

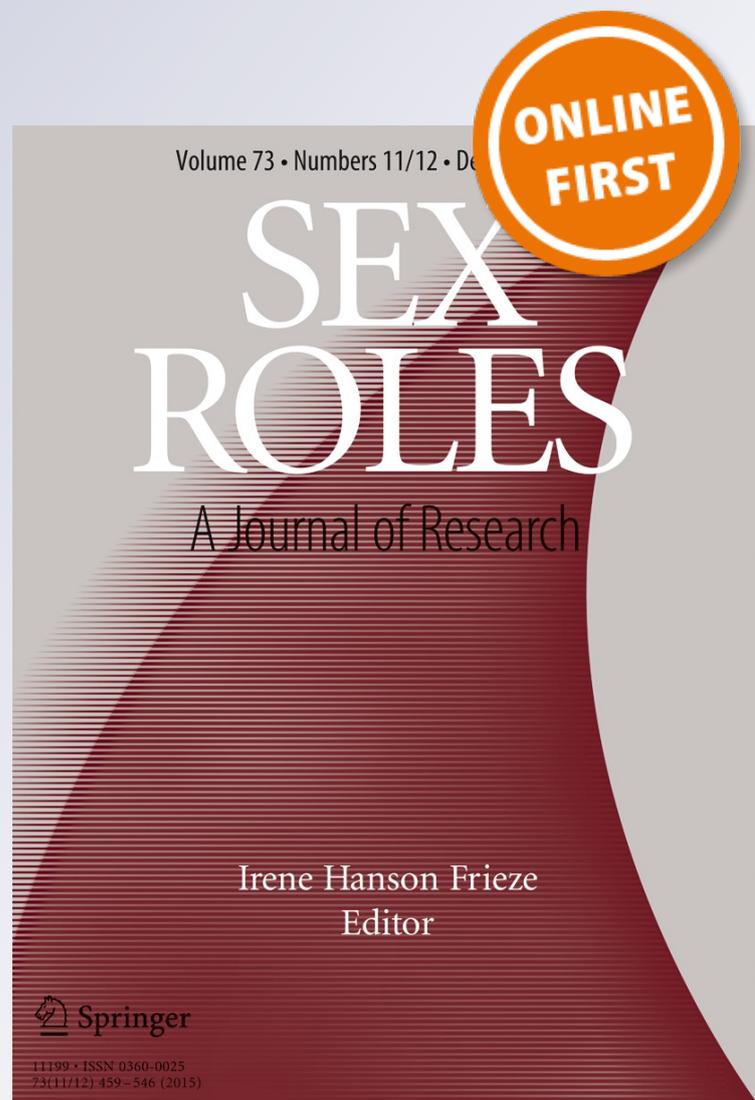
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# Disrupted Transition to Parenthood: Gender Moderates the Association Between Miscarriage and Uncertainty About Conception

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**Abstract** Miscarriage is a devastating yet common experience shared by women and their partners. Doctors often recommend that couples attempt to conceive again after the experience of a miscarriage, yet little is known about the emotional toll of conception following miscarriage. In the current study, we addressed two primary research questions: (a) How does experiencing a miscarriage relate to recalled emotional experiences of uncertainty surrounding efforts to conceive again? and (b) does gender moderate the association between miscarriage and retrospective accounts of emotions surrounding efforts to conceive? An online sample of parents from across the U.S. ( $N=429$ ; 84.4 % married or cohabiting) reported their number of prior miscarriages and completed online questionnaires assessing recalled psychological adjustment (anxiety, rumination, positive and negative emotions) during their efforts to conceive their youngest child. In addition, they provided written responses regarding their experiences during this time. Participants' responses were quantitatively analyzed for word use using LIWC, a text-analysis software program, to obtain an observational indicator of emotions. For women but not men, miscarriage was associated with recalled anxiety, rumination, and negative emotions surrounding efforts to conceive a child, as well as the use of more negative emotion, sadness, and anxiety words when describing efforts to conceive. Thus, miscarriage seemed to taint the emotional experience of trying to conceive again, and this consequence seemed particularly poignant for women.

**Keywords** Gender · Pregnancy · Fertility · Miscarriage · Distress · Emotion · Uncertainty

“The experience all around was very difficult. After the miscarriage, the thought of becoming pregnant was very scary. When I finally became pregnant, [every day] was a stressful day. I can honestly say I didn't enjoy my pregnancy as I would [have] wanted to.”~Female Study Participant

“I had a miscarriage between my middle son and youngest daughter, being pregnant after having a miscarriage was very, very stressful. I kept waiting for something bad to happen.”~Female Study Participant

“A significant amount of pressure of the situation, in trying to get pregnant, was trying to get my wife to talk about all her feelings, in order to deal with the situation that discomforted her the least and reduce the pressure that she felt.”~Male Study Participant

“We had tried many times to get pregnant. It had resulted in many miscarriages. We were certain we could get pregnant, but what caused us the most anxiety was finding out we were and then wondering if we would stay pregnant.”~Female Study Participant

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## Introduction

The loss of a child by miscarriage is a devastating experience for expectant mothers and fathers (e.g., Adolphson 2011). Miscarriage occurs in 10–25 % of pregnancies worldwide (Everett 1997 [United Kingdom (U.K.)]; Sedgh et al. 2014 [multi-

nation sample]), and as many as 25 % of women who have been pregnant experience at least one miscarriage by the time they reach age 39 (Blohm et al. 2008 [Sweden]). Doctors often recommend that couples attempt to conceive again after the experience of a miscarriage, in light of evidence suggesting that couples who conceive again within 6 months of their miscarriage have the best reproductive outcomes and lowest complication rates (Love et al. 2010 [U.K.]). Though this gives cause for optimism, the negative emotional impact of miscarriage can be lasting (Beutel et al. 1995 [Germany]), and may contribute to distress as men and women attempt to conceive following a miscarriage.

In the current study, we examine U.S. men's and women's recalled experiences trying to conceive following a miscarriage relative to those who had not experienced a miscarriage. All empirical studies cited throughout this paper are based on U.S. samples unless otherwise noted. Our approach is driven by two primary research questions: (a) How does experiencing a miscarriage relate to recalled emotional experiences of uncertainty surrounding efforts to conceive again? and (b) does gender moderate the association between miscarriage and retrospective accounts of emotions surrounding efforts to conceive? Grounded in theory suggesting that motherhood is more central to women's identities than fatherhood is to men's (Hays 1996) and that women tend to exacerbate negative experiences by ruminating about them (Lyubomirsky et al. 2015; Nolen-Hoeksema 2001), we anticipate that women will demonstrate poorer psychological adjustment than men in the face of miscarriage.

This work contributes to a growing body of research examining the detrimental emotional consequences of miscarriage (e.g., Adolfsson 2011). We build on this work by systematically comparing mothers and fathers who suffered a miscarriage with mothers and fathers who did not. Investigating the emotional consequences of miscarriage for men is an important contribution to this literature because a miscarriage is just as much a loss of a child for men as it is for women, and the extent to which men and women differ in their emotional responses to miscarriage may shape advice for couples coping with miscarriage together. In addition, understanding the effects of miscarriage in the context of conceiving again is important because pregnancy following a miscarriage may be a particularly trying time, as men and women may be particularly sensitive to the possibility of another miscarriage, which may further amplify their distress.

### **Pregnancy Following Miscarriage**

Not surprisingly, substantial evidence indicates that experiencing a miscarriage is associated with elevated symptoms of anxiety and depression (Adolfsson 2011; Chojenta et al. 2014 [Australia]; Lok et al. 2010 [Hong Kong]), as well as grief (Brier 2008), among women. Moreover, these

reactions can be quite severe: As many of 27 % of women who suffer a miscarriage demonstrate psychiatric morbidity within 10 days after the event (Adolfsson 2011).

Fortunately, more than half of couples conceive again within a year following a miscarriage (Love et al. 2010 [U.K.]), and although miscarriage may be devastating, the negative emotional impact of miscarriage often diminishes after conceiving again (Swanson 2000). Despite these declines in depressive symptoms, couples attempting to conceive again following a miscarriage face several waiting periods that may be associated with elevated anxiety and uncertainty: (a) the time between the loss of pregnancy and attempts to conceive again, (b) the period during which they are trying to conceive and waiting to discover if these attempts were successful, and (c) the period from successful conception to pregnancy viability. Evidence suggests that these waiting periods are wrought with uncertainty and that women frequently search for control over pregnancy outcomes during these periods (Ockhuijsen et al. 2014 [Netherlands]). Moreover, in a sample of women from the U.K., miscarriage predicted symptoms of depression and anxiety during a subsequent pregnancy (Blackmore et al. 2007).

Evidence clearly supports the proposition that experiencing a miscarriage is associated with elevated uncertainty—as well as anxiety and depression—among women as they attempt to conceive again. However, less is known about the experiences of men whose partners suffer a miscarriage. Some studies suggest that men experience similar feelings of grief following their partner's miscarriage (Murphy 1998 [U.K.]; Puddifoot and Johnson 1999 [U.K.]), yet others indicate that women report greater anxiety and depression following miscarriage than men (Cumming et al. 2007 [U.K.]; McGreal et al. 1997 [Australia]). In addition, because women report higher levels of depression and anxiety than men in the general population (Armstrong and Khawaja 2002; Nolen-Hoeksema 2001; Piccinelli and Wilkinson 2000), it is difficult to ascertain whether these reactions are specific to miscarriage or simply reflect this broader gender difference. Accordingly, more work is needed considering the effects of miscarriage on both men and women, relative to people who have not experienced miscarriage. Because a miscarriage is as much a loss of a child for men as for women, we could expect miscarriage to have similar effects on men's and women's emotions. However, the physical experience of becoming pregnant, carrying the fetus for a time, and then miscarrying may exert a greater toll on women's emotional well-being. We pit these competing hypotheses against each other in the present study.

### **Gender Beliefs in the United States**

Gender beliefs encompass the cultural norms and standards by which people are expected to enact gender in their daily lives (Ridgeway and Correll 2004). Such beliefs permeate U.S. culture (Lueptow et al. 2001; Spence and Buckner 2000)

and contribute to ideals characterizing femininity and masculinity. For example, femininity is typically characterized by communal values (e.g., emotional warmth, nurturing), whereas masculinity is typically characterized by agentic values (e.g., independence, assertiveness; Feather 1984). Over time, these characterizations of femininity have contributed to an idealization of motherhood, such that women are expected to have children in order to be considered feminine (Hays 1996). In turn, the idealization of motherhood may magnify the emotional cost of miscarriage for women, as they consider the possibility that they may not fulfill this societal norm. On the other hand, because fatherhood is not similarly idealized, the adverse emotional consequences of miscarriage may be less severe among men.

Societal expectations for motherhood and fatherhood also translate into gendered stereotypes for women and men without children. Women who choose not to have children are often perceived as selfish, deviant, and unfeminine (Gillespie 2000 [U.K.]). By contrast, men who choose not to have children do not face these negative stereotypes (Koropecykj-Cox et al. 2007). Accordingly, women may also experience poorer psychological adjustment in the face of miscarriage, as their childlessness is perceived negatively by their peers. Notably, when childlessness is determined to be a result of fertility challenges, the associated negative perceptions are minimized (Koropecykj-Cox et al. 2007); however, because many women choose not to disclose their miscarriages (Slade et al. 2007), others may misinterpret the reasons for their childlessness and continue to view them as selfish, deviant, and unfeminine (Gillespie 2000 [U.K.]).

### Word Use and Psychological Adjustment

Past studies of the emotional implications of miscarriage typically employ self-report methods, yielding insights into people's subjective experiences of miscarriage. Exclusive reliance on self-report measures, however, renders studies susceptible to biases inherent in self-reports (e.g., mood effects, demand characteristics, cultural and contextual relativity). Recent research suggests that features of natural language use can provide an observational point-of-view on people's psychological and social worlds (Pennebaker 2011; Pennebaker et al. 2003). Thus, examining the associations between emotion word use and self-reports of emotional experience can lend a unique perspective to the understanding of the emotional repercussions of miscarriage.

Emotion words (e.g., worried, sad, happy, love) can mark improvements or decline in psychological adjustment to traumatic or stressful events (Cohn et al. 2004; Pennebaker et al. 1990). Emotion words indicate emotional expression, which can even facilitate psychological adjustment. For example, breast cancer patients who used these words in an expressive writing task experienced fewer physical symptoms 3 months later (Creswell et al. 2007; Low et al. 2006). In sum, examining

the words people use to describe a stressful health-related experience can provide an important and unique perspective on their subsequent emotional adjustment. In the present study, we examined use of emotion-relevant words in women's and men's descriptions of their experience trying to conceive following miscarriage (compared to those trying to conceive with no history of miscarriage) to both support and augment our examination of self-reported emotional experiences.

### Current Study

In the current study, we assessed reports of psychological adjustment (anxiety, rumination, and positive and negative emotions) as individuals reflected on the time when they were trying to conceive their youngest child. Moreover, we took a multi-method approach to address our research questions (see below). In addition to self-reported psychological adjustment, we assessed emotion word use in participants' open-ended responses about their experiences trying to conceive.

We used a retrospective design for a number of reasons. Most notably, we sought to compare the experiences of parents who had experienced a miscarriage to those who had not. Because having children is associated with a variety of emotional outcomes (see Nelson et al. 2014 for a review), comparing participants who suffered a miscarriage to those whose pregnancies resulted in a live birth would likely overestimate the emotional consequences of miscarriage. Comparing retrospective accounts among parents who all experienced successful pregnancies and deliveries avoids conflating the effects of new parenthood with the effects of experiencing or not experiencing miscarriage. In addition, because miscarriage is associated with biological (e.g., hormonal) changes among women, the use of a retrospective design avoids confounding gender with biological differences between men and women in the aftermath of a miscarriage.

In the current study, we sought to answer two primary research questions, with accompanying hypotheses for each. For each hypothesis, we considered the effects of at least one miscarriage as well as multiple miscarriages.

*Question 1:* Is experiencing a miscarriage associated with heightened negative emotions, as expressed in self-report and open-ended responses, surrounding efforts to conceive again?

Regarding self-reported responses, we hypothesized that experiencing a miscarriage (or a partner's miscarriage) would be associated with elevated anxiety, rumination, and negative emotions, and decreased positive emotions (*Hypothesis 1a*). Regarding open-ended responses, we hypothesized that experiencing a miscarriage (or a partner's miscarriage) would be associated with using relatively more negative emotion words in general, and specifically anxiety and sadness words,

and with using fewer positive emotion words relative to those who did not experience a miscarriage (*Hypothesis 1b*). That is, we anticipated that word use would reflect the more negative emotional experience trying to conceive following a previous miscarriage (Cohn et al. 2004; Pennebaker et al. 1990), as well as the specific emotional responses of anxiety (Adolfsson 2011; Chojenta et al. 2014 [Australia]) and sadness (Adolfsson 2011; Brier 2008; Lok et al. 2010 [Hong Kong]) that miscarriage has evoked in previous research.

*Question 2:* Does gender moderate the association between miscarriage and retrospective accounts of emotions surrounding efforts to conceive?

Based on evidence that women react more strongly to miscarriage (Cumming et al. 2007; McGreal et al. 1997 [Australia.]), we hypothesized that the effects of miscarriage would be moderated by participants' gender, such that miscarriage would be more strongly associated with poor psychological adjustment surrounding efforts to conceive for women than for men (*Hypothesis 2a*). We also considered an alternative hypothesis. Perhaps miscarriage is primarily an indication of broader fertility concerns (i.e., a sign that maintaining future pregnancies will be a challenge) rather than an experience with a specific detrimental effect on the well-being of its sufferers. Therefore, we also tested whether gender moderates the association between other fertility concerns (e.g., medical conditions, family history) and experiences of anxiety, rumination, and positive and negative emotions (*Alternative Hypothesis 2a*).

We further hypothesized that the effects of miscarriage on emotion word use would be moderated by participants' gender, such that miscarriage would be more strongly associated with use of negative emotion words among women (*Hypothesis 2b*). Support for this hypothesis would bolster the notion that conceiving after a miscarriage is truly a more distressing experience for women than men, rather than just a reflection of women reporting more distress than men (e.g., Nolen-Hoeksema 2001).

We tested our hypotheses regarding the moderating role of gender in a multiple regression framework, including Gender, Miscarriage, and the Gender X Miscarriage interaction term as predictors. In addition, to examine the competing hypothesis that the relationship between miscarriage and adjustment is simply due to longer time to conception (which has been linked to uncertainty; Sweeny et al. 2015), we include months to conception as a covariate in our analyses.

## Method

### Participants

Participants ( $N=429$ , see Table 1 for sample characteristics) were recruited from Amazon's Mechanical Turk (mTurk)

service and paid \$2 to complete a short survey about their experiences trying to conceive a child (Sweeny et al. 2015). The study was advertised to participants with the title "Parents' Experiences While Planning Pregnancy" and the following description: "You will complete a survey about planning the pregnancy that led to the birth of your youngest child, which includes questions about your personality and your experience during the time when you or your partner was trying to become pregnant." Recruitment was restricted to U.S. participants. Internet samples offer a number of advantages, such as increased demographic diversity (Gosling et al. 2004), and recent evidence supports the reliability of data collected from mTurk samples (Buhrmester et al. 2011).

## Measures

### Anxiety

Participants rated their anxiety on 10 statements (adapted from Sweeny and Andrews 2014; i.e., "During the time when I was trying to get pregnant, I felt: worried, anxious, calm, nervous, relaxed, distressed, at ease, scared"; "I felt anxious every time I thought about our efforts to get pregnant"; "I was worried about whether I would become pregnant") on a scale ranging from 1 (*not at all*) to 5 (*extremely*). Scores were calculated by averaging responses to the ten statements (Cronbach's  $\alpha=.92$ ).

### Rumination

Participants completed six items assessing the degree to which they ruminated about their efforts to get pregnant (adapted from the Rumination about an Interpersonal Offense Scale; Wade et al. 2008). Participants rated their agreement with these statements (i.e., "I couldn't stop thinking about wanting to get pregnant"; "Pregnancy was never far from my mind"; "Thoughts about difficulties trying to get pregnant have limited my enjoyment of life"; "I had a hard time getting thoughts of pregnancy out of my head"; "I tried to figure out the reasons why I wasn't pregnant yet"; "I found myself replaying the events over and over in my mind") on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*), and responses were then averaged to create an overall score for rumination (Cronbach's  $\alpha=.86$ ).

### Positive and Negative Emotions

Participants rated their experience of 13 positive emotions (i.e., inspired, excited, determined, relieved, happy, grateful, proud, strong, enthusiastic, interested, alert, active, attentive) and 15 negative emotions (i.e., upset, afraid, ashamed, afraid, disappointed, regretful, depressed, discouraged, angry, irritable, distressed, guilty, hostile, scared, nervous, jittery; adapted

**Table 1** Demographic characteristics of full sample

	Females (n=248)	Males (n=154)	Gender difference?
Mean age (SD)	30.24 (5.48)	32.27 (6.69)	$t(400)=3.32, p=.001$
Race/ethnicity			$\chi^2(6, N=403)=8.97, p=.18$
White/Caucasian	178 (67.7 %)	116 (71.2 %)	
Black/African-American	29 (11 %)	13 (8 %)	
Hispanic/Latino(a)	12 (.8 %)	6 (3.7 %)	
Asian	8 (3 %)	13 (8 %)	
American Indian/Alaska Native	2 (.8 %)	1 (.6 %)	
Other/Multiple	17 (6.5 %)	6 (3.7 %)	
Education			$\chi^2(4, N=403)=5.87, p=.21$
Did not complete high school	3 (1.1 %)	1 (.6 %)	
Completed high school only	93 (35.4 %)	48 (29.5 %)	
Completed college	119 (45.2 %)	72 (44.2 %)	
Graduate education	33 (12.5 %)	34 (20.9 %)	
Annual household income			$\chi^2(7, N=402)=11.01, p=.14$
Less than \$15,000	21 (8.5 %)	4 (2.6 %)	
\$15,000–\$50,000	90 (34.3 %)	60 (36.8 %)	
\$50,000–\$100,000	108 (41.1 %)	64 (39.3 %)	
Over \$100,000	28 (10.6 %)	27 (16.6 %)	
Relationship status			$\chi^2(4, N=403)=3.53, p=.47$
Married	180 (72.6 %)	118 (76.1 %)	
Cohabiting	28 (10.6 %)	15 (9.2 %)	
Dating	32 (12.2 %)	20 (12.3 %)	
Single	5 (1.9 %)	0 (0 %)	
Divorced	3 (1.1 %)	2 (1.2 %)	
Relationship type			$\chi^2(1, N=424)=.29, p=.59$
Same-sex relationship	5 (1.9 %)	2 (1.2 %)	
Opposite-sex relationship	256 (97.3 %)	161 (98.8 %)	
Mean number of children (SD)	1.49 (.78)	1.35 (.68)	$t(399)=1.83, p=.07$

from similar items on the PANAS-X; Watson and Clark 1994) about their efforts to conceive on a scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). Positive and negative emotion scores were calculated by averaging the responses to each respective set of items (Cronbach's  $\alpha=.91$  for positive emotions, .94 for negative emotions).

#### Miscarriages

Participants indicated the number of miscarriages they or their partner had prior to the target pregnancy, which was then coded as zero ( $n=318$ ) versus at least one ( $n=84$ ). For some analyses, miscarriage was coded as zero ( $n=318$ ), one ( $n=56$ ), or more than one ( $n=22$ ).

#### Other Fertility Concerns

Participants indicated their personal and family histories of fertility problems, and any medical conditions they or their partner had that could influence fertility. We coded each

fertility concern (1=present, 0=absent) and summed the four risk factors for a possible range of zero to four risk factors. To account for significant skew in this variable, we conducted a  $\log^{10}$  transformation on this variable prior to conducting any further analyses.

#### Open-Ended Responses About Efforts to Conceive

Finally, participants were asked to “expand on anything that influenced [their] experience.” Responses were cleaned for spelling errors and then processed using the English version of LIWC, an extensively validated text analysis software program that counts words and classifies them into psychological and linguistic categories (Linguistic Inquiry and Word Count; Pennebaker et al. 2007). LIWC has been translated into several languages and has revealed links between word use and important psychological constructs across hundreds of studies (Tausczik and Pennebaker 2010).

The word use variables of interest were derived from the standard, well-validated LIWC2007 dictionaries (Pennebaker

et al. 2007). Each dictionary within LIWC consists of a list of words that represent a linguistic category. For example, the anxiety dictionary includes words like afraid, anxious, anxiety, dread, fear, fears, nervous, and so forth (91 words in total in that dictionary). When LIWC analyzes a piece of text, the software looks for those words (and the words in each of the dictionaries) and outputs the percentage of words that fall into that category relative to the total words in the piece of text. For example, if a participant used two anxiety words, and he wrote a total of 50 words, then the output from LIWC's analysis would indicate that 4 % of his response consisted of anxiety words. These percentages can then be used in further analyses (e.g., correlations with self-report variables, *t*-tests comparing word use between people with different characteristics) to reveal the psychological significance of word use within various linguistic categories when reflecting on one's experience trying to conceive.

Although LIWC2007 includes 65 dictionaries, we focused on four dictionaries of relevance to our hypotheses: positive emotion words (e.g., happy, calm, excited, thankful;  $M=3.03\%$ ,  $SD=2.31$ ), negative emotion words (e.g., sad, uptight, humiliated, fear;  $M=2.17\%$ ,  $SD=1.92$ ), anxiety words (a subset of the negative emotion words; e.g., worried, anxious, frantic, reluctant;  $M=1.25\%$ ,  $SD=1.42$ ), and sadness words (also a subset of the negative emotion words; e.g., grief, sad, loss, cry;  $M=0.28\%$ ,  $SD=0.64$ ). Overall, 5.31 % of words used in the open-ended responses were emotion words.

Because we did not require participants to write a certain amount regarding their experience trying to conceive, many responses were too brief to be meaningfully analyzed with LIWC. LIWC indicates word use as a percentage of the total words in a piece of text, and thus including very brief passages can provide misleading results. For example, a single negative emotion word in a piece of text that includes only 10 total words would count as 10 % in any analyses examining use of negative emotion words, thus significantly overweighting that passage in terms of negative emotionality. To avoid this problem, we opted for a minimum word count of 45 words, which caps the possible weight of any given word at approximately 2 %. Two responses were excluded due to irrelevant content (i.e., giving the researchers feedback on the questionnaires), which left 94 responses for analysis in LIWC (36 males, 58 females;  $M=76.99$  words,  $SD=41.11$ ).

Participants excluded from LIWC analyses did not differ in age, gender, number of children, number of miscarriages, rumination, anxiety, or positive and negative emotions from those who were included,  $t_s < 1.71$ ,  $p_s > .09$ ,  $\chi^2 < .01$ ,  $p > .90$ . However, the ethnic composition of those included in LIWC analyses varied slightly from the full sample,  $\chi^2(6)=14.13$ ,  $p=.03$ . Participants included in LIWC analyses were primarily White (74.5 %), followed by multiple or other (10.6 %), African American (8.5 %), Latino (a) (5.3 %), and Hawaiian/Pacific Islander (1.1 %). In neither the full sample,  $t(425)=$

0.31,  $p=.76$ , nor the subsample analyzed by LIWC,  $t(92)=0.93$ ,  $p=.36$ , did women and men differ in their total word use. See Table 2 for demographic characteristics of the subsample included in LIWC analyses by gender.

## Results

### Preliminary Analyses

Prior to testing our hypotheses, we compared whether men and women in our sample differed on any study outcome in two MANOVAs. The first MANOVA revealed significant differences between men and women in self-reported outcomes,  $F(4, 401)=3.625$ ,  $p=.006$ . Further analyses revealed that women reported greater rumination than men,  $F(1, 404)=9.91$ ,  $p=.002$ , but men and women did not differ on any other outcome. Our second MANOVA, which compared our LIWC subsample of men and women on all study outcomes, was not significant,  $F(8, 85)=1.75$ ,  $p=.10$ . See Table 3 for means and standard deviations by gender for all outcomes, and Table 4 for correlations among all study measures by gender (correlations for the full sample reported in Sweeny et al. 2015).

### Question 1: Associations Between Miscarriage and Recalled Uncertainty

#### *Psychological Adjustment*

To test *Hypothesis 1*, we examined the association between the experience of miscarriage and recollections of individuals' emotional experiences during efforts to conceive a child. Preliminary analyses revealed that individuals who had experienced miscarriage prior to their effort to conceive their youngest child reported that they spent more months trying to conceive than those who had not experienced miscarriage. Individuals who had experienced miscarriage reported that their time to conception was approximately 2 months longer ( $M=7.29$  months,  $SD=8.32$ ) than those who had not experienced miscarriage ( $M=5.14$  months,  $SD=6.51$ ),  $t(400)=2.52$ ,  $p=.01$ ,  $r_{es}=.13$ . Accordingly, in subsequent analyses, we tested the association between miscarriage and psychological adjustment using multiple regressions controlling for months to conception (no evidence of multicollinearity,  $VIF=1.02$ ). We would also note that the association between miscarriage and other risk factors (as one variable) and psychological adjustment are also reported in Sweeny et al. (2015); however, for those analyses, miscarriage is combined with other risk factors and is not the focus of the paper.

Experiencing a miscarriage was associated with relatively greater recollections of negative emotions,  $\beta=.13$ ,  $t(401)=2.58$ ,  $p=.01$ , anxiety,  $\beta=.13$ ,  $t(401)=2.56$ ,  $p=.01$ , and rumination (marginally),  $\beta=.09$ ,  $t(401)=1.85$ ,  $p=.07$ , but not

**Table 2** Demographic characteristics for subsample used in LIWC analyses

	Females ( <i>n</i> =58)	Males ( <i>n</i> =36)	Gender difference?
Mean age ( <i>SD</i> )	31.36 (4.40)	32.39 (6.54)	$t(92)=-.91, p=.37$
Race/ethnicity			$\chi^2(4, N=94)=1.67, p=.80$
White/Caucasian	44 (75.9 %)	26 (72.2 %)	
Black/African-American	5 (8.6 %)	3 (8.3 %)	
Hispanic/Latino(a)	2 (3.4 %)	2 (8.3 %)	
Asian	0 (0 %)	0 (0 %)	
American Indian/Alaska Native	0 (0 %)	0 (0 %)	
Other/Multiple	7 (12 %)	4 (11.1 %)	
Education			
Did not complete high school	1 (1.7 %)	0 (0 %)	$\chi^2(3, N=94)=1.53, p=.67$
Completed high school only	17 (29.3 %)	11 (30.6 %)	
Completed college	30 (51.7 %)	16 (44.4 %)	
Graduate education	10 (17.2 %)	9 (25 %)	
Annual household income			$\chi^2(3, N=94)=2.10, p=.55$
Less than \$15,000	2 (3.5 %)	1 (2.8 %)	
\$15,000–\$50,000	29 (50.9 %)	14 (38.9 %)	
\$50,000–\$100,000	17 (29.8 %)	16 (44.4 %)	
Over \$100,000	9 (15.8 %)	5 (13.9 %)	
Relationship status			$\chi^2(4, N=94)=4.11, p=.39$
Married	51 (87.9 %)	28 (77.8 %)	
Cohabiting	5 (8.6 %)	5 (13.9 %)	
Dating	1 (1.7 %)	2 (5.6 %)	
Single	1 (1.7 %)	0 (0 %)	
Divorced	0 (0 %)	1 (2.8 %)	
Relationship type			$\chi^2(1, N=94)=.03, p=.86$
Same-sex relationship	2 (3.4 %)	1 (2.8 %)	
Opposite-sex relationship	56 (96.6 %)	35 (97.2 %)	
Mean number of children ( <i>SD</i> )	1.74 (.95)	1.25 (.60)	$t(92)=2.78, p=.007$

positive emotions,  $\beta=-.02, t(401)=-.35, p=.72$ . Moreover, people who experienced more than one miscarriage reported

**Table 3** Descriptive statistics for all outcomes for men and women

	Women	Men
Rumination	2.96 <sub>a</sub> (.99)	2.65 <sub>b</sub> (.90)
Anxiety	2.65 (.95)	2.48 (.81)
Positive emotions	3.49 (.78)	3.41 (.85)
Negative emotions	1.64 (.68)	1.64 (.78)
Positive emotion words	2.91 % (2.29)	3.21 % (2.37)
Negative emotion words	2.46 % (1.83)	1.72 % (1.99)
Anxiety words	1.50 % (1.46)	.86 % (1.26)
Sadness words	.35 % (.72)	.17 % (.48)

Subscripts represent statistically significant differences. Rumination, anxiety, positive emotions, and negative emotions were rated on a scale ranging from 1 to 5. Word use variables are presented as percentage of words used in each category relative to the total number of words written per participant

greater anxiety,  $\beta=.52, t(401)=2.32, p=.02$ , and negative emotions,  $\beta=.52, t(401)=2.96, p=.003$ , than those who only had one miscarriage. No significant differences in rumination or positive emotions were observed between those who had multiple miscarriages versus only one miscarriage. The direction and significance of the associations between miscarriage and emotions remains identical when time to conception is excluded from the analysis and when other risk factors are included as covariates.

*Word Use*

To test *Hypothesis 1b*, we analyzed the association between miscarriage and the use of emotion words in open-ended reflections. Controlling for months to conception, miscarriage (versus no miscarriage) was associated with more use of negative emotion words,  $\beta=.29, t(93)=2.81, p=.006$ , anxiety words,  $\beta=.25, t(93)=2.46, p=.02$ , and sadness words,  $\beta=.32, t(93)=3.19, p=.002$ . The experience of miscarriage

**Table 4** Bivariate correlations among all study measures by gender

	1	2	3	4	5	6	7	8	9	10
1. Anxiety	–	.60**	–.13	.65**	–.29 <sup>+</sup>	.48**	–.02	.19	.25**	–.09
2. Rumination	.66**	–	.10	.40**	–.23	.24	–.14	.14	.23**	–.10
3. Positive emotions	–.06	.11 <sup>+</sup>	–	–.06	.14	–.07	–.28	–.15	.03	.10
4. Negative emotions	.73**	.55**	–.15*	–	–.26	.48**	–.08	.22	.34**	–.02
5. Positive emotion words	–.14	.03	.14	–.14	–	–.23	.04	–.21	–.40*	–.13
6. Negative emotion words	.07	.06	–.17	.20	–.09	–	.45**	.74**	.22	.27
7. Sadness words	.09	.15	–.03	.10	–.07	.45**	–	.10	–.01	–.08
8. Anxiety words	.08	.06	–.20	.12	–.01	.79**	.14	–	.12	.33*
9. Fertility concerns	.27**	.27**	–.02	.32**	.02	.07	.03	.03	–	.15
10. Miscarriage	.24**	.18**	–.13*	.25**	.07	.30*	.47**	.23 <sup>+</sup>	.29**	–

Correlations for men are presented above the diagonal, and correlations for women are presented below the diagonal

+ $p < .10$ , \* $p < .05$ , \*\* $p < .01$ . Miscarriage (1=at least one miscarriage, 0=no miscarriage)

was unrelated to the use of positive emotion words,  $\beta = .02$ ,  $t(93) = .20$ ,  $p = .84$ . Relative to experiencing only one miscarriage, experiencing multiple miscarriages was not associated with any word use category,  $|\beta| < .18$ ,  $ps > .11$ .

## Question 2: The Moderating Role of Gender

Next, to test *Hypotheses 2a* and *2b*, we examined whether gender moderated the association between miscarriage and recollections of emotional experiences, as well as emotion word use, in a multiple regression framework in which gender, miscarriage, and their product term were each entered as independent predictors of outcome variables (Hayes 2013). In addition, months to conception was included as a covariate in all moderation analyses.

### Psychological Adjustment

Consistent with *Hypothesis 2a*, gender moderated the association between previous miscarriage and all recalled emotional experiences (see Table 5). Analyses of simple slopes revealed that previous miscarriage was associated with recollections of anxiety,  $b = .47$ ,  $t(395) = 3.63$ ,  $p = .0003$ , rumination,  $b = .38$ ,  $t(395) = 2.72$ ,  $p = .007$ , negative emotions,  $b = .35$ ,  $t(395) = 3.33$ ,  $p = .0009$ , and positive emotions (marginally),  $b = -.20$ ,  $t(395) = -1.68$ ,  $p = .09$ , among women, but not among men,  $|\beta| < .31$ ,  $ps > .10$  (see Fig. 1). By contrast, men whose partners suffered multiple miscarriages recalled greater negative emotions relative to those who experienced only one miscarriage,  $b = 1.15$ ,  $t(395) = 3.92$ ,  $p = .0001$ . Gender did not moderate the association between multiple miscarriages and any other indicators of psychological adjustment,  $|\beta| < .61$ ,  $ps > .12$ . Thus it appears that experiencing one miscarriage is associated with poorer psychological adjustment among women, whereas men only report greater negative emotions after experiencing multiple miscarriages.

To examine the alternative hypothesis that miscarriage is merely an indicator of greater risk factors for fertility concerns (*Alternative Hypothesis 2a*), we also examined whether gender moderates the association between other risk factors and emotional outcomes. Gender did not moderate the association between other risk factors and anxiety, rumination, negative emotions, or positive emotions,  $|\beta| < 0.44$ ,  $ps > .27$ .

### Word Use

Consistent with *Hypothesis 2b*, gender moderated the association between miscarriage and the use of sadness words,  $b = .93$ ,  $t(89) = 2.97$ ,  $p = .004$ , controlling for months to conception (see Table 6). Analyses of the simple slopes revealed that previous miscarriage was associated with the use of more sadness words among women,  $b = .87$ ,  $t(89) = 4.46$ ,  $p < .001$ , but not among men,  $b = -.06$ ,  $t(89) = -.24$ ,  $p = .81$  (see Fig. 2). Gender did not moderate the association between miscarriage and the use of positive emotion words, negative emotion words, or anxiety words,  $|\beta| < 1.13$ ,  $ps > .35$ . In addition, gender did not moderate the association between multiple miscarriages (versus one miscarriage) and any emotion words,  $|\beta| < 4.17$ ,  $ps > .14$ .

Next, we tested whether gender moderated the association between the experience of other risk factors and word use (*Alternative Hypothesis 2b*). Gender moderated the association between other risk factors and the use of positive emotion words,  $b = -1.58$ ,  $t(89) = 2.96$ ,  $p = .004$ , such that the presence of other risk factors was associated with the use of fewer positive emotion words among men,  $b = -1.05$ ,  $t(89) = 2.62$ ,  $p = .01$ , but not among women,  $b = .52$ ,  $t(89) = 1.51$ ,  $p = .14$ . Gender did not moderate the association between other risk factors and the use of negative emotion words, anxiety words, or sadness words,  $|\beta| < .17$ ,  $ps > .42$ .

**Table 5** Gender moderates the association between miscarriage and psychological adjustment

	Anxiety		Rumination		Positive emotions		Negative emotions		Collinearity diagnostic VIF
	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	
Constant	2.39**	[2.25, 2.53]	2.73**	[2.57, 2.88]	3.63**	[3.50, 3.76]	1.41**	[1.30, 1.53]	
Gender	-.001	[-.20, .19]	-.14	[-.34, .07]	-.17 <sup>+</sup>	[-.34, .01]	.13	[-.03, .28]	1.24
Months to conceive	.02**	[.01, .04]	.02**	[.01, .04]	-.02**	[-.03, -.01]	.02**	[.01, .03]	1.02
Miscarriage	.47**	[.22, .73]	.38**	[.11, .65]	-.20 <sup>+</sup>	[-.44, .03]	.35**	[.14, .55]	1.48
Gender X miscarriage	-.75**	[-1.21, -.29]	-.69**	[-1.18, -.20]	.49*	[.07, .91]	-.45*	[-.82, -.09]	1.62

<sup>+</sup>  $p < .10$ , \* $p < .05$ , \*\* $p < .01$ . The effects of gender (dummy-coded, male=1), miscarriage (dummy-coded, at least one miscarriage=1), and their interaction on anxiety, rumination, positive emotions, and negative emotions were tested in four independent models

**Discussion**

In the current study, we found that miscarriage was associated with recalled anxiety, rumination, and negative emotions surrounding efforts to conceive a child, as well as the use of more negative emotion, sadness, and anxiety words when describing efforts to conceive. As anticipated, miscarriage seemed to taint the emotional experience of trying to conceive again, and this consequence seemed particularly poignant for women.

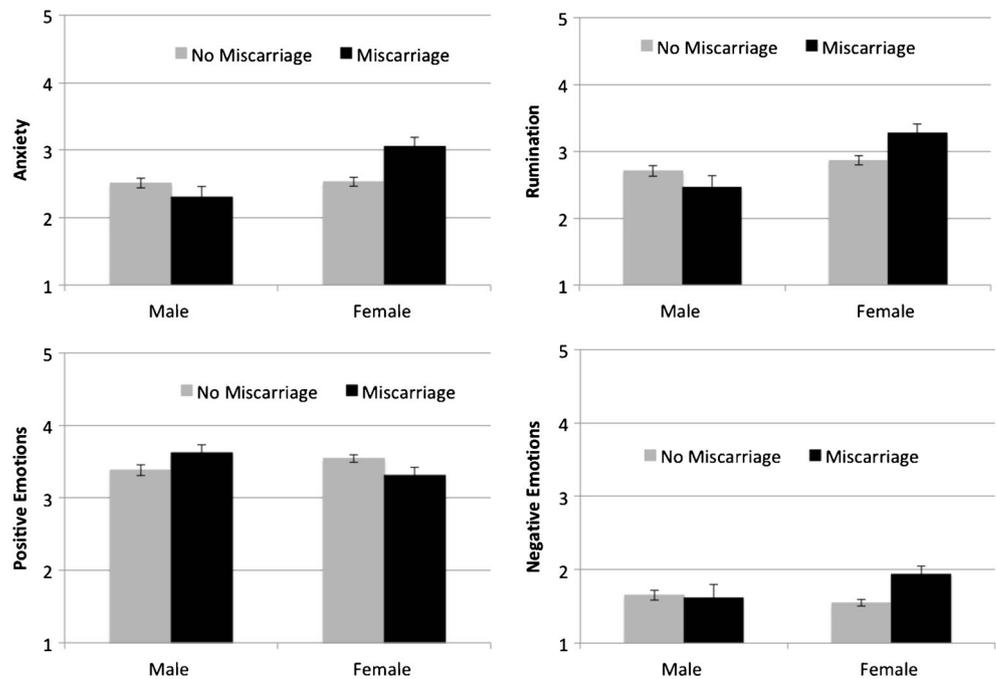
**Miscarriage**

Our findings regarding the association between past miscarriage and psychological adjustment contribute to a growing body of work investigating reactions to miscarriage (Adolfsson 2011; Chojenta et al. 2014 [Australia]; Lok et al. 2010 [Hong Kong]). Whereas past research has focused

primarily on reactions to miscarriage in general, the study presented here examines the association between miscarriage and psychological distress within a specific context—attempting to conceive again. Although trying to conceive a child may be marked by uncertainty for most people (Sweeny et al. 2015), the findings of the current study suggest that those feelings of uncertainty may be particularly elevated among people who have experienced a past miscarriage.

Miscarriage was associated not only with self-reported psychological adjustment, but with indicators of adjustment in participants’ language use as well. Providing further support for our hypothesis, participants who experienced a miscarriage (or a partner’s miscarriage) used more negative emotion, anxiety, and sadness words in their written narratives regarding their efforts to conceive. This pattern of word use bolsters our self-report findings with a more directly observational perspective on the negative emotional effects of miscarriage.

**Fig. 1** Mean self-reported psychological adjustment by gender and experience of miscarriage. Error bars represent standard errors



**Table 6** Gender moderates the association between miscarriage and word use

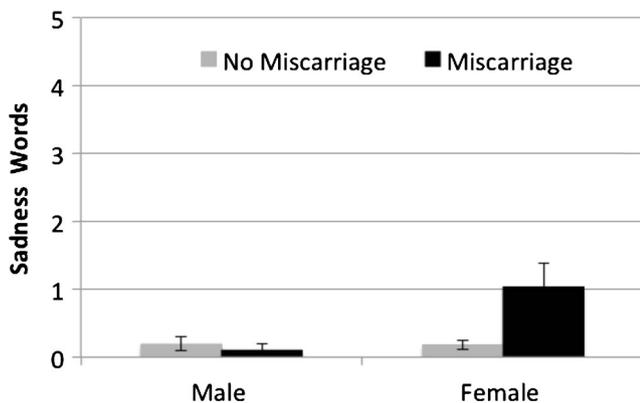
	Sadness Words		Anxiety words		Positive emotion words		Negative emotion words		Collinearity diagnostic VIF
	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	
Constant	.24*	[.05, .43]	1.32**	[.89, 1.76]	3.24**	[2.51, 3.97]	2.19**	[1.59, 2.78]	
Gender	.01	[-.27, .28]	-.69*	[-1.33, -.5]	.55	[-.51, 1.61]	-.74 <sup>+</sup>	[-1.60, .12]	1.24
Months to conceive	-.01	[-.02, .003]	.003	[-.03, .04]	-.07*	[-.12, -.01]	.0009	[-.04, .05]	1.02
Miscarriage	.87**	[.48, 1.26]	.82 <sup>+</sup>	[-.08, 1.73]	.56	[-.96, 2.07]	1.40*	[.17, 2.63]	1.64
Gender X miscarriage	-.93**	[-1.55, -.31]	.20	[-.03, .04]	-1.13	[-3.55, 1.29]	-.04	[-2.01, 1.92]	1.88

<sup>+</sup>  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ . The effects of gender (dummy-coded, male=1), miscarriage (dummy-coded, at least one miscarriage=1), and their interaction on sadness, anxiety, and positive and negative emotion words were tested in four independent models

## Gender Differences

Although miscarriage was associated with poorer psychological adjustment in general, these effects appear to be driven primarily by women in our sample. Specifically, we found that miscarriage was associated with elevated negative emotions, anxiety, and rumination, as well as fewer positive emotions, only among women. By contrast, men only reported greater recalled negative emotions when their partners suffered multiple miscarriages. Whereas past work has examined the association between miscarriage and psychological distress primarily among women, ours is one of the first studies not only to compare the experiences of men and women to each other, but also to a comparison group of men and women who did not experience a miscarriage (or a partner's miscarriage). Mirroring the findings for self-reported emotions, gender also moderated the association between miscarriage and the use of sadness words, such that experiencing a miscarriage was associated with the use of relatively more sadness words among women, but not among men.

Although many doctors recommend conceiving again following a miscarriage, our findings suggest they should



**Fig. 2** Average sadness word use by gender and experience of miscarriage. Error bars represent standard errors

be aware that those efforts may be wrought with negative emotions, anxiety, and rumination, as well as fewer positive emotions, for many women. Perhaps attempting to conceive again refreshes the grief experienced over the loss of a child. In their efforts to conceive again, these women may find themselves unable to stop thinking about becoming pregnant (i.e., ruminating) and feeling anxious that perhaps they will experience another miscarriage. In addition, women who suffered a previous miscarriage reported fewer positive emotions about their efforts to become pregnant than women who did not experience a previous miscarriage. Becoming pregnant again following a miscarriage may be less exciting and enjoyable, as women may fear another miscarriage and brace themselves for a bad outcome (e.g., Sweeny et al. 2015). Finally, because social norms dictate that motherhood is a desirable social role, women may have experienced poorer psychological adjustment as they faced their failure to adhere to this societal norm.

By contrast, men in our study only recalled heightened negative emotions during their efforts to conceive following multiple miscarriages. These findings are consistent with past evidence that women experience greater feelings of anxiety and depression following a miscarriage than men (Cumming et al. 2007 [U.K.]; McGreal et al. 1997 [Australia]) and that, emotionally, men recover more quickly from miscarriage than women (Kong et al. 2010 [Hong Kong]). One possibility may be that men interpret multiple miscarriages as a possible indicator of an underlying fertility problem, thus heightening their negative emotional response. By contrast, women may suffer greater psychological distress following a single miscarriage because the physical experience of pregnancy may lead them to feel relatively greater attachment to their child, and miscarriage may involve not only the noticeable loss of these sensations but physical discomfort as well (e.g., cramping, bleeding; Engelhard 2004). Indeed, one study found that women reported greater prenatal attachment than men (Armstrong 2002), whereas men react relatively more severely to the death of a child post-birth (Pudrovskaya 2009).

## Alternative Hypotheses

We examined several alternative hypotheses to better understand the findings of the current study. First, to consider the possibility that miscarriage is simply an indicator of broader fertility concerns (e.g., other medical issues), which may have implications for uncertainty about conception (Sweeny et al. 2015), we examined whether gender moderated the association between other fertility concerns and psychological adjustment. In this study, gender did not moderate the association between other fertility concerns (i.e., family or personal history of infertility, personal or partner's medical issues) and anxiety, rumination, or positive and negative emotions. In addition, the pattern of results reported here remained consistent controlling for the effects of other fertility concerns. Thus, it appears that experiencing a miscarriage is uniquely associated with poorer psychological adjustment among women, over and above the effects of other fertility concerns.

Second, we considered the possibility that perhaps individuals who experienced a prior miscarriage experienced greater anxiety simply because they had a more difficult time becoming pregnant. Although miscarriage was associated with a relatively longer time to conception, the findings presented here remained consistent after controlling for months to conception.

## Limitations and Future Directions

The results of this study should be considered in light of several limitations. First, participants may have been biased in their recollections of their experiences when trying to conceive their youngest child. However, by implementing a retrospective design in which all participants (or their partners) carried their pregnancies to a live birth, we were able to control for the effects of new parenthood in the current study. Furthermore, memories of conception experiences, however biased, are likely to influence later family planning decisions. For example, if women recall their successful pregnancy as stressful and joyless when it occurred in the aftermath of a miscarriage, regardless of whether their memories are accurate, they may be reluctant to undergo that experience again (cf. Margolis and Myrskylä 2015 [Germany]). Nonetheless, future studies can implement prospective designs to capture the emotional landscape of miscarriage and subsequent conception in real time. With such a design, researchers may be able to precisely capture a wider variety of experiences following a miscarriage.

Second, biological changes that occur during a miscarriage and recovery (e.g., hormonal responses) may explain why women experienced greater uncertainty in conceiving again following a miscarriage. We were unable to test this biological explanation in the current study; however, because we used a retrospective design in which all participants (or their partners) successfully conceived and gave birth to a child

following miscarriage, any biological differences would likely have dissipated by the time participants completed our survey.

Third, the findings presented here primarily represent how people in heterosexual relationships respond to a miscarriage. Although we did not exclude participants on the basis of sexual orientation, 98 % of our participants reported that they were in (or had most recently been in) an opposite-sex relationship at the time of their participation. This percentage is comparable to the composition of lesbian, gay, and bisexual individuals in the United States (Gates 2011); however, people in same-sex relationships may have a different emotional response to attempting to conceive again following a miscarriage, as those pregnancies likely involve either a sperm donor or gestational surrogate. Future research could oversample homosexual participants to examine whether sexual orientation moderates emotional reactions to miscarriage.

Fourth, the sample of participants who were included in our qualitative analyses was notably smaller than the sample used in analyses of psychological adjustment. Although those included in qualitative analyses did not differ in age, gender, number of children, number of miscarriages, or any of our indicators of psychological adjustment, the reduced sample did consist of slightly more White participants and fewer American Indian/Alaskan Natives and Asians. Moreover, the smaller sample may also have limited our ability to detect important relationships between gender, miscarriage, and word use.

Finally, due to the correlational nature of our study, we cannot draw firm causal conclusions regarding gender differences in the influence of miscarriage. Although we tried to rule out competing hypotheses that may explain the pattern of findings presented here, we cannot completely eliminate the possibility of third variable explanations. For example, although we asked participants specifically about the time when they were trying to conceive their youngest child, their elevated negative emotions, anxiety, and rumination may have preceded their miscarriage.

## Concluding Remarks

The findings presented here may be useful to couples who are attempting to conceive a child following a miscarriage. Our findings suggest that experiencing a past miscarriage is associated with elevated feelings of uncertainty—marked by increased anxiety and rumination, as well as greater negative emotions and fewer positive emotions—when reflecting on subsequent attempts to conceive. Moreover, couples informed with the knowledge that men and women react differently to miscarriage may be better equipped to support their partners as they attempt to conceive again. Taken together, our findings reveal the devastation wrought by miscarriage, which tarnishes the celebration that should accompany a later successful pregnancy.

## Compliance with Ethical Standards

**Conflicts of Interest** We have no potential conflicts of interest

**Informed Consent** All participants provided informed consent prior to answering any questions. As part of the informed consent procedure, participants were informed that they would be answering questions about their experiences and emotions during their most recent pregnancy and that they had the option to discontinue their participation at any time.

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