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Psychological traits and public attitudes towards abortion: the role of empathy, locus of control, and need for cognition

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In the summer of 2022, the U.S. Supreme Court overturned the historic *Roe v. Wade* ruling, prompting various states to put forth ballot measures regarding state-level abortion rights. While earlier studies have established associations between demographics, such as religious beliefs and political ideologies, and attitudes toward abortion, the current research delves into the role of psychological traits such as empathy, locus of control, and need for cognition. A sample of 294 U.S. adults was obtained via Amazon Mechanical Turk, and participants were asked to provide their attitudes on seven abortion scenarios. They also responded to scales measuring empathy toward the pregnant woman and the unborn, locus of control, and need for cognition. Principal Component Analysis divided abortion attitudes into two categories: traumatic abortions (e.g., pregnancies due to rape) and elective abortions (e.g., the woman does not want the child anymore). After controlling for religious belief and political ideology, the study found psychological factors accounted for substantial variation in abortion attitudes. Notably, empathy toward the pregnant woman correlated positively with abortion support across both categories, while empathy toward the unborn revealed an inverse relationship. An internal locus of control was positively linked to support for both types of abortions. Conversely, external locus of control and need for cognition only positively correlated with attitudes toward elective abortion, showing no association with traumatic abortion attitudes. Collectively, these findings underscore the significant and unique role psychological factors play in shaping public attitudes toward abortion. Implications for research and practice were discussed.

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The U.S. Supreme Court overturned the long-time landmark ruling of *Roe v. Wade* in 2022 summer. Debates and legal challenges regarding legal abortion in the U.S. have been heated (Felix et al., 2023). Furthermore, residents in several states have or will cast their vote on a ballot measure to determine abortion rights at the state level. A Gallup poll released in 2023 summer found that about one third of voters indicated that they would only vote for a candidate who shared their views on abortion (Saad, 2023). Therefore, it is imperative to understand people's attitudes toward abortion. Past research on such attitudes have mainly focused on the role of political ideology and religious belief (e.g., Hess and Rueb, 2005); however, to our knowledge, relatively few studies have been done to examine the psychological underpinnings. Here we propose that examining the correlations between psychological factors and attitudes toward abortion has the potential to make contributions from the perspectives of both research and practice.

First, compared to attitudes in everyday life such as attitudes toward a product or brand, attitudes toward abortion are unique because it often elicits strong emotional response and conflict experience (Foster et al., 2012; Scott, 1989). Moreover, such an attitude goes beyond individual preference as it is deeply intertwined with one's moral and religious beliefs, cultural background, and societal norms. Debate on abortion is not merely about a personal choice; it is about the definitions of life, rights, and autonomy (Osborne et al., 2022; Scott, 1989). For abortion, the contrasting views may lead to polarized opinions. In contrast, disagreements about a product or brand preference are typically less emotionally charged and do not carry the same societal weight. Therefore, given the unique nature of attitudes toward abortion as described above, it remains unclear whether psychological factors that correlate with attitudes in other areas still apply and, if so, in what capacity they do so. Additionally, as introduced below, several studies in this area employed a qualitative approach (interview). While the qualitative approach offered valuable insights into individuals' perspectives on abortion, we aim to expand upon these findings by employing a quantitative approach. Especially, the quantitative approach allows us to explore the unique relationship between psychology and abortion attitudes after statistically controlling for other powerful factors like religious belief and political ideology. Together, a major goal of the present study is to provide initial empirical evidence for the correlations between attitudes toward abortion and certain psychological factors. We will further detail how our study might fill research gaps when introducing specific psychological factors as described below.

Second, examining the correlations between psychological factors and attitudes toward abortion may also offer practical insights. Consider the role of thinking style, for instance. The decision to pursue an abortion is imperative and often a prominently salient one, impacting not just the pregnant woman but also her family and extensive social network. Such a decision is complex and challenging due to intense feelings (e.g., conflict) and the balance between a woman's bodily autonomy and fetal rights. From this viewpoint, there might be a correlation between attitudes toward abortion and one's thinking style, especially their willingness to address complex and difficult issues. Past research has highlighted the connection between rational decision-making and the availability of relevant information (Shafir and LeBoeuf, 2002). Hence, to facilitate informed decisions, comprehensive knowledge about abortion is both essential and beneficial. The present study will examine the relationship between thinking style and abortion attitudes. Should a correlation be identified, our study would suggest individuals engage more deeply in critical thinking about the issues of abortion to enhance abortion-related education and informed decision-making.

Together, the present study aims to shed more light on the unique role of psychology in abortion attitudes, particularly in the presence of political ideology and religious belief. Specifically, we choose to examine the factors of empathy, locus of control, and thinking style (need for cognition) based on three considerations. Firstly, from a face validity perspective, the psychological constructs are predicted to exhibit a relationship with abortion attitudes. For example, the internal locus of control aligns well with the pro-choice mantra, 'my body, my choice. Secondly, as detailed below, although these constructs have been explored in previous studies, they have only received limited attention and their relations with abortion attitudes remain inconclusive. Hence, our study aims to fill the gaps from past research by further clarifying their roles in attitudes toward abortion. Thirdly, research has indicated significant intersections between elements like cognitive style, empathy, and locus of control with various decisions, especially in health contexts (Marton et al., 2021; Pfattheicher et al., 2020; Xu and Cheng, 2021). These elements are tied to motivation, information analysis, and make trade-offs (Fischhoff and Broomell, 2020). Building on this, our study seeks to explore the applicability of these factors to the deeply sensitive and polarizing decision of abortion. On the other hand, it is worth noting that the psychological factors examined in our study are not exhaustive or driven by theoretical considerations. However, as mentioned in recent publications (Osborne et al., 2022; Valdez et al., 2022), past research on abortion attitudes with a psychological perspective is still limited. Therefore, our hope is that the present study could provide initial yet meaningful empirical evidence to exhibit the sophisticated role of psychology in attitudes toward abortion. We detail our rationales for each factor below.

Empathy

Empathy refers to a variety of cognitive and affective responses, including sharing and understanding, toward others' experiences (Pfattheicher et al., 2020). Previous studies have demonstrated a positive association between empathy and prosocial behaviors, such as caring for others (Moudatsou et al., 2020; Klimecki et al., 2016), as well as a reduction in conflict and stigma (Batson et al., 1997; Klimecki, 2019). Recently, Pfattheicher et al. (2020) also demonstrated that inducing empathy for the vulnerable people could promote taking preventative measures during the Covid-19 pandemic. While researchers advocated for incorporating empathy into abortion-related mental health intervention (Brown et al., 2022), the role of empathy in attitudes toward abortion remains understudied. Hunt (2019) investigated the impact of empathy toward pregnant women by presenting testimonial videos in which a pregnant woman described the challenges she faced due to legal abortion restrictions in Arkansas. However, this manipulation did not significantly reduce participants' support for the abortion restrictions. Research has found that people's views on abortion tends to be stable over time (Jelen and Wilcox, 2003; Pew Research Center, 2022). Hence, a short video used in Hunt (2019) might not be able to change people's long-held views on abortion. Instead, we here hypothesize that the pre-existing but not temporality induced empathy play a role in abortion attitudes.

Furthermore, in addition to the empathy toward pregnant woman, it is also reasonable to assume that (some) people may feel empathy toward the unborn. For instance, interviews with Protestant religious leaders exhibited empathy toward both pregnant women and unborn (Dozier et al., 2020). Embree (1998) asked participants to indicate their opinions when responding to different scenarios of abortion. As a result, the study found that 64% and 17% of participants showed a moderate and strong level

of empathy for the unborn, respectively. Despite the informative findings, the relationship between attitudes toward abortion and empathy toward the unborn remains unclear, particularly when taking empathy toward pregnant woman and other factors (e.g., political ideology) into account.

Together, we raise three hypotheses regarding the role of empathy as shown below.

H1a: Empathy toward pregnant woman and unborn can coexist.

H1b: People's empathy toward pregnant woman are positively related to the support toward abortion.

H1c: People's empathy toward unborn are negatively related to the support toward abortion.

As empathy has been highlighted in the intervention process when dealing with abortion-related mental health issues (Brown et al., 2022; Whitaker et al., 2015), we hope our findings could generate implications for future research and practice.

Locus of control

Locus of control (LOC) refers to people's beliefs regarding whether their life outcomes are controlled and determined by their own (internal LOC) or external resources (fate, chance and/or powerful people, external LOC) (Levenson, 1981). Before delving into details, it is important to note that the internal and external LOC refer to different dimensions and are not mutually exclusive (Levenson, 1981; Reknes et al., 2019). For example, a person's success may be determined by both hardworking and support from others. Regarding abortion attitudes, Sundstrom et al. (2018) analyzed interview contents and found that some women's thoughts on pregnancy and abortion aligned with an internal locus of control (e.g., "As women, we need to take control as much as possible of our reproductive health"), while others aligned with an external locus of control (e.g., "leave it in God's hands...we'll just play it by ear and if I get pregnant, I get pregnant").

The findings from Sundstrom et al. (2018) were informative and consistent with common sense. For example, at face value level, the slogan of "my body my choice" well aligns with the concept of internal LOC. However, the role of internal LOC in abortion attitudes may be more complicated. That is, religious belief may complicate the association between internal LOC and abortion attitudes. Past studies, including a meta-analysis and a study with over 20,000 participants, found a positive relationship between internal LOC and religious belief (Coursey et al., 2013; Falkowski, 2000; Iles-Caven et al., 2020). As noted in these articles, there are similarities between internal LOC and religious belief. For instance, religious beliefs often provide individuals with a sense of meaning, purpose, and guidance in life. Meanwhile, people higher in internal LOC are more likely to report higher levels of existential well-being and purpose in life, which can be associated with religious belief and engagement (Kim-Prieto et al., 2005; Krause and Hayward, 2013). Thus, the relationship between internal LOC and religious belief may complicate how internal LOC is involved in the abortion attitudes. Sundstrom et al. (2018) used interviews to explore the role of LOC in thoughts about abortion. However, this method might not sufficiently differentiate the influence of religious beliefs. In this study, we adopt a quantitative approach, using a classical scale to measure LOC. We aim to empirically assess the relationship between internal LOC and attitudes toward abortion, especially when accounting for religious belief. Furthermore, considering that the relationship between internal LOC and abortion attitudes might be intertwined with religious beliefs, we refrain from positing a specific hypothesis at this point.

External LOC, on the other hand, does not appear to have a significant relationship with religious belief. Additionally, a few studies found that people higher in external LOC tended to attribute outcomes to external reasons (Falkowski, 2000; Reknes et al., 2019). Building on this concept, individuals with a higher external locus of control (LOC) may be more inclined to attribute pregnancy to external factors and place less emphasis on personal responsibility. Accordingly, we predict the hypothesis below.

H2: External LOC will be positively related to the support toward abortion.

Need for cognition

Based on face validity, thinking style might pertain to one's perception of abortion. For instance, individuals who prioritize comprehensive and empirical data might arrive at a different conclusion than those who lean on personal stories and emotional narratives. A few studies have tapped into the relationship between thinking style and attitudes toward abortion. Valdez et al. (2022) conducted qualitative interviews on abortion and employed natural language processing techniques to analyze the interviews. The study identified analytical thinking, which involved considering abortion from multiple perspectives, had a negative relationship with the number of cognitive distortions (such as polarized and rigid thinking about abortion). However, such a finding conflicted with another study by Hill (2004) where the concept of cognitive complexity (thinking beyond surface-level observations) did not correlate with attitudes toward abortion. The inconsistency might be due to methodological issues. For example, the correlations described above in Valdez et al. (2022) were derived from a small sample consisting of 16 participants. A low reliability of the cognitive complexity scale used in Hill (2004) might (partly) address the non-significant relationship. Thus, the present study will utilize the Need for Cognition scale, a widely recognized and validated instrument that measures thinking style, to examine its correlation with attitudes toward abortion in a larger sample.

Need for cognition (NFC) pertains to the inclination to derive satisfaction from and actively participate in effortful thinking (Cacioppo et al., 1984). Consistent with its concept, past research demonstrated that NFC was positively correlated with information seeking (Verplanken et al., 1992), academic achievement (Richardson et al., 2012), and logical reasoning performance (Ding et al., 2020). As for attitudes toward abortion, we hypothesize the following.

H3: There will be a positive correlation between NFC and attitudes toward abortion.

Our prediction is based on two reasons. First, NFC drives individuals to actively seek and update information and knowledge. It was discovered that acquiring a deeper understanding of abortion correlated with increased support for it (Hunt, 2019; Mollen et al., 2018). Second and relatedly, NFC was found to be negatively associated with various stereotype memories and positively related to non-prejudicial social judgments (Crawford and Skowronski, 1998; Curşeu and de Jong, 2017).

Overview

In sum, the present study aims to provide empirical evidence for the association between attitudes toward abortion and psychology by examining and clarifying the role of empathy, locus of control, and need for cognition. Past research has repeatedly found the involvement of political ideology and religious belief in abortion attitudes (e.g., Hess and Rueb, 2005; Holman et al., 2020; Jelen, 2017; Osborne et al., 2022; Prusaczyk and Hodson, 2018). Given their powerful and robust effect, it is crucial to gather additional empirical evidence to elucidate the distinct contribution of

psychology to attitudes toward abortion, while considering the influence of political ideology and religious beliefs. Additionally, when describing attitudes toward abortion, the dichotomization of “pro-choice” and “pro-life” have been widely used for decades. However, some studies have criticized that the dichotomization oversimplified attitudes toward abortion (Hunt, 2019; Osborne et al., 2022; Rye and Underhill, 2020). That is, people’s views on abortion vary across different scenarios and reasons. For instance, people showed less support toward abortion with elective reasons than with traumatic reasons (Hoffmann and Johnson, 2005). With confirmatory analysis, Osborne et al. (2022) derived two types of abortion: traumatic (e.g., pregnancy due to rape) vs. elective (e.g., the woman does not want the child anymore). Building on prior research, the current study aims exploring potential variations in attitudes across different abortion reasons. Furthermore, we also intend to examine whether the psychological factors described above have varying associations with different types of abortion.

Methods

Participants. The study was approved by IRB before data collection. Participants were recruited from Amazon Mechanical Turk (mTurk) on October 20th, 2022. To be eligible for the study, participants must be an adult, a U.S. citizen, and have an approval rating greater than 98% in mTurk. A total of 300 participants were enrolled into the study. Each participant received \$3 for compensation. Six participants did not complete at least 80% of the items and were removed from the study. Thus, the effective sample size was 294. Demographics are presented in the Results section.

Materials and procedures. Participants took an online survey developed by Qualtrics. Our study did not set a specific time restriction. Across 294 participants, the average survey completion time was 682.8 s (SD = 286.6 s). The median completion time was 595.0 s (IQR = 344.8 s). The following questionnaires were completed.

Attitudes toward abortion. Hoffmann and Johnson (2005) and Osborne et al. (2022) analyzed attitudes toward abortion with six different scenarios (scenarios a-f below) that were measured by the U.S. General Social Survey. We further added an additional item regarding underage pregnancy for two reasons. First, compared to other Western industrialized nations, the U.S. has historically had a higher rate of underage pregnancies. Additionally, underage pregnant individuals tended to have a higher likelihood of seeking abortions compared to their older counterparts (Lantos et al., 2022; Kearney and Levine, 2012; Sedgh et al., 2015). Second, underage pregnancy is linked to various adverse outcomes, such as increased risk during childbirth, heightened stress and depression, disruptions in education, and financial challenges (Eliner et al., 2022; Hodgkinson et al., 2014; Kearney and Levine, 2012). Given the significance and prevalence of underage pregnancy, we chose to include it as a scenario to understand the public’s perception. Additionally, we understood that people might feel conflict or uncertain toward one or more scenarios. Hence, instead of using binary response (yes/no format) adopted in the U.S. General Social Survey, we employed a 1 to 7 Likert scale for each scenario, with a higher score indicating stronger support for a pregnant woman to obtain legal abortion.

The seven scenarios in the present study included: (a) there is a strong chance of serious defect in the baby; (b) the woman’s own health is seriously endangered by the pregnancy; (c) the woman became pregnant as a result of rape; (d) the woman is married and does not want any more children; (e) the family has a very

low income and cannot afford any more children; (f) the woman is not married and does not want to marry the man; and (g) the woman is underage.

Empathy. Following the wording used to measure empathy in Pfattheicher et al. (2020), we developed six items to measure the empathy toward the pregnant woman and unborn or fetus, respectively. The scale of empathy toward pregnant woman included: (a) I am very concerned about the pregnant woman who may lose access to legal abortion; (b) I feel compassion for the pregnant women who may lose access to legal abortion; and (c) I am quite moved by the pregnant women who may lose access to legal abortion. The scale of empathy toward unborn included: (a) I am very concerned about the fetus or unborn child; (b) I feel compassion for the fetus or unborn child; and (c) I am quite moved by the fetus or unborn child. Participants rated each item on a five-point Likert scale, with 1 being strongly disagree and 5 being strongly agree. Thus, a higher score demonstrated stronger empathy toward the target. The Cronbach’s α for the scale of toward pregnant woman was 0.90 in the present study. The Cronbach’s α for the scale of toward unborn was 0.92.

Need for cognition. The need for cognition scale (NFC, Cacioppo et al., 1984) intends to measure the tendency to engage into deep thinking. It has 18 items, such as “I only think as hard as I have to” and “I find satisfaction in deliberating hard and for long hours”. Participants rated each item on a five-point Likert scale, with a higher score indicating a greater tendency to enjoy deep thinking. In the present study, the reliability of this scale was 0.93.

Locus of control. The present study adopted Levenson multi-dimensional locus of control scale (Levenson, 1981). Across 24 items, this scale measures three dimensions of locus of control: internality (sample item: Whether or not I get to be a leader depends mostly on my ability); powerful others (sample item: I feel like what happens in my life is mostly determined by powerful people); and chance (sample item: To a great extent my life is controlled by accidental happenings). In the present study, participants rated each item on a 1 to 6 Likert scale, with a higher score indicating a stronger belief that fate was controlled by self, powerful others, or chance. The Cronbach’s α for the subscales of internality, powerful others, and chance was 0.84, 0.91, and 0.93, respectively. As shown below, there was a high agreement between powerful others and chance subscales ($r = 0.87$, $p < 0.001$). Hence, we combined these two subscales to form an external locus of control composite.

Demographics. After completing the scales described above, participants were asked to report their demographic information including race, age, gender, education, annual household income, current relationship status, abortion experience, religious belief, and political ideology. Gender was coded with 1 = male, 2 = female, and 3 = other. Race was coded with 1 = White or Caucasian, 2 = Hispanic or Latinx, 3 = Black or African American, 4 = Asian or Asian American, and 5 = Other. Education was coded with six levels: 1 = Less than high school graduate, 2 = High school graduate or equivalent, 3 = Some college or associate degree, 4 = Bachelor’s degree, 5 = Master’s degree, 6 = Doctoral degree. Annual household income was categorized into 13 levels and ranged between under \$9,999 and above \$120,000 with increments of \$9,999. Current relationship status was coded into six levels: 1 = single and not dating, 2 = single but in a relationship, 3 = married, 4 = divorced, 5 = widowed, 6 = other. For abortion experience participants were asked “For any reason, have you had an abortion?”. For this question, the answer was coded with 1 = yes and 2 = no.

Religious belief was measured with three items. The first item asked “How often do you attend religious services?” Participants selected one option out of the following: 1 = never, 2 = a few times per year, 3 = once a month, 4 = 2–3 times a month, 5 = once a week or more. The second item asked “How important is religion to you personally?” Participants rated this question on a five-point Likert point, with 5 being most important. The third question asked “How would you describe your religious denomination”. The options included 1 = Christian, 2 = Islam, 3 = Judaism, 4 = Buddhism, 5 = Hinduism, 6 = other or atheism. In the present study, the first two items were highly correlated ($r = 0.77, p < 0.001$). Following Hunt (2019), we combined the two items to form a general religiosity composite, with a higher score indicating a stronger religious belief.

Political ideology was measured with two items: (a) Generally, how would you describe your views on most social political issues (e.g., education, religious freedom, death penalty, gender issues, etc.)? and (b) Generally, how would you describe your views on most economic political issues (e.g., minimum wage, taxes, welfare programs, etc.)? Participants rated each item with a five-point Likert scale, with 1 = strongly conservative 2 = conservative 3 = moderate 4 = liberal 5 = strongly liberal. We found a strong correlation between the two political ideology items, $r = 0.76, p < 0.001$. Hence, we combined the two items to form a general political ideology composite.

Results

SPSS 24.0 was employed to perform all the analyses. Across 294 participants, age ranged from 21 to 79, with a mean of 40.4 and a standard deviation of 12.4. Table 1 displays the descriptive statistics for the variables of gender, race, education, annual household income, current relationship status, religious denomination, and abortion experience.

Table 2 presents the descriptive statistics of attitudes toward abortion in different scenarios, religious belief, political ideology, and the scores of the psychological scales. Similar to the results obtained from the large-scale surveys in the U.S. and New Zealand (Osborne et al., 2022), the support toward abortion was strong (neutral = 4) across all scenarios.

To examine the structure of attitudes toward abortion in different scenarios, a Principal Component Analysis (PCA) with a Varimax orthogonal rotation was performed on all seven scenarios. With eigenvalue ≥ 1 as the threshold, two components were generated, accounting for 81.34% of the variability. Table 3 presents the PCA results. As shown, we obtained two distinct components. The first one included the scenarios of baby deflection, pregnant woman’s health being endangered, pregnancy caused by rape, and underage pregnancy. The second component included the scenarios of not wanting the child, low income, and not wanting to marry. Such a differentiation between the two components was consistent with the notion in Osborne et al. (2022). Following this paper and the face validity of the scenarios, we labeled the two components traumatic abortion and elective abortion, respectively. Accordingly, we also computed a composite score for each component by averaging the corresponding items. In line with previous research (Hoffmann and Johnson, 2005), the support was significantly stronger toward the traumatic abortion (mean = 5.84, SD = 1.24) than the elective abortion (mean = 4.94, SD = 1.74), $t(293) = 11.51, p < 0.001$, Cohen’s $d = 0.67$.

Table 4 presents the zero-order correlations between attitudes toward traumatic and elective abortions, demographics, and scores of the psychological factors. Consistent with the findings from past research (e.g., Hess and Rueb, 2005; Holman et al., 2020), a stronger religious belief was negatively related to the support toward both types of abortions. A stronger liberal

Table 1 Descriptive statistics for race, education, and income.

Variable	Category	Frequency	Percentage (%)	
Gender	Male	147	50.0	
	Female	146	49.7	
	Other	1	0.3	
Race	White or Caucasian	255	86.7	
	Hispanic or Latinx	8	2.7	
	Black or African American	10	3.4	
	Asian or Asian American	20	6.8	
	Other	1	0.3	
	Less than high school graduate	0	0	
	High school graduate or equivalent	24	8.2	
Education	Some college or associate degree	36	12.2	
	Bachelor’s degree	153	52.0	
	Master’s degree	78	26.5	
	Doctoral degree	3	1.0	
	Income (\$)	Under 9999	3	1.0
		10,000–19,999	18	6.1
		20,000– 29,999	26	8.8
30,000–39,999		32	10.9	
40,000–49,999		37	12.6	
50,000–59,999		23	7.8	
60,000–69,999		22	7.5	
70,000–79,999		57	19.4	
80,000–89,999		23	7.8	
90,000–99,999		27	9.2	
100,000–109,999		9	3.1	
110,000–119,999		4	1.4	
above 120,000		13	4.4	
Relationship		Single and not dating	65	22.1
		Single but in a relationship	23	7.8
	Married	198	67.3	
	Divorced	7	2.4	
	Widowed	0	0	
	Other	1	0.3	
Religion	Christian	203	69.5	
	Islam	1	0.3	
	Judaism	6	2.1	
	Buddhism	3	1.0	
	Hinduism	2	0.7	
	Other or atheism	77	26.4	
Abortion Experience ^a	Yes	28	19.6	
	No	115	80.4	

^aFor abortion experience, all those who answered yes were females. The frequencies and percentages of this variable only included females.

ideology was positively related to the support toward both types of abortions. Additionally, empathy toward the pregnant woman was positively associated with the support toward both types of abortions whereas empathy toward unborn or fetus had an opposite effect. Based on the zero-order correlation, we did not find a significant relationship between internal locus of control and attitudes toward either type of abortion. The external locus of control (either powerful others or chance), on the other hand, was positively related to the support toward elective but not traumatic abortion. As there was a high agreement between the two external locus of control subscales ($r = 0.87, p < 0.001$), we formed a general external locus of control composite by averaging the two

Table 2 Descriptive statistics of attitudes toward abortion in different scenarios, religious belief, political ideology, and the scores of the psychological scales.

	Defect	Danger	Rape	Notwant	Lowinc	Notmarr	Underage	RB	PI	EW	EU	LC-I	LC-P	LC-C	NFC
Mean	5.78	5.98	6.02	4.87	5.11	4.84	5.57	2.85	3.53	3.96	3.44	4.59	3.85	3.76	3.21
SD	1.42	1.31	1.34	1.86	1.79	1.91	1.64	1.40	1.18	1.05	1.20	0.73	1.11	1.21	0.87

The first seven variables (columns) indicate the abortion attitudes in different scenarios.
 Defect: attitude toward abortion when there is a strong chance of serious defect in the baby.
 Danger: attitude toward abortion when the woman's own health is seriously endangered by the pregnancy.
 Rape: attitude toward abortion when the woman became pregnant as a result of rape.
 Notwant: attitude toward abortion when the woman is married and does not want any more children.
 Lowinc: attitude toward abortion when the family has a very low income and cannot afford any more children.
 Notmarr: attitude toward abortion when the woman is not married and does not want to marry the man.
 Underage: attitude toward abortion when the woman is underage.
 RB: religious belief.
 PI: political ideology.
 EW: empathy toward the pregnant woman.
 EU: empathy toward the unborn or fetus.
 LC-I, LC-P, LC-C: locus of control for internality, powerful persons, and chance, respectively.
 NFC: need for cognition.

Table 3 Principal component analysis for attitudes toward abortion across different scenarios.

	Rotated Components		Communalities
	1	2	
Baby Defect	0.78	0.40	0.76
Pregnant woman endangered	0.85	0.18	0.75
Pregnancy by rape	0.86	0.24	0.90
Not want child	0.31	0.88	0.87
Low income	0.32	0.88	0.87
Not want to marry	0.26	0.91	0.90
Underage pregnancy	0.73	0.47	0.74
Eigenvalues	4.64	1.06	
Variations accounted (%)	66.23	15.10	

Loading greater than 0.6 was considered as significant (Comrey & Lee, 1992).
 For more detailed description of each scenario, please refer to the Methods part or Table 2 note.

items in the following regressions. Finally, need for cognition was positively related to attitudes toward elective abortion but not traumatic abortion.

While the zero-order correlations were informative, we were mindful that the Type I error might be greatly inflated due to a vast amount of repeated testing. Moreover, one goal of the study was to examine the role of psychological factors in the presence of religious belief and political ideology. Thus, we performed a hierarchical linear regression on each type of abortion, with age, gender, income, and education in the first block, religious belief and political ideology in the second block, and psychological factors in the third block. We separated the regression between the two types of abortion because the role of predictors might vary. This approach was also employed in Osborne et al. (2022). Table 5 exhibits the regression results.

As shown in Table 5, the demographic variables of age, gender, education, and income did not account for a significant portion of the variability in attitudes toward either type of abortion. The present study added to the literature that there might not necessarily be a difference in attitudes toward abortion between males and females (Bilewicz et al., 2017; Jelen and Wilcox, 1997). By contrast, in the second block, religious belief and political ideology collectively explained a sizable portion of the variability in attitudes toward both types of abortion. In block 3, in the presence of demographic variables including religious belief and political ideology, psychological factors could still account for a significant portion of the variability.

Looking at the individual psychological predictors (for more detailed interpretations please refer to the discussion part), consistent with our hypothesis, empathy toward the pregnant woman was positively associated with the support toward both types of abortion. By contrast, empathy toward the unborn or fetus was negatively associated the support toward abortion. For the factor of locus of control, the internal locus of control was not related to any type of abortion attitudes when zero-order correlation was used (Table 4); yet it was positively related to abortion attitudes after all other predictors were taken into account, indicating a suppressing effect. Upon further examination, we identified two suppressors: religious belief and empathy toward the unborn. After removing these two variables, internal locus of control was no longer significant. The observed pattern reflected our previous prediction, indicating that the role of internal locus of control could be complicated by religious beliefs. External locus of control, on the other hand, was positively correlated with the support toward elective abortion. Similarly, need for cognition (NFC) also had a positive relationship with the support toward elective abortion. Neither external locus of control nor NFC had a significant correlation with attituded toward traumatic abortion. Hence, our hypotheses regarding external locus of control and NFC were partially supported. We detailed out interpretation and discussion of the results below.

Discussion

The present study aimed to provide empirical evidence for the correlations between psychological factors and attitudes toward abortion. As introduced earlier, while it is common to find the involvement of psychology in everyday life attitudes and preferences, attitudes toward abortion are unique and drastically different. Given its unique nature, it lacks empirical evidence regarding whether psychological factors that interplay with attitudes in other areas still apply and, if so, in what capacity they do so. Past research has primarily focused on the role of religious belief and political ideology. Our study demonstrated a substantial involvement (R^2 change = 0.27 and 0.24 for traumatic and elective abortion, respectively) of the psychological factors, after controlling for religious belief and political ideology. More importantly, these effects were comparable to the variability accounted for by religious belief and political ideology combined, particularly in the elective abortion category. The results highlighted the influential role of psychological factors in shaping attitudes toward abortion.

Additionally, past research has shown the interconnection between psychology and the public's attitudes toward major societal events. For example, during the Covid-19 pandemic,

Table 4 Correlations between attitudes toward abortion, demographics, and psychological factors.

	EA	Age	Gender	Income	Edu	RB	PI	EW	EU	LC-I	LC-P	LC-C	NFC
TA	0.65**	-0.05	-0.03	-0.08	-0.13*	-0.42**	0.48**	0.73**	-0.44**	0.002	-0.06	-0.10	0.10
EA	-	0.03	0.01	0.02	0.07	-0.19**	0.46**	0.64**	-0.38**	0.01	0.15*	0.15*	0.15*
Age		-	0.06	0.20	0.28	0.13*	0.10	0.05	0.07	0.06	0.07	0.10	0.03
Gender			-	0.09	0.04	0.13*	-0.12*	-0.02	0.11	-0.09	0.12*	0.09	-0.15**
Income				-	0.44**	0.22**	-0.09	-0.001	0.01	0.13*	0.04	0.03	0.20**
Edu					-	0.43**	0.01	-0.01	0.09	0.07	0.39**	0.40**	0.12*
RB						-	-0.18**	-0.25**	0.52**	0.28**	0.42**	0.48**	-0.16**
PI							-	0.52**	-0.26**	-0.10	0.12*	0.13*	-0.01
EW								-	-0.39**	-0.01	0.10	0.05	0.15**
EU									-	0.35**	0.25**	0.28**	-0.08
LC-I										-	-0.04	-0.02	0.11
LC-P											-	0.87**	-0.24**
LC-C												-	-0.27**

EA: elective abortion.
 TA: Traumatic abortion.
 Gender: 1 = male, 2 = female. The category of other was excluded (n = 1).
 Edu: education.
 RB: religious belief.
 PI: political ideology.
 EW: empathy toward the pregnant woman.
 EU: empathy toward the unborn or fetus.
 LC-I, LC-P, LC-C: locus of control for internality, powerful persons, and chance, respectively.
 NFC: need for cognition.
 *p < 0.05; **p < 0.01.

Table 5 Hierarchical regressions on traumatic and elective abortions.

Blocks and Variables	Traumatic abortion B(SE)	Elective abortion B(SE)
Block 1		
R ² Change		0.01
Age	-0.001 (0.01)	0.002 (0.01)
Gender	-0.07 (0.15)	0.04 (0.21)
Income	-0.01 (0.03)	-0.003 (0.04)
Education	-0.16 (0.09)	0.14 (0.13)
Block 2		
R ² Change	0.33**	0.25**
Age	-0.01 (0.01)	-0.01 (0.01)
Gender	0.16 (0.12)	0.30 (0.18)
Income	0.02 (0.02)	0.03 (0.03)
Education	0.03 (0.08)	0.26 (0.13)*
Religious belief	-0.32 (0.05)**	-0.22 (0.07)**
Political ideology	0.45 (0.05)**	0.66 (0.08)**
Block 3		
R ² Change	0.27**	0.24**
Age	-0.01 (0.004)	-0.003 (0.01)
Gender	0.12 (0.10)	0.28 (0.16)
Income	-0.01 (0.02)	<0.001 (0.03)
Education	0.01 (0.07)	0.02 (0.12)
Religious belief	-0.20 (0.05)**	-0.07 (0.08)
Political ideology	0.15 (0.05)**	0.26 (0.08)**
Empathy toward woman	0.66 (0.06)**	0.67 (0.09)**
Empathy toward unborn	-0.13 (0.05)*	-0.37 (0.08)**
Internal locus of control	0.24 (0.07)**	0.32 (0.12)**
External locus of control	-0.10 (0.05)	0.34 (0.09)**
Need for cognition	-0.05 (0.06)	0.22 (0.10)*

*p < 0.05; **p < 0.01.

while the perception of mask-wearing and/or social distancing was highly politicized, studies found that attitudes toward these preventative measures to be related to thinking style, self-control, numeracy, and working memory capacity (Steffen and Cheng, 2023; Xie et al., 2020; Xu and Cheng, 2021). In line with this, our study further underscored the significant influence of psychology

on another pressing societal topic: abortion. In the sections below, we detail our findings and relevant implications. We are fully aware that our study was preliminary and hope it could serve as a starting point for future research and practice. We also acknowledge the limitations of our study and address them at the end.

Empathy. Some past studies on empathy and abortion only considered the empathy toward the pregnant woman (e.g., Brown et al., 2022; Homaifar et al., 2017; Hunt, 2019; Whitaker et al., 2015). The present study identified two types of empathy when dealing abortion: empathy toward the pregnant woman and empathy toward the unborn. In the presence of each other, we found that greater empathy toward the pregnant woman was associated with more support toward abortion, whereas greater empathy toward the unborn or fetus was associated with less support toward abortion. Such a pattern suggested that empathy might be a source of conflict feeling. That is, when considering abortion, concerns and care toward pregnant woman and unborn could coexist, potentially leading to conflict and dilemma when people thought about abortion. While the present study examined the public’s attitudes toward abortion with a diverse sample, pregnant women might have a similar pattern of empathy and hence feel conflict and dilemma when thinking about abortion. To cope with such a conflict, it might be beneficial for a counselor to acknowledge conflicting emotions that arise from empathizing with both the unborn and the pregnant individual. Moreover, the counselor could guide the client through the process of reconciling these emotions to alleviate feelings of isolation or confusion the client may experience. Future research in the realms of mental health and counseling should consider integrating these dual empathy perspectives and empirically assess the efficacy of such therapeutic interventions.

Additionally, Hunt (2019) did not find a significant influence of empathy on abortion attitudes change when participants were exposed to testimonial videos featuring pregnant women discussing the legal obstacles they faced. The disparity between Hunt’s (2019) findings and our own could potentially be attributed to the inherent stability and longstanding nature of

abortion attitudes. Research has found that people's views on abortion tends to be stable over time (Jelen and Wilcox, 2003; Pew Research Center, 2022). As a result, it is possible that pre-existing empathy, rather than empathy induced temporarily, was the factor correlated with individuals' perception and consideration of abortion. Our findings were consistent with this possibility. Together, our findings supported H1a to H1c. Moreover, our study shed more light on empathy by showing its association with *distinct* views on abortion. The results suggest that future research could investigate how different types of empathy are formed and how they influence the shaping and persuasion of abortion attitudes.

Locus of control. Through qualitative interviews, Sundstrom et al. (2018) unveiled individual differences in the locus of control when discussing opinions on abortion. However, these interviews might not have fully captured the interplay between internal and external locus of control and other factors involved attitudes toward abortion. To fill the gap, our study employed a quantitative approach to delve deeper into how locus of control correlated with abortion attitudes. Consistent with Levenson (1981) and Reknes et al. (2019), we found that the constructs internal locus of control and external locus of control were differentiated but not unidimensional. For internal locus of control, interestingly, we found a suppressing effect. As discussed earlier, the role of internal locus of control in abortion attitudes might be complicated. That is, on the one hand, by face validity, the internal locus of control well aligned with the concept of "my body, my choice" (Sundstrom et al., 2018). On the other hand, in line with past research (Coursey et al., 2013; Falkowski, 2000; Iles-Caven et al., 2020), our study found that internal locus of control was positively related to religious belief. Furthermore, as shown in Table 4, internal locus of control was also positively related to the empathy toward the unborn, and such a relationship was significantly mediated by religious belief (mediation effect = 0.21, SE = 0.5, 95% CI = [0.13, 0.31]). Therefore, when using zero-order correlation, the effect of internal locus of control might be neutralized by the two opposite parts ("my body, my choice" vs. religious belief) discussed above. By contrast, in regression, the "my body, my choice" part stood out because the religiosity part was partialled out by the variables of religious belief and empathy toward the unborn.

In addition to internal locus of control, we also discovered that external locus of control was involved in abortion attitudes. Specifically, we found a positive relationship between external locus of control and support toward elective abortion (H2 was partially supported). Past research has found that locus of control is related to attribution (Falkowski, 2000; Reknes et al., 2019). Thus, our finding was in line with the notion that those with a greater level of external locus of control might be more likely to attribute unwanted pregnancy to external reasons (not personal responsibility), and hence showed more support toward abortion.

Our findings regarding locus of control suggest that individuals might simultaneously believe in personal autonomy ("my body, my choice") while also feeling that certain life events, like unwanted pregnancies, are influenced by external factors beyond their control. This is particularly true when thinking about elective abortion. Education and counseling practices might be designed to reflect this duality. For example, materials and discussions could simultaneously emphasize the importance of personal choices and responsibilities, while also exploring societal, cultural, or circumstantial factors that might influence abortion decision. Incorporating both perspectives would allow to create a supportive environment where individuals feel seen and acknowledged in their complexities.

Need for cognition. As introduced earlier, past research on the relationship between thinking style and abortion attitudes was inconclusive. To clarify the relationship, the present study adopted the validated need for cognition scale. Need for cognition has demonstrated its involvement in consequential events, such as political elections and the adoption of preventive measures during the Covid-19 pandemic (Sohlberg, 2019; Xu and Cheng, 2021). In the present study, we discovered that need for cognition was positively related to the support toward elective abortion. Such a finding was consistent with the notion that need for cognition was negatively related to stereotypes (Crawford and Skowronski, 1998; Curşeu and de Jong, 2017). Additionally, as need for cognition drives individuals to seek and update knowledge, our result was also in line with the finding that gaining knowledge about abortion led to more positive view on abortion (Hunt, 2019; Mollen et al., 2018). Our study implied that future research could empirically evaluate if indeed abortion knowledge mediates the relationship between need for cognition and abortion attitudes.

It is worth noting that the present study also clarified the role of need for cognition in attitudes toward abortion by examining a potential artifact. Specifically, the observed positive relationship between need for cognition and support for abortion might be an artifact, given that liberal ideology is positively correlated with both abortion attitudes and need for cognition (Young et al., 2019). However, as shown in our regression, the relationship between need for cognition and elective abortion remained significant in the presence of other variables, including political ideology. Thus, the finding suggested that at least part of the relationship between need for cognition and attitude toward abortion was unique and not driven by political ideology.

Our findings related to need for cognition had an implication on abortion-related education. As discussed earlier, having adequate knowledge about abortion could facilitate the support for making informed decisions. As need for cognition was found to be related to openness and motivation to seek and update information (Russo et al., 2022), our finding suggested that cultivating willingness to engage into critical thinking might be beneficial for education on abortion and reproductive rights. While we are fully aware that correlation does not equate to causation, our study still offers a starting point for future research and practice on abortion-related education.

Traumatic abortion vs. elective abortion. While some researchers argued that the dichotomization of "pro-choice" and "pro-life" was oversimplified, to date, only two studies have empirically examined attitude variation between different abortion scenarios (Hoffmann and Johnson, 2005; Osborne et al., 2022). Both studies demonstrated that public views on abortion can be grouped into two categories: traumatic and elective. Our research not only replicated these findings but also introduced two significant advancements. First, we incorporated a scenario addressing underage pregnancy, given its high prevalence and significance. Secondly, instead of a binary response, we employed a 7-point Likert scale, allowing us to more accurately capture potential conflicting attitudes among participants.

Furthermore, our findings revealed that the roles of external locus of control and need for cognition varied in relation to attitudes toward the two types of abortion. Interestingly, we observed that neither of these variables significantly related to attitudes toward traumatic abortion, as indicated by both zero-order correlation and regression analyses. Conceptually, the scenarios of traumatic abortion (e.g., pregnancy caused by rape; mother life endangered) tend to be more extreme and emergent than the scenarios of elective abortion. Hence, there might be less room for psychological factors, such as thinking or attribution, to function in traumatic abortion

than in elective abortion. Our interpretation was also consistent with the statistical pattern between the two abortions. That is, compared to elective abortion, the standard deviation of traumatic abortion was smaller. Additionally, there were more participants rated seven on the Likert scale in the scenarios of traumatic abortion (29.6%) than in the scenarios of elective abortion (18%). Despite the difference between the two types of abortion, it is essential to acknowledge that elective abortion does not imply a stress-free experience. Both traumatic and elective abortions involve significant levels of stress and emotional challenges. While traumatic abortion scenarios can be considered more extreme, it is crucial to recognize that individuals undergoing elective abortion may also experience considerable emotional distress.

Taken together, with concrete evidence, our study demonstrated that the public's attitude toward abortion depended on abortion reasons. Our study also implied that future research should focus on attitudes toward specific abortion scenarios rather than a holistic concept of abortion. Furthermore, the differentiation between the traumatic and elective abortions suggested the limitation and potential ineffectiveness of one-size-fits-all legislative solutions. Given the varying and often conflicting attitudes that people harbor, it would be reasonable for legislative frameworks to be flexible, adaptive, and cognizant of the different circumstances surrounding abortion. This will not only be more reflective of public opinions but also more supportive of individuals who undergo different types of abortion experiences, each of which carries its own set of emotional and psychological challenges.

Expanding findings with a quantitative approach. Some past studies employed a qualitative approach when dealing with attitudes toward abortion (e.g., Dozier et al., 2020; Sundstrom et al., 2018; Valdez et al., 2022; Woodruff et al., 2018). These investigations have provided insights and served as inspirations for our own research. However, the relationship between abortion attitudes and pertinent factors may remain somewhat opaque. This is particularly true when considering the intricate interconnectedness among these factors. The present study demonstrated that findings from qualitative studies could be extended and enriched with a quantitative approach. For instance, we utilized quantitative scales to measure empathy toward the unborn—a variable that was previously identified through interviews in the study by Dozier et al. (2020). Moreover, we further exhibited the role of empathy toward the unborn when statistically controlled other variables, including empathy toward the pregnant. Similarly, the role of internal locus of control was revealed in interviews in Sundstrom et al. (2018). With validated scales, we exhibited the correlation with internal locus of control in both types of abortion. Furthermore, by detecting and interpreting a suppressing effect, we showed the interplay between internal locus of control, religious belief, and attitude toward abortion. Thus, our study implied that using quantitative scales and analyses was a viable approach to examine attitude toward abortion and could deepen the understanding of relevant factors.

Limitations and future directions. Despite the contributions, limitations should be acknowledged as well. First and foremost, we believe our study was still in the explorative stage. The specific psychological factors tested in the present study were not exhaustive and not theoretically driven. We hope the present study could provide initial empirical evidence to show the sophisticated role of psychology in attitudes toward abortion. Future studies could use a more theoretical driven approach to examine the specific psychological involvement in abortion attitudes. For example, given the correlation between need for cognition and attitudes toward abortion, future research could further elucidate the role of thinking style in

attitudes toward abortion by incorporating the Dual-Process Theory (Evans, 2008). The Dual-Process Theory posits that humans have two distinct systems of information processing: System 1, which is intuitive, automatic, and fast; and System 2, which is deliberate, analytical, and slower. By examining the interplay between these two systems, researchers might gain insights into how intuitive emotional responses versus more deliberate cognitive analyses influence individuals' attitudes toward abortion. For instance, are individuals who predominantly rely on System 1 more swayed by emotive narratives or imagery related to abortion?

Second, when analyzing and discussing the results, we proposed several possible underlying mechanisms that might elucidate the relationships observed. To illustrate, we employed the concept of attribution to shed light on the role of an external locus of control, positing that individuals with a strong external locus might attribute abortion decisions to external factors or circumstances rather than personal choices. Furthermore, we suggested that the observed positive relationship between the need for cognition and abortion attitudes might be mediated through abortion knowledge. This implies that individuals with a higher need for cognition could potentially seek out more information on abortion, leading to more informed attitudes. However, while these interpretations offer potential insights, we recognize their speculative nature. It's crucial to emphasize that our proposed mechanisms require rigorous empirical testing for validation. For example, it would be of interest to test whether indeed, gaining various types of abortion knowledge improves views of abortion.

Third, as described above, we strived to show how our findings could be potentially used in abortion-related counseling. However, we acknowledge that our study is explorative but not counseling focused. Therefore, while we believe our findings offer meaningful implications, we caution against over-extrapolating their direct applicability to counseling contexts. Future research could delve into empirically investigating how psychological factors, such as varying empathy types and loci of control, could be utilized to alleviate negative feelings associated with abortion decisions. Additionally, understanding how various psychological factors interact with cultural and social norms could further help tailor counseling approaches.

Fourth, the present study did not include an attention check item. We believe the quality of our survey could have been improved had we included one or more attention check items. However, the reliabilities of our scales were relatively high (ranged from 0.84 to 0.93). Additionally, we also replicated some major findings from previous research (e.g., the associations between attitudes toward abortion and religious belief and political ideology). Thus, we believe that overall, inattention did not affect the quality of our data. Future online surveys could consider using attention check items for quality control.

In conclusion, the present study demonstrates the unique contribution of empathy, locus of control, and need for cognition to how people perceived abortion in different scenarios. The findings suggests that attitudes toward complex moral issues like abortion are shaped by individual psychological traits and cognitive needs, in addition to societal, religious, and cultural norms. Future research could use our study as a starting point to expand on these findings, exploring other psychological traits and cognitive processes that may similarly affect perceptions of abortion and other controversial subjects.

Data availability

Data included in this project may be found in the online repository, <https://doi.org/10.7910/DVN/E5AB5R>.

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References

- Batson CD, Polycarpou MP, Harmon-Jones E, Imhoff HI, Mitchener EC, Highberger L et al. (1997) Empathy and attitudes: can feeling for a member of a stigmatized group improve feelings toward the group? *J Person Soc Psychol* 72(1):105–118
- Bilewicz M, Mikołajczak G, Babińska M (2017) Speaking about the reborn. How specific terms used in the abortion debate reflect attitudes and (de)mentalization. *Person Individ Differ* 111:256–262
- Brown L, Swiezy S, McKinzie A, Komanapalli S, Bernard C (2022) Evaluation of family planning and abortion education in preclinical curriculum at a large midwestern medical school. *Heliyon* 8(7):e09894. <https://doi.org/10.1016/j.heliyon.2022.e09894>
- Cacioppo JT, Petty RE, Kao CF (1984) The efficient assessment of need for cognition. *J Person Assess* 48(3):306–307. https://doi.org/10.1207/s15327752jpa4803_13
- Comrey AL, Lee HB (1992) *A first course in factor analysis* (2nd ed.). Lawrence Erlbaum Associates, Inc
- Coursey LE, Kenworthy JB, Jones JR (2013) A meta-analysis of the relationship between intrinsic religiosity and locus of control. *Arch Psychol Relig* 35:347–368. <https://doi.org/10.1163/15736121-12341268>
- Crawford MT, Skowronski JJ (1998) When motivated thought leads to heightened bias: high need for cognition can enhance the impact of stereotypes on memory. *Person Soc Psychol Bull* 24(10):1075–1088. <https://doi.org/10.1177/01461672982410005>
- Curşeu PL, de Jong JP (2017) Bridging social circles: need for cognition, prejudicial judgments, and personal social network characteristics. *Front Psychol* 8:1251. <https://doi.org/10.3389/fpsyg.2017.01251>
- Ding D, Chen Y, Lai J, Chen X, Han M, Zhang X (2020) Belief bias effect in older adults: roles of working memory and need for cognition. *Front Psychol* 10:2940. <https://doi.org/10.3389/fpsyg.2019.02940>
- Dozier JL, Hennink M, Mosley E, Narasimhan S, Pringle J, Clarke L, Blevins J, James-Portis L, Keithan R, Hall KS, Rice WS (2020) Abortion attitudes, religious and moral beliefs, and pastoral care among Protestant religious leaders in Georgia. *PLoS one* 15(7):e0235971. <https://doi.org/10.1371/journal.pone.0235971>
- Eliner Y, Gulersen M, Kasar A, Lenchner E, Grünebaum A, Chervenak FA, Bornstein E (2022) Maternal and neonatal complications in teen pregnancies: a comprehensive study of 661,062 patients. *J Adolesc Health* 70(6):922–927. <https://doi.org/10.1016/j.jadohealth.2021.12.014>
- Emree RA (1998) Attitudes toward elective abortion: preliminary evidence of validity for the personal beliefs scale. *Psychol Rep* 82(3 Pt 2):1267–1281. <https://doi.org/10.2466/pr0.1998.82.3c.1267>
- Evans JSTBT (2008) Dual-processing accounts of reasoning, judgment and social cognition. *Ann Rev Psychol* 59:255–278. <https://doi.org/10.1146/annurev.psy.59.103006.093629>
- Falkowski CK (2000) Locus of control, religious values, work values and social policy choices. *Diss Abstracts Int. Sec B: Sci Eng* 61:1694
- Felix, M., Sobel, L., & Salganicoff, A. (2023). Legal challenges to state abortion bans since the doobs decision. *Kaiser Family Foundation*. Retrieved from <https://www.kff.org/womens-health-policy/issue-brief/legal-challenges-to-state-abortion-bans-since-the-dobbs-decision/>
- Fischhoff B, Broomell SB (2020) Judgment and decision making. *Ann Rev Psychol* 71:331–355
- Foster DG, Gould H, Taylor J, Weitz TA (2012) Attitudes and decision making among women seeking abortions at one U.S. clinic. *Perspect Sexual Reprod Health* 44(2):117–124. <https://doi.org/10.1363/4411712>
- Hess JA, Rueb JD (2005) Attitudes toward abortion, religion, and party affiliation among college students. *Curr Psychol* 24(1):24–42. <https://doi.org/10.1007/s12144-005-1002-0>
- Hill A (2004) The relationship between attitudes about abortion and cognitive complexity. *UW-J Undergrad Res* VII:1–6
- Hodgkinson S, Beers L, Southammakosane C, Lewin A (2014) Addressing the mental health needs of pregnant and parenting adolescents. *Pediatrics* 133(1):114–122. <https://doi.org/10.1542/peds.2013-0927>
- Hoffmann JP, Johnson SM (2005) Attitudes toward abortion among religious traditions in the United States: change or continuity. *Soc Relig* 66(2):161–182. <https://doi.org/10.2307/4153084>
- Holman M, Podrazik E, Silber Mohamed H (2020) Choosing choice: how gender and religiosity shape abortion attitudes among Latinos. *J Race Ethnicity Politics* 5(2):384–411. <https://doi.org/10.1017/%20rep.2019.51>
- Homaifar N, Freedman L, French V (2017) “She’s on her own”: a thematic analysis of clinicians’ comments on abortion referral. *Contraception* 95(5):470–476. <https://doi.org/10.1016/j.contraception.2017.01.007>
- Hunt ME (2019) Shifting Abortion Attitudes using an Empathy-based Media Intervention: a randomized controlled study. graduate theses and dissertations Retrieved from <https://scholarworks.uark.edu/etd/3256>
- Jelen TG (2017) Public attitudes toward abortion and LGBTQ issues: a dynamic analysis of region and partisanship. *SAGE Open* 7(1):1–6. <https://doi.org/10.1177/2158244017697362>
- Jelen TG, Wilcox C (1997) Attitudes toward abortion in Poland and the United States. *Soc Sci Q* 78(4):907–921
- Jelen TG, Wilcox C (2003) Causes and consequences of public attitudes toward abortion: a review and research agenda. *Political Res Q* 56(4):489–500. <https://doi.org/10.2307/3219809>
- Kearney MS, Levine PB (2012) Why is the teen birth rate in the United States so high and why does it matter. *J Econ Perspect* 26(2):141–166. <https://doi.org/10.1257/jep.26.2.141>
- Kim-Prieto C, Diener E, Tamir M, Scollon C, Diener M (2005) Integrating the diverse definitions of happiness: a time-sequential framework of subjective well-being. *J Happiness Studies* 6(3):261–300. <https://doi.org/10.1007/s10902-005-7226-8>
- Klimecki O, Mayer S, Jusyte A et al. (2016) Empathy promotes altruistic behavior in economic interactions. *Sci Rep* 6:31961. <https://doi.org/10.1038/srep31961>
- Klimecki OM (2019) The role of empathy and compassion in conflict resolution. *Emotion Rev* 11(4):310–325
- Krause N, Hayward RD (2013) Prayer beliefs and change in life satisfaction over time. *J Relig Health* 52:674–694
- Lantos, H., Pliskin, E., Wildsmith, E., & Manlove, J. (2022). State-level abortion restrictions will negatively impact teens and children. *Child Trends*. Retrieved from <https://www.childtrends.org/blog/state-level-abortion-restrictions-will-negatively-impact-teens-and-children>
- Levenson H (1981) Differentiating among internality, powerful others, and chance. In: Lefcourt HM (Ed.) *Research with the Locus of Control Construct*. Academic Press, New York, NY, p 15–63. 10.1016/b978-0-12-443201-7.50006-3
- Iles-Caven Y, Gregory S, Ellis G, Golding J, Nowicki S (2020) The relationship between locus of control and religious behavior and beliefs in a large population of parents: an observational study. *Front Psychol* 11:1462. <https://doi.org/10.3389/fpsyg.2020.01462>
- Marton G, Pizzoli SFM, Vergani L, Mazzocco K, Monzani D, Bailo L, Pancani L, Pravettoni G (2021) Patients’ health locus of control and preferences about the role that they want to play in the medical decision-making process. *Psychol Health Med* 26(2):260–266. <https://doi.org/10.1080/13548506.2020.1748211>
- Mollen D, Hargons C, Klann EM, Mosley DV (2018) Abortion knowledge and attitudes among psychologists and graduate students. *Counseling Psychol* 46(6):738–760. <https://doi.org/10.1177/0011000018795296>
- Moudatsou M, Stavropoulou A, Philalithis A, Koukouli S (2020) The role of empathy in health and social care professionals. *Healthcare* 8(1):26. <https://doi.org/10.3390/healthcare8010026>
- Osborne D, Huang Y, Overall NC, Sutton RM, Petterson A, Douglas KM, Davies PG, Sibley CG (2022) Abortion attitudes: an overview of demographic and ideological differences. *Political Psychol* 43:29–76. <https://doi.org/10.1111/pops.12803>
- Pew Research Center. (2022, May 17). *Public Opinion on Abortion*. Retrieved from <https://www.pewresearch.org/religion/fact-sheet/public-opinion-on-abortion/>
- Pfathheicher S, Nockur L, Böhm R, Sassenrath C, Petersen MB (2020) The emotional path to action: empathy promotes physical distancing and wearing of face masks during the COVID-19 pandemic. *Psychol Sci* 31(11):1363–1373. <https://doi.org/10.1177/0956797620964422>
- Prusaczyk E, Hodson G (2018) Left-right differences in abortion policy support in America: clarifying the role of sex and sexism in a nationally representative 2016 sample. *Person Individ Differ* 127:22–25. <https://doi.org/10.1016/j.paid.2018.01.030>
- Reknes I, Visockaite G, Liefvooghe A, Lovakov A, Einarsen SV (2019) Locus of control moderates the relationship between exposure to bullying behaviors and psychological strain. *Front Psychol* 10:446169. <https://doi.org/10.3389/fpsyg.2019.01323>
- Richardson M, Abraham C, Bond R (2012) Psychological correlates of university students’ academic performance: a systematic review and meta-analysis. *Psychol Bull* 138(2):353–387. <https://doi.org/10.1037/a0026838>
- Russo D, Masegosa AR, Stol KJ (2022) From anecdote to evidence: the relationship between personality and need for cognition of developers. *Empir Software Eng* 27:71. <https://doi.org/10.1007/s10664-021-10106-1>
- Rye BJ, Underhill A (2020) Pro-choice and pro-life are not enough: an investigation of abortion attitudes as a function of abortion prototypes. *Sexuality Culture* 24:1829–1851. <https://doi.org/10.1007/s12119-020-09723-7>
- Saad, L. (2023, June 21). Abortion remains a potent issue for pro-choice voters. *Gallup*. Retrieved from <https://news.gallup.com/poll/507527/abortion-remains-potent-issue-pro-choice-voters.aspx>

- Sedgh G, Finer LB, Bankole A, Eilers MA, Singh S (2015) Adolescent pregnancy, birth, and abortion rates across countries: levels and recent trends. *J Adolesc Health* 56(2):223–30
- Scott J (1989) Conflicting beliefs about abortion: legal approval and moral doubts. *Soc Psychol Q* 52(4):319–326. <https://doi.org/10.2307/2786995>
- Shafir E, LeBoeuf RA (2002) Rationality. *Ann Rev Psychol* 53(1):491–517. <https://doi.org/10.1146/annurev.psych.53.100901.135213>
- Sohlberg J (2019) Elections are (not) exciting: need for cognition and electoral behaviour. *Scand Political Stud* 42(2):138–150. <https://doi.org/10.1111/1467-9477.12138>
- Steffen J, Cheng J (2023) The influence of gain-loss framing and its interaction with political ideology on social distancing and mask wearing compliance during the COVID-19 pandemic. *Curr Psychol* 42(10):8028–8038. <https://doi.org/10.1007/s12144-021-02148-x>
- Sundstrom B, Szabo C, Dempsey A (2018) “My Body. My Choice”: a qualitative study of the influence of trust and locus of control on postpartum contraceptive choice. *J Health Commun* 23(2):162–169. <https://doi.org/10.1080/10810730.2017.1421728>
- Valdez D, Jozkowski KN, Haus K et al. (2022) Assessing rigid modes of thinking in self-declared abortion ideology: natural language processing insights from an online pilot qualitative study on abortion attitudes. *Pilot Feasib Stud* 8:127. <https://doi.org/10.1186/s40814-022-01078-0>
- Verplanken B, Hazenberg PT, Palenewen GR (1992) Need for cognition and external information search effort. *J Res Person* 26(2):128–136. [https://doi.org/10.1016/0092-6566\(92\)90049-A](https://doi.org/10.1016/0092-6566(92)90049-A)
- Whitaker AK, Quinn MT, Martins SL, Tomlinson AN, Woodhams EJ, Gilliam M (2015) Motivational interviewing to improve postabortion contraceptive uptake by young women: development and feasibility of a counseling intervention. *Contraception* 92(4):323–329. <https://doi.org/10.1016/j.contraception.2015.06.015>
- Woodruff K, Biggs MA, Gould H, Foster DG (2018) Attitudes toward abortion after receiving vs. being denied an abortion in the USA. *Sexuality Res Soc Policy* 15(4):452–463. <https://doi.org/10.1007/s13178-018-0325-1>
- Xie W, Campbell S, Zhang W (2020) Working memory capacity predicts individual differences in social distancing compliance during the COVID-19 pandemic in the U.S. *PNAS* 117(30):17667–17674
- Xu P, Cheng J (2021) Individual differences in social distancing and mask-wearing in the pandemic of COVID-19: the role of need for cognition, self-control and risk attitude. *Person Individual Differ* 175:110706. <https://doi.org/10.1016/j.paid.2021.110706>
- Young DG, Bagozzi BE, Goldring A, Poulsen S, Drouin E (2019) Psychology, political ideology, and humor appreciation: why is satire so liberal. *Psychol Popular Media Culture* 8(2):134–147. <https://doi.org/10.1037/ppm0000157>

Author contributions

JC: conceptualization, data curation and analysis, writing, review& editing; PX: conceptualization, writing, review; CT: conceptualization, data curation and analysis, review.

Competing interests

The authors declare no competing interests.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional review board (IRB 23-0018) at the University of Northern Iowa with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Additional information

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