of neither.

Limitations of the Present Study

Despite significant results in support of the primary and secondary hypotheses, there are a variety of limitations regarding the findings of the present study. One important limitation is a potential lack of external validity. Because the present study was conducted in a non-naturalistic setting (i.e., in a psychology laboratory), it is possible that the results may not generalize to more typical academic settings. More specifically, although most college students do study with background music at least some of the time (North & Hargreaves, 1997), very few college students take examinations in a laboratory room, and even fewer are permitted to listen to music while taking a test. Furthermore, if students were permitted to listen to music, it is reasonable to expect they would choose music they personally enjoyed; as over one-third of the participants assigned to an experimental condition with background music ($N = 22$) of participants reported moderately or severely disliking the music they had listened to, the generalizability of the results of the present study to real-life situations is called into question. (However, as noted previously, music liking did not correlate with examination scores.) Participants also completed the examination alone, with minimal interpersonal interaction on the part of the experimenter or any other laboratory researcher present: in a true examination setting, students are virtually never without the supervision of a professor, and are surrounded by their peers the vast majority of the time. The conjunction of interpersonal variables with existing situational factors could plausibly moderate or enhance the effects of stereotype threat. Finally, only current university undergraduates were eligible for participation in the present study; therefore, the results cannot be interpreted as informative regarding any other populations, adolescent or otherwise.

Future Directions for Research

To the best of the author's knowledge, the present study is the first to specifically examine the ability of gender-stereotypic music to induce stereotype threat in high-achieving women taking a difficult mathematics test; as such, opportunities for relevant future investigation are numerous. Two avenues appear particularly ripe for further research.

One intriguing option is to examine whether or not experimental manipulations that have previously succeeded in reducing or eliminating the effects of gender-based stereotype threat among women attempting a quantitative task are equally effective when the stereotype threat is a direct consequence of background music. For example, Ben-Zeev, Fein, and Inzlicht (2005) informed women who were on their way to take a mathematics test in a room full of men – a situation which is demonstrably threatening to females (Inzlicht & Ben-Zeev, 2000) – that they would be exposed to a "subliminal noise generator," which might increase their physiological arousal. These participants were therefore provided with a situational attribution for the stress they experienced during the mixed-gender mathematics examination – stress that actually resulted from stereotype threat. When women were able to blame their heightened anxiety on a non-existent noise machine, and thereby attribute their arousal to an external rather than internal variable, they were able to perform at levels equivalent to males. McIntyre, Paulson, and Lord (2003) found that women provided with brief biographies of successful females were able to perform equivalently to similarly qualified men on a quantitative task, even when they were told ahead of time that "some previous research shows men outperform women on math tests." The provision of positive role models thus appears to help inoculate females against the effects of stereotype threat elicited through the explicit discussion of potential gender differences. The author encourages interested researchers to investigate whether or not these experimental manipulations could be equally successful in terms of reducing or eliminating stereotype threat caused by popular music.

Another tactic involves exploring whether or not the positive effects of auditory stimuli can be overwhelmed by less desirable effects of visual stimuli. Specifically, some popular songs contain empowering lyrics, but are accompanied by music videos that sexually objectify women, thereby potentially negating any positive effects of the pro-female music. For example, Hollaback Girl by Gwen Stefani, which was selected for the *No Stereotype* condition of the present research by independent raters, is comprised of empowering lyrics that describe a woman refusing to acquiesce to the demands of others:

"So I'm ready to attack/Gonna lead the pack." However, the accompanying music video features Stefani gyrating seductively in time to the music, swaying her hips and baring her cleavage and midriff in a cropped top. It would be interesting to examine whether or not presenting the music videos of such songs to female participants in a similar study would dominate any facilitative effects of the lyrics in terms of the impact of stereotype threat. The author emphasizes that these questions merit further empirical investigation.

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Table 1

Eligibility by Gender and Condition

	Males			Females		
Condition	*n*	*M*	*SD*	*n*	*M*	*SD*
Age						
1. Stereotype – FA	11	21.091	1.044	15	20.067	1.163
2. Stereotype – MA	11	20.091	1.221	15	20.000	0.961
3. No Stereotype	12	20.083	1.676	15	20.400	1.454
4. No Music	10	21.300	2.869	15	20.200	0.941
Total	**44**	**20.614**	**1.832**	**60**	**20.170**	**1.132**
SAT Score						
1. Stereotype – FA	11	742.727	46.063	15	736.000	37.569
2. Stereotype – MA	11	736.363	31.139	15	735.333	47.188
3. No Stereotype	12	739.167	49.810	15	737.333	41.312
4. No Music	10	733.000	42.960	15	735.333	42.738
Total	**44**	**737.955**	**42.403**	**60**	**736.000**	**41.260**
MMS Score						
1. Stereotype – FA	11	11.909	1.864	15	11.600	0.828
2. Stereotype – MA	11	12.000	1.897	15	11.667	1.234
3. No Stereotype	12	11.750	1.357	15	11.867	1.407
4. No Music	10	11.900	1.663	15	11.600	1.234
Total	**44**	**11.886**	**1.646**	**60**	**11.683**	**1.214**

Note. n = number of participants.
M = mean.
SD = standard deviation.
FA = female artist.
MA = male artist.

Table 2.1

Songs and Artists by Condition

Condition 1: Stereotype – Female Artist

Primary Artist	Song Title	Sample Lyrics
Britney Spears	3	"1 2 3/Not only you and me/Got 180 degrees/And I'm caught in between"
Britney Spears	If U Seek Amy	"Love me, hate me/Say what you want about me/But all of the girls and all of the boys/Are begging to F-U-C-K me"
Cassie	Me & U	"Baby, I'll love you all the way down/Get you right where you like it/I promise you'll like it"
Danity Kane*	Show Stopper	"We in the car, we ride slow/We do things other girls don't do/The boys stare, we smile back"
Keri Hilson*	Turnin' Me On	"You got one more time to feel on my booty/Better recognize a lady/Recognize the way you do me"
Lady Gaga	Love Game	"Let's have some fun/This beat is sick/I want to take a ride/On your disco stick"
Pussycat Dolls*	Buttons	"I'm telling you to loosen up my buttons, baby/But you keep frontin'/Saying what you're gonna do to me"
Pussycat Dolls*	Dontcha	"Dontcha wish your girlfriend was hot like me?/Dontcha wish your girlfriend was a freak like me?"

Note. * = sung also by secondary artist of opposite sex

Table 2.2

Songs and Artists by Condition

Condition 2: Stereotype – Male Artist

Primary Artist	Song Title	Sample Lyrics
50 Cent	Ayo Technology	"She gonna do the right thing and touch the right spot/She'll dance in your lap til you're ready to pop"
David Guetta	Sexy Bitch	"She's nothing like a girl you've ever seen before/Nothing you can compare to your neighborhood whore"
Flo Rida*	Sugar	"Sprung for the taste/Addicted to her gloss/One smile this way/Baby, I rub it off"
Ludacris*	My Chick Bad	"Your girl might be sick, but my girl's sicker/She rides that dick and she handles her liquor"
Plies	Hyponotized	"You got me so hypnotized, the way your body rollin' round and round/Booty keep bumpin', titties just bouncin' up and down"
Ray J	Sexy Can I	"Sexy can I hit it from the front/Then I'll hit it from the back/Know you like it like that"
Usher*	Little Freak	"If you coming with me, really coming with me/You let her put your hands in your pants/Be my little freak"

Note. * = sung also by secondary artist of opposite sex

Table 2.3

Songs and Artists by Condition

Condition 3: No Stereotype

Primary Artist	Song Title	Sample Lyrics
Beyoncé	Irreplaceable	"I can have another you by tomorrow/So don't you ever for a second get to thinking you're irreplaceable"
Gwen Stefani	Hollaback Girl	"So I'm ready to attack/Gonna lead the pack/Gonna get a touchdown/Gonna take you out"
JoJo	Too Little Too Late	"It's just too little too late/Go find someone else/In letting you go I'm loving myself"
Kristinia DeBarge	Goodbye	"Had to switch my attitude up/Thinkin' of changin' up how I ride/No more on the passenger side"
Natasha Bedingfield	Unwritten	"No one else can feel it for you/Only you can let it in/No one else, no one else/Can speak the words on your lips"
P!nk	So What	"So, so what?/I'm still a rock star/I got my rock songs/And I don't need you"
P!nk	U + Ur Hand	"We didn't get all dressed up just for you to see/I'm not here for your entertainment/And you don't really wanna mess with me"
Sara Bareilles	Love Song	"You mean well, but you're making this hard on me/I'm not gonna write you a love song/'Cause you asked for it"

Note. * = sung also by secondary artist of opposite sex

Figure 1. Interaction by Gender and Condition of Number of Questions Answered Correctly

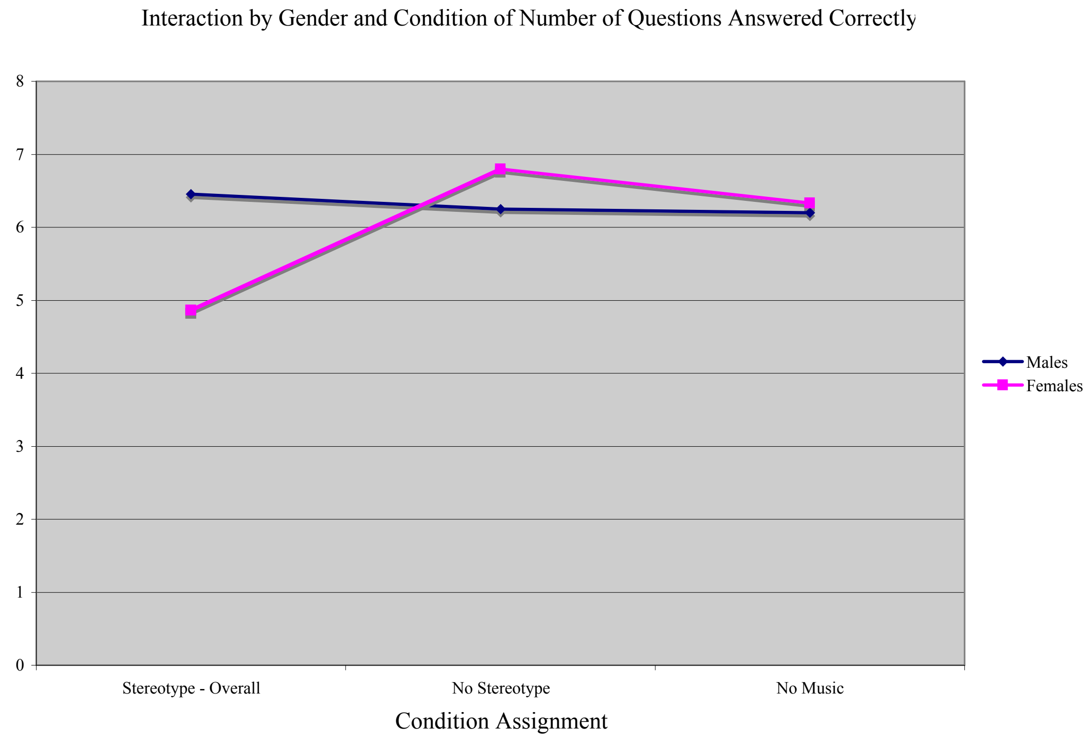
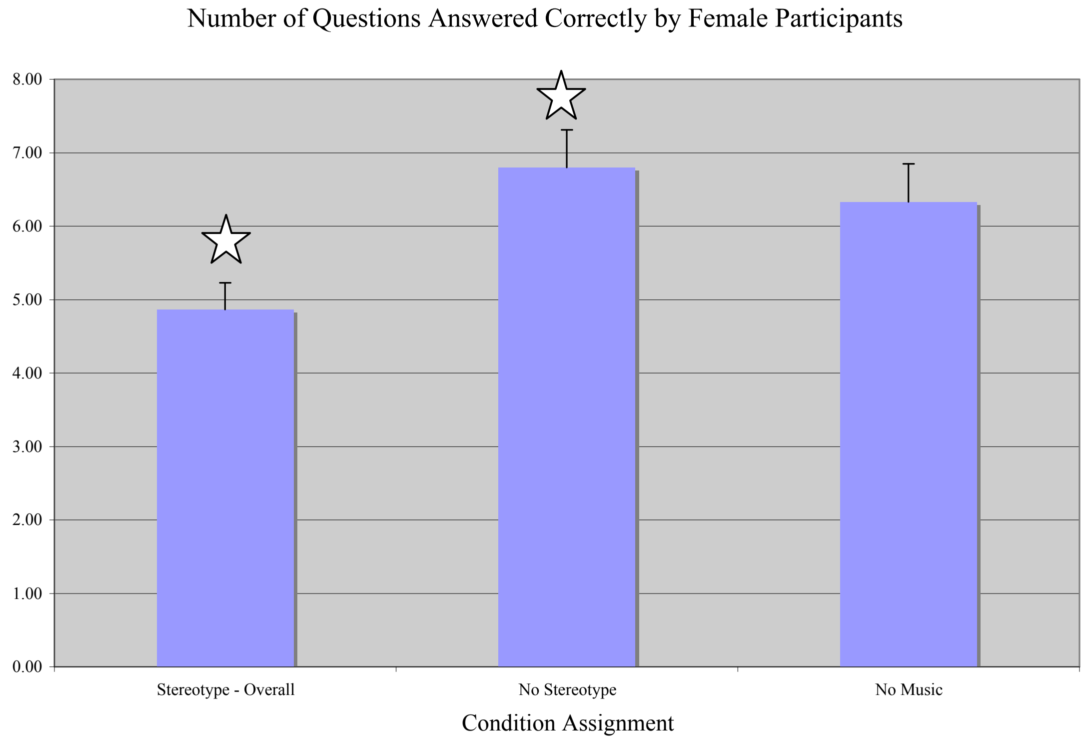


Figure 1. Line graph depicting the significant interaction between gender and condition, $F(1,102) = 3.161$, $p = .047$. Female performance was affected by random condition assignment (specifically, *Stereotype – Overall* as opposed to *No Stereotype* condition assignment).

Figure 2. Number of Questions Answered Correctly by Female Participants



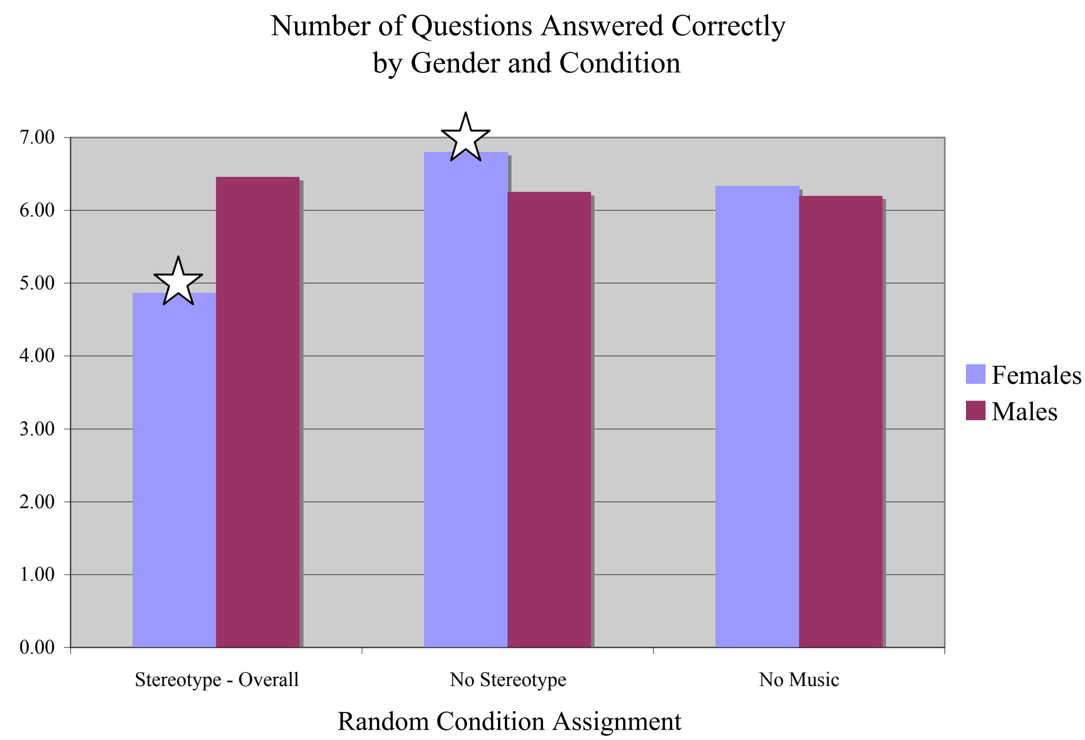
Note. ☆ = Significantly different from each other, $p < .01$

Figure 1. Bar graph depicting the dependent variable (number of exam questions answered correctly) as a function of condition assignment. Details summarized below.

Condition	*M (SE)*	*95% CI*
Stereotype - Overall	4.867 (0.363)	[4.140, 5.593]
No Stereotype	6.800 (0.513)	[5.722, 7.828]
No Music	6.333 (0.513)	[5.306, 7.361]

Note. CI = confidence interval.
M = mean.
SE = standard error.

Figure 3. A side-by-side comparison of performance by gender and condition.



Note. ☆ = Significantly different from each other, $p < .01$

Figure 3. Bar graph depicting the number of examination questions answered correctly by gender and condition. Although female performance was significantly different in the *Stereotype – Overall* condition as opposed to the *No Stereotype* condition (See Figure 2), male performance remained stable across all three conditions.