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Women's Intrasexual Variability in Sexual Psychology and Pain Functioning

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Women's Intrasexual Variability in Sexual Psychology and Pain Functioning

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Abstract

The purpose of this study was to examine the relationship between sexual orientation, self-described gender expression and preferred levels of gender expression in romantic partners with ischemic pain performance in healthy young women. It was hypothesized that lesbian and bisexual women would be less sensitive to pain than heterosexual women. It was also hypothesized that regardless of sexual orientation, women who endorse a preference for more feminine romantic partners and who describe themselves as more masculine would report higher pain thresholds, higher pain tolerance, and lower pain intensity levels than women who report attraction to more masculine romantic partners and rate themselves as possessing more feminine dispositions.

A total of 172 women completed multiple assessments of identity and gender expression followed by an ischemic pain task. The study demonstrated that ischemic pain performance is associated with sexual orientation, dispositional gender expression, and preferred gender expression in romantic partners in healthy young women. Compared to heterosexual women, lesbian and bisexual women reported lower pain intensity ratings. Among heterosexual women, attraction to more feminine romantic partners was associated with lower pain intensity ratings early into the ischemic discomfort task, and there was a slight association between self-described masculinity and lower pain intensity ratings for heterosexual women. Similar associations emerged between attraction to more feminine romantic partners and higher pain tolerance in the heterosexual group and for dispositional masculinity and higher pain threshold and tolerance levels in the combined lesbian and bisexual group. These findings provide preliminary support for the hypothesis that, irrespective of biological sex, various other aspects of sexual identity are associated with ischemic pain performance.

Women's Intrasexual Variability in Sexual Psychology and Pain Functioning

Pain behaviors are inherently, yet not exclusively, a biological process. Multiple contributing and mediating factors of pain behaviors have been identified in both the psychological and biological arenas including, but not limited to: differences in social influence/support, depression and anxiety levels, hormone levels and activation of opioid receptors (see Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley III, 2009; Lautenbacher, Spernal, Schreiber & Krieg, 1999 and McClelland & McCubbin, 2008). "The perception of, expression of, and reaction to pain are influenced by genetic, developmental, familial, psychological, social and cultural variables" (McGrath, 1994, p. 55S). In addition, there are categorical differences within these influences that make studying pain from both the psychological and physical viewpoints a delicate, intricate and multi-faceted undertaking. This wide range of contributing factors to pain experiences only serves to strengthen the paradigm shift in medicine that an increasing amount of human physiology is at least influenced, if not controlled, by a combination of psychological and biological factors rather than solely biological ones.

Biologically and psychologically, it is well-established that biological sex modulates pain. As compared to males, females report greater prevalence, frequency, and duration of clinical pain and pain-related distress. A 2009 study by Fillingim et al. discusses an accumulation of evidence over the previous 10 to 15 years indicating sizeable sex differences in both clinical and experimental pain responses. Experimental studies show that women are more likely to report lower pain threshold and tolerance, and higher pain intensity associated with various types of noxious stimuli (e.g., ischemic, pressure, electrical, and thermal) and evidence suggests that women respond differently than men to clinical pain treatment.

However, these sex differences are far from absolute, according to two different meta-analyses in the past fifteen years. A 1998 study by Riley, Robinson, Wise, Myers and Fillingim found varying effect sizes (moderate to large) depending on both the pain measurement method used (threshold or tolerance) and the pain stimulus method used (e.g. thermal, ischemic, pressure). Specifically that the largest effect sizes occurred for tolerance and threshold of electrical stimulation and pressure pain compared to smaller, more variable thermal pain threshold effects. This lack of a pattern in sex differences is still obvious in the 2012 meta-analysis by Racine, Tousignant-Laflamme, Kloda, Dion, Dupuis & Choinière where a review of 122 articles measuring both pain tolerance and threshold of many forms of laboratory-induced pain in healthy subjects were not fruitful in generating any significant patterns of sex differences in either pain threshold or tolerance across many pain stimulus methods, including "deep, tonic, long-lasting stimuli, which are known to better mimic clinical pain" (p. 602). The current study will provide additional data that may clarify these sex differences in pain perception by measuring both ischemic pain tolerance and threshold.

A conventional explanation of sex differences in pain behaviors (i.e., verbal and nonverbal pain gestures) is that they are driven by learned role expectations. According to Paller et al. (2009), pain reporting in children of both genders can be affected by manipulation of sex-role expectations through differing reinforcement of pain expression, which reinforces Western cultural norms of masculinity and femininity, with males generally expressing less pain than females. However, this interpretation does not account for the cross-cultural and developmental nature of the differences; sex differences in experimental pain sensitivity persist independently of significant cultural factors such as ethnicity (see Rahim-Williams, Riley III, Williams & Fillingim, 2012). Also, differences in pain behaviors have been observed in infancy,

with female newborns expressing more facial features of pain than their male counterparts as shown by Guinsburg, Peres, de Almeida, Balda, Berenguel, Tonelotto, & Kopelman, (2000). Therefore, a more likely explanation for the nature of the differences is that they are driven by biologically functional and specialized (sex-typical) behavioral strategies and corresponding communication styles. "Recent theory on the evolution and development of social behaviors in humans suggests that males and females evolved specialized expressive styles for communicating and interacting with same-sex affiliates" (Vigil, 2008, p. 507). Vigil's 2009 publication outlines a theoretical Socio-Relational Framework of Expressive Behaviors (SRFB) stating that an individual's expressive, emotive behaviors are evolutionarily designed to advertise either one's *perceived capacity* to help or harm others or one's *perceived trustworthiness* to reciprocate others' help or harm. This balance between trustworthiness and capacity aligns with traditional social concepts of submissiveness versus dominance and feminine versus masculine expressive emotions. This framework provides an additional context through which differences in pain perception can be interpreted, within and between genders, as well as across the sexual orientation spectrum.

Several studies have shown that pain sensitivity covaries with fluctuations in circulating sex hormones levels. One instance of this is decreased ischemic pain sensitivity during the mid-follicular phase (see de Tommaso, 2011 and Fillingim, Maixner, Girdler, Light, Harris, Sheps & Mason, 1997). Also, in men, stress-induced increases in cortisol that resulted in decreased testosterone levels correlated with increased pain levels and decreased pain tolerance according to Choi, Chung and Lee (2012). However, neither of these instances of hormone-influenced differences in pain has been examined with respect to gender expression. On the basis of a social communication model of sex differences in pain behaviors, there is predicted to be many

associations between pain perception and psychological constituents of biological sex, including personal identity formation and preferred gender expression in potential partners highlighted in the current study (see Vigil, 2009), which is why this study will explore a relationship between gender expression and pain reporting.

Health Disparities in Pain Experience and Treatment

Understanding individual differences in women's experimental pain sensitivity is clinically important for multiple reasons. First, in continuation of the sex differences in both clinical and experimental pain perception just discussed, Paller, Campbell, Edwards & Dobs, (2009) reviewed an extensive body of research indicating women's heightened response to experimentally induced pain compared to men, as well as women reporting of greater clinical pain and pain-related distress than men. Second, women are more susceptible to conventional risk factors (i.e., body weight and age) that exacerbate musculoskeletal and inflammatory pain. Finally, according to health data from the U.S. Centers for Disease Control, women utilize significantly more healthcare services than men, with an average of only 11.3% of women reporting no health care visits to doctor offices or emergency departments or home health visits in the past 12 months, compared to an average of 21% of men reporting no health care visits. This increase in use of healthcare services by women has particular societal relevance and implications in light of increasing healthcare costs and other barriers to healthcare access.

What these differences tell us is that there are serious implications to sex differences in pain perception, experience and treatment. The first and foremost of these implications is that treatment may be insufficient and possibly ineffective if differences in pain perception and experience are not considered. "(T)here are variability at the genetic level and significant variation in individual responsiveness to analgesics, as well as to pain perception. The interplay

of biological sex with hormones, genetics, and brain neurochemistry appears to induce individual responses to pain" (Godfrey & Mackey, 2008, p. 917). While clinicians routinely consider individual differences in treatment scenarios, this may be insufficient and lead to excessive "trial-and-error" treatment plans that unnecessarily prolong patient suffering.

Intrasexual Variation in Sexuality

Throughout the pain literature, gender has only been looked at in binary fashion – male or female. Understanding the differences in women's pain by sexual orientation and gender expression could also elucidate the previously discussed health care disparities. It has been reported in the literature that African American and Hispanic ethnic minorities have reported increased sensitivity and/or lower tolerances (see Campbell, Edwards & Fillingim, 2005 and Rahim-Williams, Riley III, Herrera, Campbell, Hastie, & Fillingim, 2007). It is also well established that lesbian and bisexual women are exposed to higher levels of unpredictable, episodic and daily social stress, discrimination, and harassment than heterosexuals. In the same patterns as ethnic and racial discrimination, the persecution of sexual minorities is not limited to a single social or community context. However, sexual minority women and men (in at least some instances) also suffer abuse from family members that is not characteristic of ethnic and racial discrimination, which could increases safety concerns and attempts at sexual identity concealment that could in turn affect physical pain perception and tolerance in both clinical and experimental settings. Therefore, the current study is the first one to my knowledge to explore pain sensitivity and tolerance in lesbian and bisexual women. Differences in pain perception by sexual orientation, if found, could lead to improved health care treatment for sexual minority women.

Self-Identity and Pain

Despite a growing body of literature on sex differences in pain, surprisingly little research has been conducted on the influence of gender expression and sexual orientation on pain sensitivity within each sex, and this is particularly true among women. To the best of my knowledge, this is also the first study to measure how ischemic pain performance corresponds to variability in aspects of identity (i.e., a collection of self-descriptions) in women that include gender expression, preferred gender expression in a romantic partner and sexual orientation. The goal of the present study was to use a representative sample to examine if initial trends in these relationships exist to warrant a larger scale investigation. This research was designed to provide the important first step for interpreting how within-sex differences in different aspects of one's self-identity are linked to experimental pain sensitivity, which can expand our understanding of the nature of clinical pain in women.

Gender expression refers to the characteristics in one's personality, appearance, and behavior that are culturally defined as masculine or feminine. This construct is usually measured via self-report instruments designed to capture people's beliefs, behaviors, and attitudes about being of a particular sex. Several studies have shown that self-described masculinity and femininity are predictive of experimental pain sensitivity; specifically that dispositional femininity has been linked to greater clinical pain in men. Additionally, several laboratory studies have reported that people who rate themselves as possessing higher levels of trait masculinity have higher pain thresholds than people who rate themselves as having more feminine traits (see Alabas, Tashani, Tabasam & Johnson, 2012).

However, previously investigators have not controlled for biological sex and sexual orientation, which confounds the ability to measure the influence of gender expression

independent of these factors. It has previously been reported that pain sensitivity is affected by biological factors such as gonadal sex hormones (e.g., fluctuations across the menstrual cycle), but less is known about pain functioning in relation to other salient socio-cultural aspects of one's identity. Specifically, psychological constructs that correspond to biological sex, including gender identity and expression, sexual orientation, and preferred gender expression in romantic partners are all constructs that have yet to be studied in relation to pain sensitivity, particularly in women.

Past research on the influence of gender on pain performance has mainly focused on reduced pain tolerance in men who describe themselves as more feminine. Therefore the current study is the first to examine the relationship between sexual orientation and core components of identity including self-described gender expression and preferred trait levels of gender expression in romantic partners, sexual orientation, and ischemic pain performance in healthy young women. These results may have implications for regulating clinical pain because experimental pain sensitivity is predictive of clinical pain as shown by D'Antono, Ditto, Rios, & Moskowitz, in 1999 and Edwards, Doleys, Fillingim, & Lowery in 2001; therefore the results may have implications for understanding individual differences in clinical pain experiences in women. It was hypothesized that lesbian and bisexual women would be less sensitive to pain than heterosexual women. Regardless of sexual orientation, women who endorse a preference for more feminine romantic partners and women who describe themselves as more masculine were predicted to report higher pain thresholds and pain tolerance, and lower pain intensity levels than are women who report attraction for more masculine romantic partners and rate themselves as possessing more feminine dispositions. These findings will provide initial information on the potential links between fundamental components of identity (including

gender expression, sexual orientation, and preferred gender expression in potential partners) and experimental pain sensitivity that operate irrespective of biological sex.

Method

Participants and Research Design

The study protocol was approved by the University of North Florida's Institutional Review Board and informed written consent was obtained from all participants. Subjects in this study were drawn from a convenience sample of UNF students over 18 years of age. Students were primarily solicited in psychology classes as well as through on-campus flyers and word-of-mouth/snowball sampling for a study on "individual differences in pain perception." No monetary or other physical compensation was given to participants for participation in this study. Students enrolled in psychology classes where extra credit was offered for research participation were awarded two hours of participation credit to be applied according to the professor's specifications. While this circumstance covered a majority of the participants, the study also included a small sample of students who were not eligible for course credit, but participated purely for altruistic reasons (approximately 4% of the entire sample).

The study was performed with a non-equivalent groups, quasi-experimental design where participants were included in the study if they clearly indicated their biological sex as female and if they were 30 years of age or younger (participants who self-identified as male or transgendered were excluded from the study). Participants self-identified contraindications to the ischemic pain task, which included any past history of illness or pathology related to peripheral vascular or neuropathic abnormalities, psychological distress/diagnoses, excessive alcohol usage in the week prior to participation, and current medication usage related to vascular or pain-related ailments. Subjects endorsing any contraindication were excluded from the study.

A total of 172 women, ages 18 – 30 (*M* = 21.42, *SD* = 2.51) met these criteria for inclusion in the study. Their self-identified ethnic makeup was slightly more diverse than the subject pool, with a distribution of 55.6% European-American, 18.7% African-American, 5.3% Latin-American, 4.1% Asian-American, 1.8% Native-American, and 14.6% Other. Participants were also asked to self-report their sexual orientation, with a distribution of 8 participants (4.7%) identifying as lesbian and 11 participants (6.4%) identifying as bisexual; the remaining 153 participants (89%) described themselves as heterosexual, which is similar to national averages according to the National Health Statistics Report (Chandra, Mosher, Copen, & Sionean, 2011).

Measures

Background Survey

The study began with an electronic background questionnaire designed to measure various demographic characteristics and psychological constructs such as: general life experiences, psychological well-being, social network characteristics and social behaviors/motivations. Researcher-generated questions created by our lab as part of a larger survey (over 200 items) were used to measure a wide-range of personal and interpersonal subtopics including general life experiences, social network characteristics and social behaviors that were not gender specific. The individual items that pertained to the current study included sex, age, ethnicity, sexual orientation and gender expression. Gender expression was measured with two items that used the concepts of masculinity/femininity to capture two separate components of self-identity. For the first item, participants rated the level of masculinity and femininity preferred in a romantic partner and for the second item, participants indicated their own levels of masculinity and femininity. Each of the gender expression items was scored on a 10-point Likert scale ranging from 1 (*extremely masculine*) to 10 (*extremely feminine*) that is

similar to other techniques used for measuring gender expression (Lehavot, Molina, & Simoni, 2012).

Depression has been shown to correlate with pain tolerance (see Adler & Gattaz, 1993 and Lautenbacher, Spernal, Schreiber, & Krieg, 1999). This study measured depression by including the Center for Epidemiologic Studies Depression (CES-D) Scale in the Background Survey. The CES-D consists of 20 items that are scored on a 4-point Likert scale (α = .88). The overall depression score was not correlated with any of the pain measurement (ps > .41), and the depression scores did not differ across the sexual orientation groups (p = .96), or between the heterosexual women and the combined lesbian and bisexual women (p = .72). Finally, smokers were included in the study, however, the proportion of smokers (defined as currently smoking 2 times a month or more) did not differ for the heterosexual or the combined lesbian and bisexual women (p = .36); smoking was also not correlated with the pain threshold or tolerance measures (ps > .10).

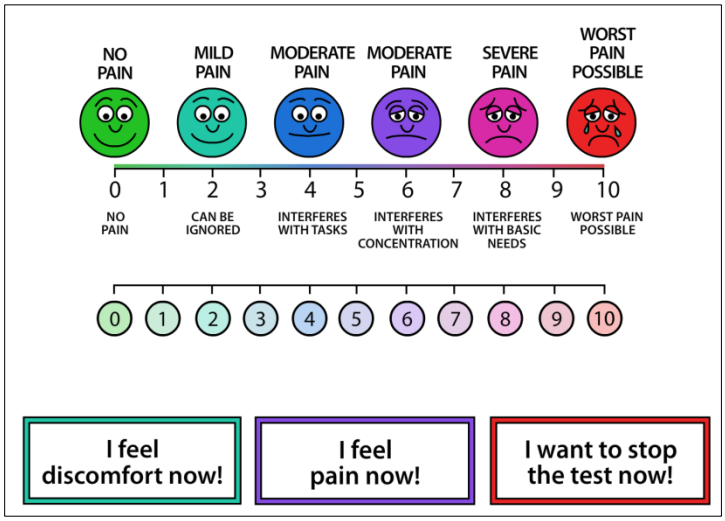
Ischemic Pain Task

The pivotal measurement of the study was the discomfort task, where participants performed a submaximal effort tourniquet task designed to induce ischemic discomfort. Ischemic discomfort is caused by the localized restriction of blood (and oxygen) flow to a restricted part of the body (usually the arm). Discomfort experiments frequently use this technique because it easily creates a pain sensation that is restricted to the manipulated site and instantaneously terminates when the cuff is released.

The quantitative portion of this assessment required participants to periodically rate their discomfort level on a computerized version of a Visual Analog Scale (VAS). The VAS is a common method for converting abstract, subjective data and concepts into operational,

quantifiable data. This particular VAS was taken from the pain literature and used an 11-point numeric scale (0-10), where each rating was paired with a facial drawing and a short phrase depicting a level of discomfort/pain (0 for *no pain* to 10 for *worst pain possible*) (see Figure 1 below).

Figure 1: Visual Analog Scale (VAS)



Subjects were prompted to select a numeric pain rating every thirty seconds for the duration of the task. The qualitative portion of this assessment required the subject to indicate three levels of ischemic discomfort by clicking three buttons onscreen. The buttons were marked "I feel discomfort now!" "I feel pain now!" and "I want to stop the test now!" Subjects were instructed to press each button when they were experiencing the specific response, regardless of the numeric ratings they were selecting periodically. The purpose of this secondary rating was to quantify subjective differences in pain ratings compared to the objective ratings of the numeric scale and is similar to other studies in the literature (see Carter, McNeil, Vowles, Sorrell, Turk, Ries, & Hopko, 2002).

Social Motivations Questionnaire

The final assessment was the Social Motivations Questionnaire, where multiple psychological constructs were rated using Likert scale responses. Many of the researcher-generated questions were repeated from the Background Survey in order to investigate differences and changes in the social behaviors/motivations after the ischemic pain task. Other constructs were measured independently of the pain task for the larger lab survey and correlated to demographic variables from the Background Questionnaire.

Procedure

Recruitment and Informed Consent

All participants were directed to the Psychology department's online SONA participant recruitment system to sign up for study times and to track participation for students receiving course credit for participation. When non-psychology students contacted the researchers regarding participation, they were individually signed up into timeslots by the research staff. Participants were scheduled in one hour blocks, with the entire study taking approximately 1 to1.5 hours per subject. For the study, participants reported to a research lab suite made up of one large room that served as a waiting area with three interior rooms used for the different portions of the study. All interior room doors were kept closed while participants completed their tasks to minimize interference from external stimuli.

When a subject first arrived, she read and signed two paper-based informed consent forms detailing the tasks, benefits and risks of the study. The first form covered the entire study and detailed the discomfort task that the subject was expected to perform. The second form specifically obtained permission for the discomfort task and was used to screen out any

participants currently being treated for a physical or psychological condition that could interfere with or be affected by the ischemic pain task.

Background Survey

After consent was obtained, the participant was seated at a computer in an interior suite room to complete the demographics and background questionnaire. The questionnaire was preloaded onto the computer for the participant and a researcher entered the subject's study ID number before the survey was started. Once the participant completed the background questionnaire, she immediately proceeded to the next task.

Ischemic Pain Task

When the participant was ready to begin the discomfort task, she was led into the room with two researchers to begin the task. Because the larger lab study included both male and female subjects, one male and one female researcher were present during the ischemic procedure to control for gender-based audience-effects on experimental pain performance (see Vigil & Coulombe, 2011). Upon entering the ischemic task room, researchers first obtained an initial pain assessment score [VAS1] along the VAS 0 – 10 scale. The participant was then seated in front of a computer and a computer program was initiated. The program provided instructions about how to indicate pain intensity ratings, discomfort and pain thresholds, and pain tolerance while eliminating potential confounds (e.g., time latency and recording errors) that can accompany manual experimenter pain recordings. Participants were informed both by the program and by a research assistant that after the task began, she was to select the rectangular buttons onscreen to indicate the instant that she first experienced discomfort, first experienced pain, and was ready to stop the task. The pain assessment program also prompted participants to indicate their pain intensity ratings (0-10) every thirty seconds throughout the duration of the

ischemic procedure (upon an audio prompt and illumination of the pain VAS). There was no indication of time visible to participants on the computer screen or in the testing room in order to ensure that participants were unaware of how much time elapsed during the procedure. Participants were informed before they began that they could end the pain task at any time if they were no longer willing or able to continue.

Once participants verbally indicated their comprehension of the task and how to use the computer interface, the ischemic pain task was initiated. At this time, the subject was asked by the first researcher to remove any jewelry from their non-dominant hand and arm and her clothing was adjusted as necessary to ensure that the blood pressure cuff could be properly applied. Then the participant fully extended her non-dominant arm vertically into the air for a period of at least one minute while exsanguination of the arm occurred. During exsanguination of the arm, the second researcher reviewed the information with her to ensure that she understood the task and answered any questions that the subject had at this time.

A blood pressure cuff was then applied to the participant's forearm 5 cm below the elbow crease and inflated to 200 mm/Hg over a period of 20 seconds by the first researcher. Once the cuff was fully inflated, the participant then lowered and rested her arm horizontally on a pillow in front of her and provided an initial pain assessment on the computer screen [VAS2]. Then the subject began performing soft-fist movements (described as gently touching the fingertips to the palm of the hand every 3 seconds), and continued the movements throughout the duration of the ischemic procedure. Continuous hand flexing motions are functionally similar to handgrip exercises used in other studies for quickly and reliably producing high levels of pain sensations (see Edwards, Haythornthwaite, Sullivan & Fillingim, 2004; Fillingim et al., 2009 & Zhou, Fillingim, Riley III & Verne, 2010).

The initial pain assessment [VAS2] activated the program (a computerized version of the pain VAS) that prompted the subject (with an audible cue and VAS illumination) every 30 seconds to click onscreen and select the one pain response that corresponded to her level of discomfort at that moment [VAS 3-13]. Also, in the bottom half of the screen three buttons were displayed for a second set of participant responses. These buttons were selected by the subject at any time of her choosing, regardless of the numerical VAS responses every 30 seconds. The first button was selected whenever the participant reached ischemic "discomfort" [Discomfort Threshold] and the second button whenever she reached ischemic "pain" [Pain Threshold]. While the task proceeded, the second researcher reminded the participant of the required responses as necessary and monitored the time. The third and final button was selected by the subject once pain tolerance was reached [Pain Tolerance] and terminated the task. This prompted the first researcher to slowly deflate the blood pressure cuff over a period of 20 seconds. The second researcher was responsible for concluding the task if the participant had not reached her tolerance level after a period of 5 minutes and 30 seconds. Participants were unaware of this time limit and it was used to ensure the safety of the participants.

After the Ischemic Pain Task was completed and the blood pressure cuff removed, the subject was informed that she would be given five minutes alone to rest her arm and allow the pain in her arm subside back to normal levels, according to safety protocols. At this time, the second researcher also explained the normal physical changes that were occurring as blood flow was restored to the arm and hand, including "tingling sensations" and changes in skin color. The researchers then left the subject alone in the pain task room with the door closed, and set a timer for five minutes outside the room in order not to disturb the participant while she was resting.

At the end of the five minute waiting period, a researcher reentered the pain task room and asked the subject what her current/final pain level was. If the final level was no higher than two levels above the subject's verbal baseline pain rating, the subject was "cleared" to continue on to the final part of the study. Otherwise, if the subject's final pain level was three or more levels above the initial rating, then she was given more time to rest until her pain level dropped to an acceptable level, as noted above.

Social Motivations Questionnaire and Debriefing

Once the participant was ready, she was moved into another room to complete the final computer-based assessment of the study. The participant was seated at a computer with the Social Motivations survey displayed onscreen. The subject's study ID number was entered and then the researcher left the room so that she could complete the survey in private. After completion of the questionnaire, the participant was thanked for her participation, debriefed orally and in writing, and released from the study.

Results

Data Analyses

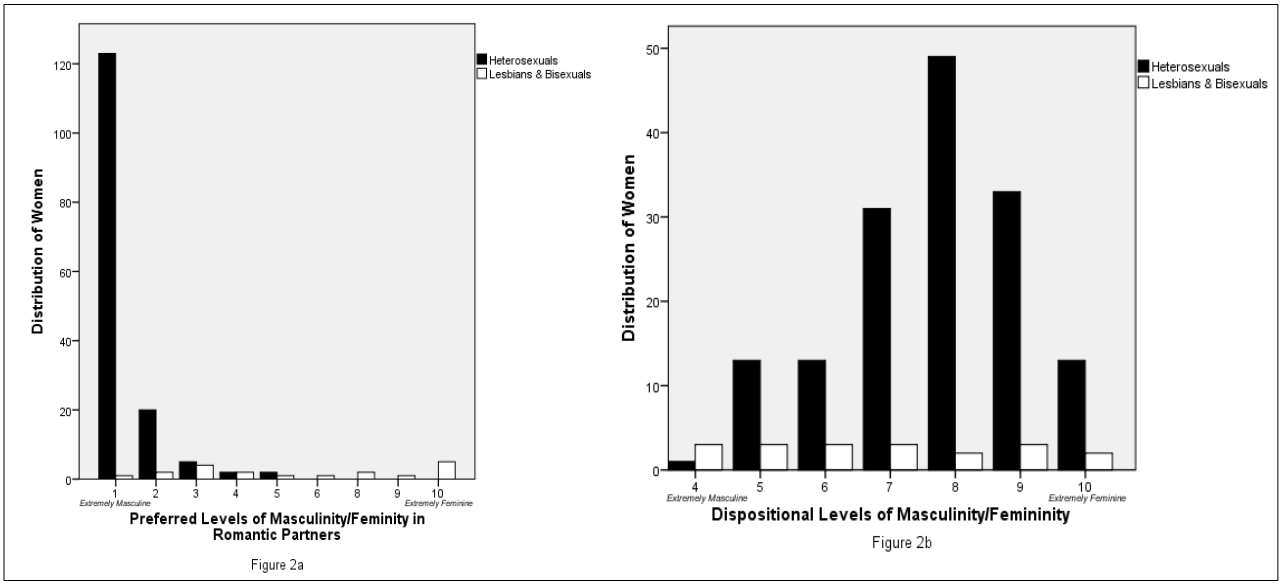
The pain scores included the participant's discomfort threshold, pain threshold, pain tolerance (measured in seconds of time latency from onset of the task), and the pain intensity scores during the first two minutes of the task (VAS2-VAS5). Higher intensity scores and lower threshold and tolerance scores are interpreted as indicating greater pain sensitivity. Lower intensity scores and higher threshold and tolerance scores are interpreted as indicating lower pain sensitivity. Since the proportions of individuals with different sexual orientations were unequal and the gender-related scores were not normally distributed, nonparametric statistics are reported. Due to the small proportion of lesbian and bisexual women, these subgroups were

combined and contrasted with heterosexual women to increase the strength of any group effects by sexual orientation for the primary analyses corresponding to pain sensitivity. The heterosexual and the combined lesbian and bisexual groups did not differ in age (p = .604) or ethnic background (p = .313). Relationships between variables are measured with Spearman R correlations (r_s) and differences between groups are measured with Mann-Whitney U tests. Effect sizes are described as correlation coefficients ($r = Z/\sqrt{N}$).

Variability in Gender Identities

Preference for masculine romantic partners and dispositional femininity were negatively correlated for the entire sample (r_s = -.32, p < .01). Comparing heterosexual and combined lesbian and bisexual women separately revealed that attraction to more masculine romantic partners and dispositional femininity were only significantly correlated in the heterosexual group (r_s = -.27, p < .01), and there was a trend towards a similar correlation in the combined lesbian and bisexual group (r_s = -.41, p = .09). The distribution of scores for the gender-based items for the heterosexual and combined lesbian and bisexual groups is shown in Figures 2a and 2b below, respectively.

Figure 2: Distribution of Scores of Gender-Based Items



As shown in Figure 2a, preferred levels of gender expression in one's sexual partner ranged from 1 (*extremely masculine*) to 5 in heterosexual women, and from 1 to 10 (*extremely feminine*) in lesbian and bisexual women. The frequency distribution was positively skewed in the heterosexual group (Median = 1, Range = 4; skewness = 3.14, *SE* = .20; kurtosis =11.04, *SE* = .39), and eighty-one percent of these women were attracted to extremely masculine romantic partners (a score of 1 on the 10-point scale). The frequency distribution in the lesbian and bisexual group was bi-modal (Median = 5, Range = 9; skewness = .13, *SE* = .52; kurtosis = -1.72, *SE* = 1.01) and a Mann-Whitney test indicated a significant group difference between heterosexual and lesbian and bisexual women in this measure, $U = 161.50$, $Z = -8.03$, $p < .01$, with lesbian and bisexual women preferring more feminine partners than did heterosexual women. Comparisons of romantic preferences between lesbian and bisexual women showed that bisexual women reported a greater preference for feminine romantic partners (Median = 10, Range = 9) as compared to lesbian women (Median = 3, Range = 6, $U = 11.50$, $Z = -2.72$, $p = .01$.

Dispositional gender expression ranged from 4 to 10 (*extremely feminine*), and this construct was normally distributed around the mean in the heterosexual group (Median = 8, Range = 6; skewness = -.45, *SE* = .20; kurtosis = -.29, *SE* = .39). For the combined lesbian and bisexual group, this construct was uniform around the mean (Median = 7, Range = 6; skewness = .14, *SE* = .52; kurtosis = -1.22, *SE* = 1.01). Comparisons between the two groups showed that while they did not report a Median difference in dispositional gender expression (Medians = 6 and 7, Ranges = 6, $U = 39.00$, $Z = -.42$, $p = .68$), a significant group difference was observed for this construct between the heterosexual and combined lesbian and bisexual groups, $U = 1041.50$, $Z = -2.06$, $p = .04$.

Sexual Orientation, Gender Expression, and Pain Sensitivity

The median pain intensity ratings for the heterosexual and the lesbian and bisexual women for each of the first four pain intensity ratings taken during the discomfort task are shown in the first three columns of Table 1.

Table 1: Group Differences in Pain Scores and Correlations with Gender Expression

	Group Differences			Correlations (r_s)	
Pain Variable	Heterosexual	Lesbian and bisexual	*Z*	Masculine vs. Feminine Preferred Partners	Dispositional Masculinity vs. Femininity
VAS(30s) (*n*s=144,18)	2.00 (10)	2.00(6)	-1.47	-.15	.21**
VAS(60s) (*n*s=137,17)	4.00 (8)	2 (7)	-2.08*	-.21**	.22**
VAS(90s) (*n*s=111,16)	5 (9)	3.50 (7)	-2.14*	-.28**	.07
VAS(120s) (*n*s=85,15)	6 (9)	6 (8)	-1.39	-.26**	.05
Discomfort Threshold (*n*s=124,19)	43.12(313)	103.07(358)	-1.47	.01	-.13
Pain Threshold (*n*s=136,19)	105.42(418)	126.21(414)	-1.79	.16	-.20**
Pain Tolerance (*n*s=144,19)	138.75(624)	171.16(512)	-1.25	.17*	-.15

Note: The first column shows the number of participants in each sexual orientation group (heterosexual and combined lesbian and bisexual, respectively). The next three columns show group differences in Median values (Ranges are in parentheses) for the pain sensitivity scores. The last set of columns represents Spearman correlations among the entire sample. *$p < .05$, **$p < .01$

As shown in Table 1, Mann-Whitney U tests revealed significant group differences in pain intensity ratings at 60 s and 90 s into the pain task, with lesbian and bisexual women

reporting lower pain scores as compared to heterosexual women (r_s = .17 and .19). The median threshold and tolerance scores for the heterosexual and the lesbian and bisexual women are shown in the bottom of Table 1. Mann-Whitney U tests did not reveal any significant group differences for these measures, however there was a trend for lower median pain threshold scores among the heterosexual group (U = 618.00, p = .07, r = .15).

Spearman correlations between the pain ratings and the two gender items (preferred levels of femininity in romantic partners and trait levels of femininity) for the entire sample are shown in the second set of columns in Table 1. As shown, attraction to more feminine romantic partners was related to lower pain intensity ratings between one and two minutes into the task. Similarly, there was a modest association between self-described masculinity and lower pain intensity ratings during the first minute of the task. Comparing the heterosexual and the lesbian and bisexual women separately revealed a correlation between attraction to feminine partners and lower pain intensity levels at 90 s (r_s = .22, p = .02) and 120 s (r_s = .23, p = .04) into the pain task for the heterosexual group. Dispositional masculinity was also associated with lower pain intensity ratings at 30 s (r_s = .19, p = .02) and 60 s (r_s = .19, p = .03) into the task in the heterosexual group. The gender-based items were not associated with pain intensity scores in the combined lesbian and bisexual group (ps > .10).

Lastly, Table 1 shows that, among the entire sample, attraction to feminine romantic partners was similarly associated with higher pain tolerance and dispositional masculinity was associated with higher pain threshold. Comparing the heterosexual and lesbian and bisexual women separately revealed a trend toward a relationship between attraction for more feminine partners and higher pain tolerance in the heterosexual group only (r_s = .16, p = .06). In the lesbian and bisexual group, dispositional masculinity was associated with higher pain threshold

(r_s = -.66, p = .02), and there was a trend toward a relationship between dispositional masculinity and higher pain tolerance (r_s = -.49, p = .06).

Discussion

This preliminary study demonstrated that ischemic pain performance is associated with sexual orientation, dispositional gender expression, and preferred gender expression in romantic partners in healthy young women. Compared to heterosexual women, lesbian and bisexual women reported lower pain intensity ratings. Among heterosexual women, attraction to more feminine romantic partners was associated with lower pain intensity ratings early into the ischemic discomfort task, and there was a slight association between self-described masculinity and lower pain intensity ratings for heterosexual women. Similar associations emerged between attraction to more feminine romantic partners and higher pain tolerance in the heterosexual group and for dispositional masculinity and higher pain threshold and tolerance levels in the combined lesbian and bisexual group. These findings provide preliminary support for the hypothesis that, irrespective of biological sex, various other aspects of sexual identity are associated with ischemic pain performance.

These findings suggest that larger scale studies of aspects of identity such as gender expression and sexual orientation would be fruitful and may lead to a better understanding of individual differences in both experimental and clinical pain and related health problems in women. According to Case, Austin, Hunter, Manson, Malspeis, Willett, & Spiegelman (2004), increased rates of certain health behaviors in sexual minority women compared to heterosexual women including elevated alcohol consumption, higher rates of obesity and cigarette smoking, much higher rates of nulliparity (never giving birth), as well as key risk factors for breast cancer and cardiovascular disease are correlated with increased negative health outcomes. A 2011

report from The Institute of Medicine of the National Academies reinforces this discrepancy, noting that lesbian, gay, bisexual, and transgender (LGBT) individuals comprise a patient subgroup that is at greater risk than the general population for experiencing the adverse health outcomes of breast cancer and heart disease.

Lower quality health is also speculated to stem from external factors such as higher rates of actual or anticipated discrimination and lower quality healthcare from medical providers. People who experience prejudice and discrimination, and people who conceal a same-sex orientation are more likely to show occupational distress and lower general health. Stigmatization of sexual minorities including discrimination, violence, expectations of rejection, and internalized homophobia have been found to negatively affect mental health and psychological distress. Diaz & Bein (2001) reported that many gay and bisexual Latino men in the United States suffer from symptoms of psychological distress and mental health difficulties as a direct result of social oppression that leads to low self-esteem and social alienation. Sexual minority women are more likely to avoid general preventative care and under-utilize healthcare services overall. These patterns of insufficient medical treatment may be linked to repeated experiences of homophobia and heterosexism within the health care system, according to McNair (2003) who detailed health inequalities for lesbian and bisexual women resulting from a wide range of discriminatory experiences based on their sexual orientation, including homophobia and heterosexism. Such treatment inequality by medical practitioners could lead to sexual minority women and men avoiding disclosure of their sexual orientation within consultations, that then results in decreased screening and other routine healthcare, which could lower their overall health outcomes. Additional minority identities, such as ethnic minority status, appear to compound the increased risk of morbidity in lesbian and bisexual women (see

Mays, Yancey, Cochran, Weber & Fielding, 2002), though it is unclear at this time how these added risk factors are related to internal (e.g., personal) and/or external (e.g., interpersonal) factors. Nonetheless, disparities in patient pain experiences is an important public health issue that is both costly to society and important for understanding potential causes of under-treatment of pain-related conditions for some women.

The current study highlights the potential importance of dispositional gender expression and preferred gender expression in romantic partners for understanding sex differences in clinical and experimental pain sensitivity. The results provided preliminary evidence that several components of sexual identity are each predictive of experimental pain sensitivity, which may actually interact with, rather than merely result from biological sex to influence pain behaviors. For example, Kunz, Gruber & Lautenbacher (2006) found that women show a stronger association between reflexive (e.g., facial) pain behaviors and reflective pain reports, suggesting that facial responses to pain are a better approximation of subjective pain intensity in women than men. This also signals that females may be more sensitive to exaggerate the expression of pain behaviors, in comparison to males, who may instead be more sensitive to constrain the display of pain in general. Other investigators have shown that women are more sensitive to both dosage and type of analgesic medication (see Giles and Walker, 2000), however less is known about how fundamental components of sexuality and gender within each sex, not directly related to chromosomal identity, may contribute to variability in pain perception and overall health.

Some theorists have suggested that the evolved processes underlying distinct components of sexuality such as preferred gender expression in potential reproductive partners and dispositional characteristics (e.g., affectional bonding) are functionally independent (see

Diamond, 2003), and may thus share unique relations with other aspects of biological functioning including pain sensitivity. This thesis is consistent with the current preliminary findings that preference for more masculine/feminine romantic partners and trait-levels of gender expression were only slightly correlated, and that regardless of sexual orientation, preference for, and dispositional gender expression were independently associated with pain intensity, threshold, and tolerance reports. These findings are consistent with the hypothesis that cognitive representations and/or reports of sexual identity may mediate the relation between biological (chromosomal) sex and variability in pain sensitivity. Psychological constructs such as gender expression, preferred gender expression in significant relationship partners, and sexual orientation may therefore play a role in women's pain experience somewhat independent of physical tissue damage, and in ways that could exacerbate clinical pain.

The limitations of this study included that there was a very small sample size of lesbian and bisexual females as compared to heterosexual females; although the rates of self-identified heterosexual, lesbian, and bisexual orientations of this sample were comparable to national averages. It is also important to consider that trait levels of dispositional femininity and masculinity were relatively homogenous for both the heterosexual and lesbian and bisexual groups and skewed towards more self-described feminine dispositions, and it is unknown if these patterns are typical for women with different demographic characteristics and cultural backgrounds. Sexual majority women homogenously preferred extremely masculine partners compared to lesbian and bisexual women which may limit the generalizability of the findings for women with more diverse and varied sexual identities. Another limitation of this study is that dispositional masculinity/femininity and preference of gender expression in romantic partners were measured by Likert-style scales, and other psychometric techniques (e.g., factor-analyzed

personality assessments) may be more adept at capturing additional components of sexual identities such as appearance, gender roles, and emotional expression. "Gender expression varies considerably among lesbian and bisexual women…. (but) no current measure adequately assesses gender expression in this community" (Levahot, King & Simoni, 2011, p. 381).

A further limitation of the study and similar investigations of this nature is that lesbian and bisexual women were combined for analyses. Larger-scale studies should be designed such that investigators may recruit more bisexual and lesbian women in order to look at these distinct subgroups individually. Finally, the handgrip component of the ischemic task was not standardized, which could have produced a scenario in which individuals squeeze with less force as they experience more pain, effectively lowering the intensity of the painful stimulus for some women. It is also possible that simultaneously rating pain and completing the ischemic task could have acted as a distraction and reduced pain tolerance. If these problems occurred, then they likely would have affected all participants equally. However, due to these limitations, the study should be considered preliminary, yet useful for informing future research on sexual identity formation and pain perception.

In conclusion, the findings of this study show that within-sex variability in gender expression and sexual orientation in women is associated with experimental pain performance. If this observation is confirmed by future larger studies, these results may have important implications for understanding the determinants of individual differences in pain perception and for guiding individualized pain treatment options. These newly individualized pain treatments could also integrate biofeedback and other bio-psychological components that are more closely aligned with individual identity and personality components (e.g. gender expression), therefore

increasing use of more integrative, internal pain management compared to external, pharmacological pain management.

Future research will also benefit by comparing lesbian and bisexual and majority subgroups separately so as to not obscure important distinctions across individuals and adding measures of psychosocial distress (e.g., discrimination). Moreover, the current study's findings suggest that individual differences in sexual identity and orientation, irrespective of biological sex, may be important to consider when examining, comparing, and interpreting individual and group differences in experimental pain performance and clinical pain experiences.

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Curriculum Vita

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Education

MA, General Psychology — University of North Florida
BA, Psychology, Minor in Business Administration — Loyola University New Orleans

Honors

College of Arts & Sciences Graduate Scholarship, University of North Florida
Fr. Marlow Residential Life Award, Loyola University New Orleans

Professional Association Memberships

Psi Chi Psychology Honor Society
Sigma Alpha Iota Women's Music Fraternity
Eta Sigma Phi Classical Studies Honor Society

Significant Graduate Coursework

Advanced Biopsychology
Advanced Human Development
Advanced Personality Theory
Advanced Social Psychology
Cognitive Development in a Sociocultural Context
Learning and Cognition
Research Design and Analysis
Statistical Methods in Social Sciences

Publications

Lutz, C. M. Women's Intrasexual Variability in Sexual Psychology and Pain Functioning (Master's Thesis)

Vigil, J.M., Lutz, C. M., Rowell, L. R. (in press) Gender expression, sexual orientation and pain sensitivity in women.

Community Involvement

2002 — Consultant, Our Lady of Lourdes Center, New Orleans, LA
2010 – 2012 — Member, Sergeant-At-Arms, Rotaract of Florida's First Coast, Jacksonville, FL

Research Experience

2009 — Research Assistant, Schema Adaptability as a mediator between self-complexity, and affect intensity and alexithymia, Principle Investigator: Dr. Deborah Baker

2008 to 2009 — Co-Researcher, Social Motivations and Pain Perception Lab, University of North Florida, Principle Investigator: Dr. Jacob M. Vigil

Work Experience

3/2011 to 8/2013	Office Coordinator, Smith-McCrary Architects, Jacksonville Beach, FL
4/2010 to 9/2010	Field Operations Clerk, US Census Bureau, Decennial Census, Jacksonville, FL
9/2009 to 4/2010	Office Assistant, UNF Department of Psychology, Jacksonville, FL
8/2008 to 8/2009	Student Associate, Kaplan Test Prep and Admissions, Jacksonville, FL
11/2007 to 8/2007	Supply Chain Expediter, PSS World Medical, Jacksonville, FL
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