

Examining Misperceptions about Miscarriage in U.S. Adults

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Abstract: Adults in the U.S., from a university or Amazon Mechanical Turk (MTurk), read a vignette about a woman experiencing a miscarriage and answered questions about reactions to the vignette, predictions about the subject's future, demographics, knowledge of miscarriage, belief in a just world, locus of control, and liking of children. Participants anticipated the woman's experience and future differently depending on their gender, her stated age, and whether she was trying to become pregnant. More correct knowledge regarding miscarriage also was predicted by female gender, less belief in a just world, more internal locus of control, and greater liking of children.

Keywords: miscarriage, research and theories, pregnancy

Miscarriage, or spontaneous pregnancy loss before 28 weeks of gestation (Armstrong, Hutti, & Myers, 2009; Geller, Kerns, & Klier, 2004), is a highly common but widely misunderstood pregnancy outcome (Nikčević & Nicolaidis, 2014). Widespread misunderstanding or ignorance of pregnancy loss is concerning because women and those in their support system may be unprepared for miscarriage when it occurs (Geller et al., 2004). Evidence suggests even medical professionals harbor common myths regarding the experience of miscarriage (Reed, 1992).

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Misperceptions and potentially harmful myths, summarized below, involve the frequency, causes of, and potential for grief or trauma stemming from miscarriage.

The Frequency of Miscarriage

Studies indicate about 20% of verified pregnancies end in miscarriage (Garcia-Enguidanos, Calle, Valero, Luna, & Dominguez-Rojas, 2002; Maconochie, Doyle, & Prior, 2004; Savitz, Hertz-Picciotto, Poole, & Olshan, 2002) and miscarriage is the most likely adverse outcome of pregnancy (Meaney, 2016). However, one national survey revealed the majority of American respondents believed less than 5% of pregnancies end in miscarriage (Bardos, Hercz, Friedenthal, Missmer, & Williams, 2015). The widespread underestimation of the likelihood of miscarriage may partially stem from the fact that most miscarriages occur before 12 weeks of gestation (Regan & Rai, 2000), which is before most women are visibly pregnant and before many women have publicly announced their pregnancy. In fact, many women do not become aware of the prevalence of miscarriage in their own family and circle of friends until they themselves experience a miscarriage (Meaney, Corcoran, Spillane, & O'Donoghue, 2017).

The Causes of Miscarriage

There also is much ignorance regarding the typical cause(s) of pregnancy loss, possibly because at least half of women experiencing miscarriage never learn of a specific reason for their loss (Regan & Rai, 2000). Even with recurrent pregnancy loss (typically diagnosed once at least two - three miscarriages occur), most cases lack a specific medical diagnosis or explanation (Li, Makris, Tomsu, Tuckerman, & Laird, 2002; Saravelos & Li, 2012). While miscarriages may result from uterine structural abnormalities, genital infections, endocrine or immune system imbalances, and substance use (Andersson, Nilsson, & Adolfsson, 2012), more than half of miscarriages are due to chromosomal abnormalities resulting from errors in cell division (Andersson, Nilsson, & Adolfsson, 2012; Gueneri et al., 1987). As such, most miscarriages result largely from factors that are out of the expectant mother's direct control and not indicative of past or future reproductive success. Large numbers of American adults, while acknowledging that such chromosomal factors could contribute to miscarriage, also attribute miscarriage to more controllable lifestyle factors like stress, lifting heavy objects, previous sexually transmitted infections, past contraception usage, and getting into an argument (Bardos et al., 2015). In one Swedish sample, women

experiencing miscarriage tended to assign blame to their own stress, anxiety, smoking, eating, or physical activity when a medical professional could not provide a specific reason for their loss (Adolfsson, Larsson, Wijma, & Berterö, 2004).

The Experience of Miscarriage

There is also seemingly widespread misunderstanding or ignorance of how women and their partners experience miscarriage. In addition to the physical experience of bleeding, pain or cramping, and possible surgical intervention (Friedman, 1989), many if not most women also have an emotional reaction to miscarriage. Women exhibit a diverse range of emotional reactions, grief, depressive and anxious symptoms, and trauma that may persist for days to years following pregnancy loss (Geller, Kerns, & Klier, 2004; Klier, Geller, & Ritsher, 2002). Common (88% of women in one sample) immediate emotional reactions include sadness, crying, and a desire for isolation (Madden, 1994). At a four-week follow-up, 48% of women in another sample could be classified as depressed (Friedman, 1989). Potential grief or bereavement following miscarriage may be difficult to anticipate or empathize with because the loss is typically sudden and with a lack of a visible human being or shared memories to mourn (Armstrong, Hutti, & Myers, 2009). As such, contemporary American culture lacks a social script for responding to or even conceptualizing pregnancy loss (Reiheld, 2015) which may contribute to avoidance of discussing or seeking education on typical emotional reactions to miscarriage.

Further ignorance or misunderstanding of the miscarriage experience may involve the individual or couple's anticipation of future pregnancy. Although friends and family may brush aside negative emotional reactions to pregnancy loss with assurances that one can "always try again" (Reiheld, 2015), there is evidence that women tend to experience high levels of worry about future pregnancies months after miscarriage (Nikčević, Tunkel, Kuczmierczyk, & Nicolaidis, 1999). Post-traumatic stress symptoms, including intrusive thoughts and avoidance, also appear to persist into subsequent healthy pregnancies (Armstrong et al., 2009).

Taken together, these reviewed sources suggest widespread and potentially harmful misunderstanding of the nature of miscarriage and couples' experience of it. While more research could address the existence of the myths surrounding miscarriage, even fewer investigations have targeted the potential factors shaping or contributing to these misperceptions of pregnancy loss. The authors sought to accomplish the latter goal utilizing two research designs: using vignettes to elicit participants' appraisal of a situation involving pregnancy loss and administering a questionnaire assessing previously documented beliefs

regarding miscarriage, which are popular but erroneous. The justification for including various independent variables, predictor variables, and covariates is explained below.

Possible Influences on Misperceptions of Miscarriage

Gender

Men and women may differ in their understanding of pregnancy and pregnancy loss. Women may generally pay more attention to pregnancy-related issues since a pregnancy would typically involve their own body. In addition, women experiencing pregnancy loss may confide in other women for support, making other women more aware of the realities of miscarriage. While seldom researched, there is evidence that men are more likely to underestimate the prevalence of miscarriage (Bardos et al., 2015), and are generally less informed about pregnancy and fertility (Vassard, Lallemand, Andersen, Macklon, & Schmidt, 2016). Following this line of thinking and available findings, the researchers anticipated that men would display higher levels of misperceptions of miscarriage than would women.

Victim blaming

Victim blaming is a term used to describe holding individuals fully or partially accountable for crimes or traumatic events that they have experienced (Janoff-Bulman, Timko, & Carli, 1985). Victim blaming was included as a possible factor contributing to misperceptions of pregnancy loss because miscarriage may represent one of numerous negative life events for which victims experience unpleasant consequences not merely from the event itself, but also from a non-supportive response from others. Past research on victim blaming has supported that individuals with a stronger *belief in a just world* and/or a more internal *locus of control* are more likely to blame victims (Alexander, 1980; Furnham, 2003).

Belief in a just world (BJW), as described within the Just World Hypothesis (Lerner & Simmons, 1966), involves a worldview encompassing just and fair outcomes for all people. Unfortunate or tragic events do not occur randomly according to such a belief system. Instead, individuals become victims of misfortune because of their own actions and deserve the suffering they have personally brought upon themselves. BJW has been linked to general stigmatization, negative appraisal, or avoidance of victims of a variety of unpleasant situations, including theft, poverty, sexual assault, domestic violence, job loss, HIV/AIDS, and cancer (Hafer & Bègue, 2005). To date, no available published research has

examined BJW as a predictor of beliefs regarding miscarriage as an aversive experience or traumatic event. Many of the common myths surrounding miscarriage (summarized previously) are, however, consistent with BJW. These include the notions that pregnancy loss is rare and usually resulting from a controllable event or unhealthy lifestyle. Based on this observation, the researchers hypothesized that participants reporting higher BJW would more often exhibit misperceptions of miscarriage.

Many of the commonly misunderstood aspects of miscarriage have are related to an expectant mother's degree of control over her pregnancy outcome. Locus of control (Rotter, 1966) refers to personal beliefs about whether life events are generally due to internal (i.e., personal effort) or external (i.e., luck) factors. Believing women miscarry because of health or lifestyle factors instead of unpredictable factors at the cellular level is consistent with a more internal locus of control. So far, little to no research has explicitly addressed the relationship between locus of control and miscarriage beliefs or understanding. To date, the scant available relevant research has addressed locus of control and pregnancy behaviors and experience. In these studies, internal locus of control appears to play an adaptive role. Specifically, a more internal locus of control has been associated with pregnancy planning and folic acid and vitamin intake and a more external locus of control linked to smoking and alcohol consumption during pregnancy (Bödecs, Horváth, Szilágyi, Németh, & Sándor, 2011). Researchers also have supported an interaction between locus of control and pregnancy worries on pregnant women's mental health, with internal control appearing as a buffer against harmful effects of such worries (Puente, Morales, & Monge, 2015). Taken with older evidence that nurses with a more internal locus of control blame victims of rape more for their experience (Alexander, 1980), such studies may indicate that internal locus of control is beneficial for encouraging a healthy pregnancy but potentially harmful when a pregnancy is not viable. Based on available evidence and current understanding of victim blaming, the investigators hypothesized that adults with a more internal locus of control would harbor more misperceptions of miscarriage.

Liking of children

Another element potentially related to perceptions of miscarriage is whether a woman or those in her support network have a favorable attitude toward children. In other words, reactions to pregnancy loss may differ based on whether an individual views bringing a child into the world as a desirable outcome. As with the other proposed predictors, liking of children has not been explicitly investigated as a correlate of miscarriage knowledge. Liking of children has previously been linked to teachers' job satisfaction (Faiz, Körükçü, & Karadeniz, 2016), and teachers' attitudes

toward children's rights (Kasapoğlu & Akyol, 2012). Logically, it follows that individuals would think of miscarriage differently depending on whether they like children. Moreover, those greatly interested in or motivated to have children would seem likely to seek out or attend to information on pregnancy and potential complications. For these reasons, the authors proposed that participants higher in liking of children would exhibit a more accurate understanding of miscarriage.

Perceived readiness to parent

Finally, adults may understand or interpret a particular miscarriage experience differently depending on whether the woman is perceived as ready to become a parent. Specifically, others' interpretation of a pregnancy loss may depend on whether the expectant mother has been explicitly trying to become pregnant or is of a subjectively appropriate age or marital status for becoming a parent. In other words, individuals may underestimate the unpleasant aspects of miscarriage when happening to someone younger (18 years old in the current investigation), unmarried, or not trying to become pregnant because of stigma associated with younger motherhood (Ellis-Sloan, 2014; Whitley & Kirmayer, 2008), single motherhood (Cook & Dicken, 2014; Ellison, 2003), and unplanned pregnancies (Ellison, 2003; Smith et al., 2016).

Given the above review of past research and current reasoning, the investigators sought to detect differences in understanding of miscarriage based on participant gender, belief in a just world, locus of control, liking of children, and the age, marital status, and trying status of the expectant mother. Next, the authors describe how this was accomplished.

Method

Participants

The convenience sample included 849 adults. Participants were recruited in two ways. Some participants were drawn from university undergraduate psychology courses ($n = 642$) at a state university in the southern United States. Course sections from which participants were recruited differed in enrollment from 40 to 100 students and involved both online and traditional classes. Students earned course credit for participation, and equivalent options for course credit such as alternative studies and assignments were available to students not wishing or not eligible to participate. This investigation required that participants be 18-years-of-age or older when completing the survey. The average age for the university sample was 19.98 ($SD = 7.60$) years. There were slightly more

females in the university sample (53.89%), and the most represented racial classifications were White/Caucasian (68.22%) and Black/African American (22.74%). Most university participants were single (i.e., never married: 94.99%), with 2.50% currently married, 1.88% in a domestic partnership or civil union, and less than 1% divorced or separated.

Remaining participants were recruited online using Amazon Mechanical Turk (MTurk; $n = 207$). MTurk participants were required to be U.S. residents and at least 18 years old at the time of survey completion. MTurk participants were paid forty cents for completing the survey. Participants recruited with MTurk were older, as a group, than those recruited through university classes ($M = 34.31$; $SD = 10.57$). The MTurk sample also included slightly more female participants (52.17%), and the most endorsed racial classification was White/Caucasian (79.67%). More of the MTurk participants were married (40.11%), with 46.15% single (i.e., never married), 5.49% in a domestic partnership or civil union, 6.59% divorced, 1.10% separated, and less than 1% widowed.

From the full sample of 849, 805 participants' data were complete on all proposed covariates/control variables, independent/predictor variables, and dependent variables, and were thus included in final analyses. Data were missing due to skipped items or sections. The Institutional Review Board reviewed and approved this investigation before recruitment of both samples.

Measures and Materials

Demographic information. Participants completed closed-ended questions regarding their gender, race, and marital status. In addition, this section included an open-ended item about age in years.

Miscarriage vignettes. Participants read a written description of a woman named Candace learning she is pregnant and subsequently making lifestyle changes and scheduling and attending her first prenatal medical checkup. There were, in total, six different versions of the vignette, differing by Candace's age (18 versus 28), marital status (single versus married), and whether she was trying to become pregnant or not. All versions of the vignette depicted Candace as taking prenatal vitamins, not smoking, and having switched from regular coffee to decaffeinated coffee after getting a positive pregnancy test result. All vignettes also described Candace experiencing vaginal bleeding and cramping just before her medical visit, when the doctor performs an ultrasound revealing development having stopped at about five weeks after conception.

Expectations of miscarriage outcomes. Participants were asked to predict how probable, based on strictly the information presented in the vignette, various outcomes would be using a nine-point rating scale ranging from one (Not at all likely) to nine (Extremely likely). This eleven-item measure was created specifically for the current study. Item content and descriptive statistics are listed in Table 1.

Table 1

Summary of Descriptive Statistics for Individual Items Addressing Expectations of Miscarriage Outcomes

	<i>M</i>	<i>SD</i>
Candace will be disappointed.	7.83	1.85
Candace will be relieved. ^R	7.19	2.21
Candace will cry.	8.01	1.56
Candace will blame herself for her loss.	5.95	2.18
Candace will become pregnant again within the next year. ^R	5.01	1.84
Candace will enjoy a relative healthy pregnancy next time. ^R	4.55	1.54
Candace's next pregnancy will end in miscarriage.	4.58	1.34
Candace will go through a period of grief and mourning.	7.54	1.65
Candace will be diagnosed with a condition affecting her reproductive system.	4.75	1.61
Candace will experience complications with future pregnancies.	4.72	1.46
Candace will be excited about being pregnant next time. ^R	3.93	1.98

Note. ^R Item was reverse scored. Scaling was from 1 (*Not at all likely*) to 9 (*Extremely likely*). All items received a minimum score of 1.00 and a maximum score of 9.00 after reverse scoring.

As noted in Table 1, certain items were reverse scored such that all individual items' scores would have consistent scaling. Specifically, scoring was conducted such that a higher score would reflect greater likelihood of the more unpleasant or less desirable outcome.

Further data reduction occurred before hypothesis testing began. Using principle components analysis (PCA), the investigators sought to determine whether the items should be combined into a single score versus subscale scores. First, the data appeared appropriate for PCA based on the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy being .76 and the Bartlett's Test of Sphericity being significant ($p = .00$). The researchers obtained a rotated factor solution, selecting Promax rotation. The factor loadings from the pattern matrix can be found in Table 2. Results supported the presence of three factors based on an eigenvalue cutoff of 1.00 and minimum pattern matrix component loading cutoff of .60. As evident in Table 2, the first factor or subscale, labeled by the investigators as "emotion," included items addressing Candace's emotional reactions to her miscarriage. The second factor centered on Candace possessing a medical condition or risk factor for physical or biological complications preventing healthy pregnancy. This second factor was labeled, "medical cause." Finally, a third factor emerged involving Candace's future reproductive experiences. The researchers labeled the third subscale, "future pregnancy."

Table 2

Component Loadings from Principle Components Analysis of Items Assessing Expectations of Miscarriage Outcomes

	1	2	3
Candace will be disappointed.	.82	-.04	0.12
Candace will be relieved. ^R	.73	-.10	-.03
Candace will cry.	.82	-.01	-.00
Candace will blame herself for her loss.	.60	.07	.14
Candace will go through a period of grief and mourning.	.81	.06	.05
Candace's next pregnancy will end in miscarriage.	-.06	.70	.08
Candace will be diagnosed ... reproductive system.	-.01	.82	-.06
Candace will experience complications with future pregnancies	.04	.77	-.05
Candace will become pregnant again within the next year. ^R	.02	-.12	.73
Candace will enjoy a relative healthy pregnancy next time. ^R	.10	.21	.69
Candace will be excited about being pregnant next time. ^R	-.05	-.08	.78

Note. Bolded values reflect inclusion in the factor. 1 = emotional; 2 = medical cause; 3 = future pregnancy

Next, to create final composite scores to be included in hypothesis testing, the authors averaged items within each subscale to yield three final variables. The authors selected averaging in place of summing items to maintain the scoring range of one (*Not at all likely*) to nine (*Extremely likely*). The averages for the final composite scores were 7.30 ($SD = 1.41$) for emotional, 4.68 ($SD = 1.12$) for medical cause, and 5.50 ($SD = 1.31$) for future pregnancy.

Misperceptions of miscarriage. After reading the vignettes and answering questions related to them, participants completed a series of

knowledge items about miscarriage. The items were written by the authors for the current investigation based on the common myths surrounding miscarriage supported by the literature review. This section of the online questionnaire consisted of 16 statements. The statements included a mixture of true and false items based on current medical and psychological knowledge. Participants noted the truthfulness of each statement on a scale from one (Completely false) to five (Completely true). Sample items include “Miscarriage is usually caused by a stressful event or lifting a heavy object,” “The majority of conceptions result in pregnancies which do not last more than two weeks,” and “Miscarriage is much less upsetting when the pregnancy has not progressed very far.” True items were recoded such that higher scores would reflect greater misinformation or poorer understanding regarding miscarriage. Since items exhibited adequate internal consistency (Cronbach’s $\alpha = .71$), they were summed to create a final total score ($M = 38.95$; $SD = 7.21$).

Belief in a just world. The degree to which participants believe that the world is a morally fair place (i.e., people deserve the consequences of their actions) was measured by the seven items available from the Global Belief in a Just World Scale (GBJWS) (Lipkus, 1991). Scoring involved a six-point (one = strongly disagree to six = strongly agree) Likert-type scale, including all positively-scored items. Sample items include, “I feel that people get what they are entitled to have,” and “I feel that people who meet with misfortune have brought it on themselves.” The final sum score was computed so that a higher score reflected a greater belief in a just world ($M = 22.94$; $SD = 6.70$). The inter-item reliability for this scale in the current study was good (Cronbach’s $\alpha = .81$), similar to results from other investigations including this measure (e.g., Hafer, 2000; Sutton & Winnard, 2007).

Locus of control. The degree to which participants exhibited an internal locus of control was measured with 20 items available from the International Personality Item Pool (Goldberg et al., 2006). Scoring involved a four-point (one = strongly disagree to four = strongly agree) Likert-type scale, with a mixture of positively- and negatively-scored items. Sample items include, “I believe that my success depends on ability rather than luck,” and “I believe that the world is controlled by a few powerful people.” The final sum score was computed so that a higher score reflected more internal locus of control ($M = 62.35$; $SD = 7.75$). As with previous research employing these items (e.g., Sohr-Preston & Boswell, 2015), inter-item reliability for this scale in the current study was strong (Cronbach’s $\alpha = .83$).

Liking of children. Individual attitudes regarding children were assessed using the Barnett Liking of Children Scale (BLOCS) (Barnett &

Sinisi, 1990). Participants were asked to indicate the extent to which they agreed with each of the 14 statements included in the measure. Scoring involved a seven-point ($1 = \textit{strongly disagree}$ to $7 = \textit{strongly agree}$) Likert-type scale, including 10 items reflecting a positive evaluation of children and four items reflecting a negative evaluation of children. Sample items include, "I enjoy getting to know a child," and "I do not like talking with young children." After coding the items in the same (subjectively positive) direction, the final sum score was computed so that a higher score reflected a greater liking of children ($M = 71.19$; $SD = 18.65$). The inter-item reliability for this scale in the current study was high (Cronbach's $\alpha = .95$), which is in agreement with past research including this measure (e.g., Barnett & Sinisi, 1990; Kasapoğlu & Akyol, 2012).

Procedure

Data collection was exclusively online. Participants gained access to the survey using an internet link listed by the primary investigator on either the department of psychology's participant recruitment site or MTurk. Upon opening the questionnaire, participants were randomly assigned to one of the six versions of the vignette. Before reading the vignette and related follow-up questions, participants indicated informed consent with their initials. Instructions stated they were required to complete the study in a single session. Participants could skip any items or sections sparking discomfort.

Results

Reactions to Vignette

To investigate expected differences in how male and female participants would expect Candace to react to her pregnancy loss based on whether she was labeled as 18 years old versus 28 years old, single versus married, or trying versus not trying to become pregnant, the researchers performed a multivariate analysis of covariance (MANCOVA). This analysis included three dependent variables (emotion, medical cause, and future pregnancy) and the covariate of participants' own age in years. Specifically, the analysis included four factors or grouping variables, the independent variables of maternal age, marital status, and trying, plus the quasi-independent variable of participant reported gender. MANCOVA was conducted instead of a separate analyses of covariance (ANCOVA) because of significant correlations among the three dependent variables ($r = -.07$ to $r = .25$; $p < .05$ for all dyads). The authors evaluated the assumption of homogeneity of covariances using Box's test of equality of covariance matrices. Results

of the test were significant ($p = .00$), suggesting this assumption had indeed been violated. Apart from actual inequality of covariances, this test is sensitive to unequal cell sizes, which were present in this study due to the quasi-independent nature of the variable of gender. The assumption of normality also was potentially violated for all dependent variables based on significant Kolmogorov-Smirnov and Shapiro-Wilk tests. The emotion variable additionally displayed negative skew in a histogram. Because analysis of variance (ANOVA) procedures are robust to such violations, analyses continued as planned but caution is warranted.

As seen in Table 3, the covariate of participant age and three of the main effects were significant ($p < .05$). Specifically, maternal age was significant (Wilks' $\Lambda = .99$; $F = 2.83$; $p = .04$; partial $\eta^2 = .01$ or small effect size), trying was significant (Wilks' $\Lambda = .76$; $F = 82.66$; $p = .00$; partial $\eta^2 = .24$ or large effect size), and participant sex was statistically significant (Wilks' $\Lambda = .95$; $F = 14.32$; $p = .00$; partial $\eta^2 = .05$ or small effect size).

Table 3

Results of MANCOVA Examining Expected Reactions to a Miscarriage

Grouping Variable	Wilks' Λ	F	p	M Emotion	M Medical	M Future
Participant age (covariate)	.95	13.73	.00			
Age	.99	2.83	.04			
18 years old				7.23	4.61	5.42
28 years old				7.34	4.80	5.54
Marital status	1.00	1.07	.36			
Single				7.23	4.75	5.47
Unmarried				7.33	4.65	5.49
Trying	.76	82.66	.00			
Not trying				6.66	4.64	5.08
Trying				7.91	4.76	5.87
Participant sex	.95	14.32	.00			
Male				7.08	4.75	5.25
Female				7.49	4.65	5.70

Note. Bolded values reflect statistically significant group differences in follow-up testing.

Follow-up testing took place with a series of univariate ANCOVA. For the maternal age effect, differences at the univariate level were significant only for medical cause ($F = 6.41$; $p = .02$; partial $\eta^2 = .01$ or small effect size). For the trying effect, there were significant differences at the univariate level for emotion ($F = 303.49$; $p = .00$; partial $\eta^2 = .20$ or medium

effect size) and future pregnancy ($F = 122.16$; $p = .00$; partial $\eta^2 = .09$ or medium effect size). Regarding the main effect of participant gender, differences were supported for emotion ($F = 32.67$; $p = .00$; partial $\eta^2 = .03$ or small effect size) and future pregnancy ($F = 39.16$; $p = .00$; partial $\eta^2 = .03$ or small effect size). Examination of the means (see Table 3) revealed that participants rated Candace as more likely to have an underlying medical cause for her miscarriage if described as 28 years old instead of 18 years old. Participants anticipated a stronger emotional reaction to the pregnancy loss and more positive experience regarding future pregnancy if Candace had been trying to become pregnant. Finally, female participants rated the woman to experience stronger emotion and have a more pleasant future pregnancy than did male participants.

Next, a multiple linear regression evaluated predictors of misperceptions of miscarriage. Specifically, a hierarchical regression included two steps: previously supported control variables (participant gender and age in years) and the novel predictor variables (belief in a just world, locus of control, and liking of children). The control variables accounted for 12.90% ($R^2 = .13$) of the variance in misperceptions of miscarriage. There was significant increase in model fit when the predictor variables were added ($\Delta R^2 = .07$; $p = .00$), with the full model explaining 20.00% ($R^2 = .20$) of the variance in misperceptions of miscarriage. As seen in Table 4, all control variables and predictors were significantly associated with the dependent variable at the bivariate level. Based on the regression coefficients in the final model summarized in Table 5, when all other predictors were held constant, all remained significantly related to misperceptions of miscarriage. In the full model, gender was negatively associated ($\beta = -.20$; $p = .00$), meaning males displayed higher levels of misperceptions than females. Misperceptions of miscarriage were also higher in participants who were younger ($\beta = -.22$; $p = .00$), more believing in a just world ($\beta = .24$; $p = .00$), having a more external locus of control ($\beta = -.13$; $p = .00$), and liking children less ($\beta = -.08$; $p = .03$).

Table 4
Correlations among Constructs Included in Multiple Regression

Measure	1	2	3	4	5
1. Misperceptions of miscarriage	-				
2. Gender	-.25 **	-			
3. Age	-.25 **	-.04	-		
4. Belief in a just world	.26**	-.11**	-.11**	-	
5. Locus of control	-.16**	.11**	.06*	.16**	-
6. Liking of children	-.19 **	.33 **	.01	.02	.38**

Note. * $p < .05$; ** $p < .01$. Gender was coded such that male = 1 and female = 2. Locus of control is scored such that higher scores reflect a more internal locus of control.

Table 5
Multiple Regression Predicting Misperceptions of Miscarriage

Predictor	<i>B</i>	<i>SE B</i>	β	R^2
Step 1				.13
(Constant)	48.97	.97		
Sex	-3.73	.48	-.26**	
Age	-.18	.02	-.26 **	
Step 2				.20
(Constant)	50.67	2.08		
Sex	-2.76	.50	-.20**	
Age	-.16	.02	-.22 **	
Belief in a just world	.25	.04	.24**	
Locus of control	-.12	.03	-.13**	
Liking of children	-.03	.01	-.08 *	

Note. * $p < .05$; ** $p < .01$

Discussion

The investigators sought to demonstrate adults' misunderstanding of miscarriage and to examine predictors of such misunderstanding. Based on follow-up questions to a vignette, participants displayed subtle but significant tendencies to believe miscarriage would be more emotionally upsetting and more hampering of future pregnancy experiences when the woman had actually been trying to become pregnant. Female participants anticipated more of the negative emotional reaction to pregnancy loss and interference with or foreboding of future pregnancy. Respondents also suspected more of an underlying medical cause of pregnancy loss when happening to a woman in her late twenties instead of the late teenage years. When misperceptions of miscarriage were examined using a more

direct knowledge measure in place of reactions to a vignette, participants more often rated myths surrounding pregnancy loss as true when identifying as male, higher in just world beliefs, more external in locus of control, and lower in liking of children.

Regarding the gender differences observed, it is not incredibly surprising that women in the study exhibited a more factually correct understanding of miscarriage and greater acknowledgement of the short-term and long-term emotional consequences of pregnancy loss. This difference may be explained by greater likelihood of exposure to information about miscarriage among women since they are the ones who become pregnant. This finding may indicate that there should be increased effort to incorporate the topic of miscarriage into public education campaigns and various university and professional or medical school courses to fill the gaps in men's knowledge.

When taken with past results with nursing staff (Reed, 1992), the result regarding participants' differential anticipation of emotional distress and impact on future pregnancy for planned versus unplanned pregnancy suggest a general tendency to discount the potential for grief in women miscarrying an unplanned pregnancy. There is no available evidence that grief following pregnancy loss is restricted to planned pregnancies or even wanted pregnancies. Bias in favor of those actually trying to become pregnant before experiencing miscarriage could result in minimal or dismissive support from medical staff, friends, and family when a nonviable pregnancy is known or assumed to be unplanned.

The finding that participants were more likely to expect an underlying biological or medical cause for a miscarriage in a 28-year-old than an 18-year-old woman may reflect awareness that fertility begins to decline slightly at this age (Peterson, Pirritano, Tucker, & Lampic, 2012). Still, even after fertility begins to decline, miscarriage is a not necessarily a reflection of an underlying medical problem. Such results suggest that women may have greater difficulty obtaining support when experiencing pregnancy loss as they get older, with loved ones perhaps seeing the loss as inevitable or blaming the woman for waiting too long to become pregnant.

Participants also endorsed more faulty beliefs regarding miscarriage when possessing higher levels of belief in a just world. To the authors' awareness, this is the first empirical study to link these two constructs, with one possible exception from over forty years ago in which participants' reactions to unplanned pregnancy ending in miscarriage were compared across conditions describing rape versus improper use of contraception (Stokols & Schopler, 1973). In that study, participants were more sympathetic to the women when presented as an innocent victim, but the aversive event depicted was more the unplanned pregnancy itself than the actual pregnancy loss. The current results add pregnancy loss as

a distinct event to the list of unpleasant and unwelcome situations, including serious physical illness, poverty, violent crime, and sexual assault (Hafer & Bègue, 2005), that many individuals would prefer to believe only happen to careless or reckless individuals. Just world beliefs likely serve an adaptive function, comforting individuals with a sense of agency in a chaotic world (Furnham, 2003). Believing controllable lifestyle factors will prevent miscarriage may harbor healthy behaviors in individuals with such a mindset, even if such behaviors do not actually stave off miscarriage. Although belief in a just world may have these benefits, there is danger of victim blaming or general distorted thinking from it. Well-meaning others may ask a woman suffering pregnancy loss if she was under too much stress, not taking vitamins, exercising too much or too little, and similar questions geared toward making sense of an unexpected and upsetting event. Such questions actually may produce feelings of guilt and frustration in the woman already experiencing physical and/or emotional pain as she feels blamed for her own adversity.

The finding that those higher in misperceptions of miscarriage displayed a more external locus of control was surprising. Published studies addressing locus of control and victim blaming were difficult to come by, but previous support, though perhaps dated (Alexander, 1980), suggested internal locus of control would accompany misunderstanding of miscarriage. Certainly, a more internal locus of control would fit well with beliefs that miscarriage is avoidable for anyone attending to lifestyle advice and health recommendations. Instead, the current results indicate higher misperceptions of pregnancy loss in those participants having a lesser tendency to assume one's own actions determine outcomes. Further replication and expansion is clearly warranted to help make sense of this finding.

Finally, participants liking children less harbored more misperceptions of miscarriage. Individuals with a generally negative view of children may avoid learning about pregnancy in general and may have difficulty imagining grief following pregnancy loss since they themselves do not view reproduction as joyful or desired. Having empathy for someone experiencing pregnancy loss may be easier for someone who understands the desire to have children or be around children, meaning those who like children may be better providers of emotional support following a miscarriage.

Limitations and Directions for Future Research

When evaluating and interpreting the current findings, it is necessary to note several important limitations. First, while care was taken to maximize diversity by including two unique and separately recruited samples, recruitment still was limited to the U.S. and mostly included Caucasian participants, so results may not fully generalize to other regions or cultures.

Another relevant limitation is that, while numerous statistically significant results emerged, some effect sizes were small. Results, although statistically significant, perhaps involved less practical significance. Put another way, the differences supported were not so large as to indicate qualitatively distinct categories. For group differences within the MANCOVA, ratings still tended to lie within the same categorical descriptor (i.e., somewhat likely) although one group averaged significantly lower on the targeted scale. Likewise, the final model in the multiple regression only explained 20% of variance in misperception of miscarriage, indicating there are other variables left out of the prediction that future studies should aim to include. Promising candidate variables would be previous personal experience with miscarriage, infertility, and pregnancy, as well as exposure to fertility-related topics (whether in a factual or untruthful manner) from family or friends, in school, or at work.

Another limitation involves the vignettes and the measures used to measure misperceptions of miscarriage. By necessity, with no previous studies directly addressing all variables of interest, some measures were developed specifically for the current investigation, suggesting further examination of reliability and validity is highly desired. The use of factor analytic techniques yields related items, but future establishment of psychometric properties would strengthen trust in the findings.

All of these limitations, taken together, communicate that the current study was a preliminary attempt to establish a novel line of research. Results are by no means definitive and would best be interpreted in the context of future attempts to replicate and expand research on public misperceptions of miscarriage and what factors may influence or predict erroneous beliefs surrounding the common but taboo event of pregnancy loss. To date, the only other similarly designed study known to the researchers used scenarios to provoke participant reactions based on a miscarrying woman's marital status, gestational age, and participants' religiosity (Grooms-Sadley, Cox, Jones, & Mannahan, 2016). This research suggests that replication of the current study should add gestational age (early in pregnancy versus late in pregnancy) as a vignette condition and questions regarding participants' religious beliefs. Other promising next steps include interviewing or surveying women or couples experiencing pregnancy loss to assess their own understanding of the event and evaluate how medical staff, friends, and family seem to perceive the event and offer support.

Implications

While noted limitations must be acknowledged, the current findings suggest further need to study widespread myths and faulty beliefs

surrounding miscarriage. Pregnancy loss is a common life event for women and their partners, yet it is seldom discussed and tarnished with numerous harmful misperceptions about its occurrence, nature, and usual or appropriate reactions. Given that rampant misunderstanding of pregnancy loss and its physical and emotional consequences may worsen the experience when women seek support, reducing public misperceptions of miscarriage is a desirable goal. This goal, however, requires considerably more research before it is possible. It is essential to document that myths surrounding miscarriage are indeed believed by many adults. Also, it is important to conduct further research delving into social and cognitive processes possibly increasing the likelihood of myths taking hold so that professionals and educators may work toward repudiating misperceptions of miscarriage.

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