

UNCERTAINTY, PARENTING ATTITUDES, RISK PERCEPTIONS, AND
COVID-19 VACCINATION INTENTIONS

By

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Abstract

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The COVID-19 pandemic has had a significant impact on the lives of millions of people, particularly parents. Drawing on uncertainty-identity theory and research on intensive parenting attitudes, two studies sought to understand the effects of self-uncertainty, parenting beliefs, and perceived illness and vaccine side effect severity, on parental intentions to vaccinate children against COVID-19. We hypothesized that parents with intensive parenting attitudes would rely on their parenting identity to reduce uncertainty and make decisions about vaccinating their children. The results revealed that parents who perceived illness severity in unvaccinated children as high were more likely to vaccinate their children, while those who perceived vaccine side effect severity as high were less likely to intend to vaccinate their children. We found that the relationship between self-uncertainty and vaccination intentions was moderated by intensive parenting attitudes. Among parents with strong intensive parenting beliefs, uncertainty was positively associated with vaccination intentions, but this was not the case for parents with weaker intensive parenting attitudes. However, intensive parenting ideology did not moderate perceptions of vaccine side effects. These findings suggest that parents with intensive parenting beliefs may be more inclined to vaccinate their children because of the clear social identity outlined by the rigid norms associated with this parenting style, which prioritize the protection of children through vaccination.

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Introduction

The COVID-19 pandemic presented a significant challenge to the world's ability to predict and manage the impact of the disease, inducing great uncertainty in the United States and beyond (Gillman et al., 2022; Nagler et al., 2020). According to a poll conducted by the Kaiser Family Foundation (2020), 84% of Americans experienced drastic changes to their lives due to COVID-19. Across all demographic groups, parents with children under 18 reported the highest rates of change, with nearly 90% reporting major disruptions (Kaiser Family Foundation, 2020). The disturbances caused by the novel COVID-19 disease forced U.S. parents to completely reorganize their work, childcare, schooling, and support systems (Forbes et al., 2022; Minello, 2020).

In the initial months of the pandemic, parents had to make previously unthinkable adjustments for themselves and their children. State governments closed schools and daycares, and parents became solely responsible for their children's education, development, and around-the-clock care (Forbes et al., 2022). Even when schools reopened, parents had to manage their children's exposure to the virus with social distancing, quarantines, and successive closures (Head et al., 2021). These realities had a significant impact on parents' lives, and many could not balance their lives outside of their children without typical social help (Lewis, 2020; Senior, 2020). Economic insecurity and shifting job responsibilities further destabilized people's lives (Wang et al., 2021). For essential workers, working in the community with the added risk and stress of bringing the disease home to their families was a particularly challenging situation (Kaiser Family Foundation, 2020). Conflicting information about disease prevention

practices and heightened culture wars may have overwhelmed parents about how they should think, feel, and react to the unparalleled moment in history (Nagler, 2020; Perry et al., 2021).

The decision by parents to vaccinate their children against COVID-19, which has critical implications for controlling the severity of the pandemic, was likely influenced by this increased uncertainty. In October 2021, the FDA authorized COVID-19 vaccines in children over five, and parents had to decide whether and when to immunize their children against the disease (U.S. Food and Drug Administration, 2021). While some parents had no doubt about vaccinating their children, for others, the decision was more complicated. Vaccine hesitancy has long been a contentious issue in the United States and exists on a spectrum throughout many communities for various reasons (Smith et al., 2011).

Vaccine Intentions

Previous research analyzing child vaccine intentions has concentrated mainly on demographic and individual differences that predict hesitancy toward inoculation. Gust (2003) found less confidence in vaccine safety and more concern over the potential side effects among parents making between 50k and 75k annually and among those with only a high school education. A more recent study found that mothers' concerns about efficacy and safety were the top reasons for not vaccinating preadolescent children against influenza (Imburgia et al., 2017). Likewise, parents worried about vaccines' severe and long-term side effects reported hesitancy in their decision to vaccinate their children against any disease (Santibanez et al., 2020). Currently, little research has examined

parents' perceptions of COVID-19 vaccination for children. However, Karlsson (2021) found that predictors of vaccination for adults (or lack of COVID-19 vaccine hesitancy) were the degree to which people thought the vaccine was safe and their perception of COVID-19 disease severity. This suggests that for adults, trust is a major component of both the decision not to get vaccinated and to get vaccinated.

Worries about the efficacy and safety of vaccines indicate that an element of uncertainty is associated with parental vaccination intentions for COVID-19. Blaisdell et al. (2016) suggest that *scientific uncertainty*, such as missing, unreliable, or conflicting information, is a significant concern for parents deciding on vaccination for their children. This uncertainty is particularly relevant to COVID-19, where even experts have been uncertain about the disease and its prevention (Breslow, 2020; Nagler, 2020; Schumaker, 2020). However, Gillman et al. (2022) found that uncertainty about COVID-19 did not necessarily lead to vaccine hesitancy. Instead, individual character traits, such as lower tolerance for ambiguity and higher dispositional risk tolerance, were associated with lower COVID-19 vaccination intentions (Gillman et al., 2022). Although this study did not focus on child vaccination specifically, there is some evidence to suggest that parents' own vaccine intentions are related to their intentions to vaccinate their children. Opel et al. (2011) found that parents who were more likely to get a flu vaccine themselves were also more likely to vaccinate their children against the flu. However, parents' intentions to vaccinate their children are influenced by a range of factors, including their beliefs about vaccines, their perceptions of vaccine risks and benefits, their trust in healthcare providers, and their social networks (Brewer et al., 2017; Smith et

al., 2010). Therefore, while parents' own vaccine intentions may play a role in their decision to vaccinate their children, situational variances may also impact child COVID-19 vaccination intentions.

Uncertainty-identity Theory

Uncertainty-identity theory (UIT) argues that self-uncertainty is not solely an individual trait, but rather a state produced by contextual factors (Hogg, 2007).

According to this theory, individuals have a fundamental need to reduce uncertainty about themselves, their identities, and the social world around them. Self-uncertainty is defined as the degree to which individuals experience uncertainty about themselves and their identities due to situations that undermine their confidence in their beliefs, emotions, perceptions, and knowledge of self. Parents, for example, may be more distressed by uncertainty about how to best care for their children than non-parents because it impacts a highly relevant aspect of themselves – being a parent.

When individuals experience self-uncertainty, they are motivated to engage in behaviors that help reduce it. These behaviors can include seeking out information about themselves and gaining validation from others. Individuals may also engage in behaviors that help reduce uncertainty, such as relying on rigid beliefs and stereotypes. According to UIT, people are driven to reduce feelings of self-uncertainty by identifying with a social group (Hogg, 2007). Groups help inform one's values, morals, attitudes, and self-conception, as well as guide anticipation of their own and others' behaviors (Turner & Reynolds, 2012). UIT emphasizes the importance of understanding how self-uncertainty

arises in different contexts and the role that social identity and group identification play in reducing uncertainty about the self.

Importantly, the social categorization process involves perceiving a group only to the extent that individuals share distinctive attributes (Turner & Reynolds, 2012). Group norms, which are prescriptive and descriptive, provide critical information on how group members should behave and respond, particularly when uncertain about oneself (Hogg, 2007; Hogg & Turner, 1987; Cialdini et al., 1991). People assign group norms to themselves when they categorize as a group member, seeing themselves through the lens of a prototype, which is determined by how similar they are to other group members and how different they are from members of other groups (Hogg, 2021; Hogg et al., 2004). Uncertainty reductions, therefore, depend on social comparisons that define the prototype of a particular group (Hogg et al., 2004; Hogg, 2007).

People looking to groups to reduce uncertainty usually seek a prototype that transparently demonstrates how others ought to behave, think, or feel (Hogg, 2007). Groups with a distinct prototype are usually highly entitative – having apparent boundaries, high levels of essentialism, and offering moral prescriptions to their members (Hogg et al., 2007). Entitative groups are particularly attractive to people under high self-uncertainty because they define and prescribe explicit norms to guide thoughts, feelings, and actions (Hogg, 2021). These groups are also perceived to have immutable or innate qualities, making them particularly effective at reducing uncertainty (Clarkson et al., 2017; Hogg, 2007). Groups that have an explanatory system of beliefs, values, and attitudes, (otherwise known as ideology) are more attractive to people experiencing self-

uncertainty. (Hogg, 2005; 2007). Ideological belief systems—almost always attached to a group identity—explicitly delineate what one should and should not do in a self-contained macrocosm, ideally assisting uncertainty reduction (Hogg, 2007).

Intensive Parenting Attitudes

It may be unusual to conceptualize an ideology surrounding American parenthood, but according to sociological researcher Sharon Hays (1996) indeed one exists. Hays (1996) coined the term "intensive mothering ideology" (IMI) to describe the widespread cultural ideal of parenting as "child-focused, expert-guided, emotionally absorbing, labor-intensive, financially expensive" (p. 8). According to this perspective, women are biologically destined caretakers compared to men. Being a parent is life's most fulfilling endeavor and should take an extraordinary amount of effort and responsibility. A good mother puts her child's needs over everything else, despite being more challenging than any other job (Hays, 1996). Intensive parenting outlines a particular childcare style that emphasizes parents being highly involved in their children's lives, with a focus on maximizing their children's potential with constant supervision and high levels of emotional support. These beliefs represent a value-laden "correct" way to be a parent, implicitly juxtaposed with a bad parent— one who is neglectful, uninformed, or easy-going (Hays, 1996). Intensive parenting beliefs may be considered extreme as they set unrealistic and unattainable expectations for parents. This can result in negative consequences for both parents and children, including stress, anxiety, and pressure to conform to rigid gender roles (Novoa et al., 2022).

The Intensive Parenting Attitudes Questionnaire (IPAQ) is a self-report questionnaire that is designed to measure attitudes and beliefs related to intensive parenting practices (Liss et al., 2013). The IPAQ has been used to explore the association between intensive parenting beliefs and various outcomes, such as parental stress, child behavior problems, and child mental health (Schiffrin et al., 2015; Woodgate et al., 2015; Yerkes et al., 2021). Studies have found that parents who hold intensive parenting beliefs perceive greater threats to their child's well-being and are more likely to engage in protective behaviors, such as monitoring their child's activities and limiting their exposure to potential harm (Nelson et al., 2014; Novoa et al., 2022; Schiffrin et al., 2015). Researchers have used the IPAQ on a large, diverse segment of the United States to determine how this measure fits parenting attitudes in the country overall by matching the sample population to updated U.S. census data (Forbes et al., 2020). Interestingly, intensive parenting attitudes were widely held in American participants, with no significant differences in scores amongst various race, ethnicity, relationship status, number of children, social class upbringing, and age demographics. The pervasiveness and stability of IPAQ throughout the United States reveals a reliable ideology (attached to the identity of a good parent) that can inform and prescribe thoughts, feelings, and behaviors for parents under situations of self-uncertainty. The narrow conception of motherhood defined by intensive parenting ideology may be acting as a social group that prescribes social norms in time of uncertainty.

Additionally, mothers who hold intensive parenting beliefs may be more likely to seek out and participate in mothers' groups to gain support and guidance on how to meet

the high expectations of intensive parenting (Hays, 1996; Niela-Vilén et al., 2014) These groups may reinforce and perpetuate intensive parenting norms and practices through socialization processes, such as shared values and beliefs, role modeling, and peer pressure (Niela-Vilén et al., 2014). While many of these groups meet in person, Mothers' groups may also serve as a means for mothers to compare their own parenting practices to those of other mothers, which may fortify their intensive parenting beliefs (Guest & Keatinge, 2009). Traditionally, mothers' groups met in person to share experiences and exchange advice. However, with the advent of social media, mothers' groups are increasingly being organized online on sites like Facebook and Reddit (Hutchinson, 2020). This trend has accelerated during the COVID-19 pandemic when in-person meetings have been limited due to social distancing measures, making online groups a valuable way for mothers to stay connected.

Uncertain parents concerned about the COVID-19 disease or vaccine for their children may turn to rigid, essentialist, or extreme parenting beliefs to advise their decisions. Intensive parenting suggests parents, especially mothers, are exclusively responsible for their children, and should invest time and energy into being a "good" parent, including protecting them from harm (Reich, 2016). It could be expected that uncertain parents who highly endorse intensive parenting attitudes, may seek to reduce the uncomfortable feelings of uncertainty by informing their thoughts, perceptions, and behaviors through the intensive parent prototype. This may heighten the idea that they must spend substantial energy and care protecting their children from the COVID-19 disease (Liss et al., 2013; Reich, 2016). The intensified concern about their child's well-

being and fear of risks may also translate to greater worry about potential vaccine side effects (Luz, 2020; Ward et al., 2017). Since concern about vaccine side effects for children predicts vaccine hesitancy in parents and perceptions of illness severity motivate vaccination against COVID-19 in adults, intensive parenting beliefs may modulate vaccination intentions through perceptions of vaccine efficacy and side effects in children (Santibanez et al., 2020; Karlsson, 2021).

The current study seeks to understand the relationship between conceptual self-uncertainty, parenting beliefs, and COVID-19 vaccine intentionality for children. This research applies the theoretical components of UIT to investigate how uncertainty is related to vaccine intentions through risk perceptions of the COVID-19 disease and vaccine side effects. It also examines how intensive parenting attitudes moderates the perception of COVID-19 illness severity and vaccine side effects in children. Along with its theoretical significance, this study hopes to add to the sparse yet complex literature on child vaccine intentionality, especially regarding COVID-19. This work consists of data from two distinct samples considering to intensive parenting beliefs. One sample is comprised of parents involved in online parenting groups, and the other is comprised of parents of diverse socioeconomic backgrounds. The survey included measurement of uncertainty, belief in intensive parenting, risk perceptions of the COVID-19 vaccine, perception of COVID-19 illness severity in children, and intention to vaccinate their child against COVID-19.

Overview of the Research

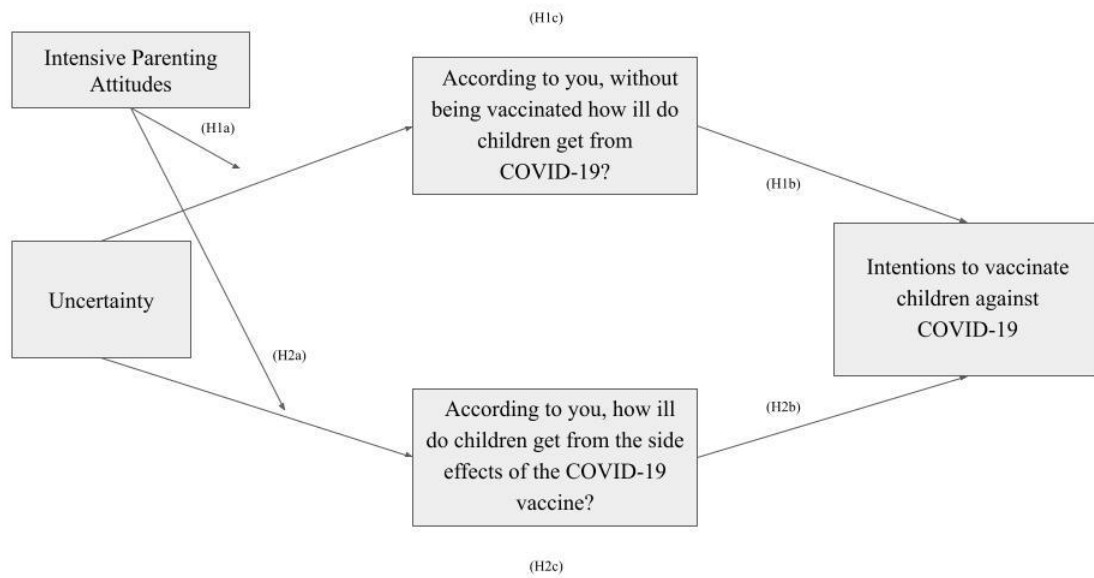
The following studies explored the relationships between parents' uncertainty, intensive parenting attitudes, perceptions of disease severity and vaccine side effects, and intentions to vaccinate their children against COVID-19. This research was approved by the Institutional Review Board (IRB 21-074) on January 4th, 2022 and data were collected between January and February 2022. Two studies (one sample of parents active in social media parenting communities and one sample of nationally representative parents) examined these associations. These data were part of a larger project; thus, we included only the relevant measures in the procedure. Each study hypothesized that:

(H1a) Intensive parenting attitudes (IPAQ scores) would moderate the impact of uncertainty on the perception of COVID-19 illness severity in children, such that those higher in intensive parenting will perceive the illness to be more severe compared to parents with lower scores (H1b) Perceptions of COVID-19 severity without child vaccination would positively predict intentions to vaccinate (H1c) Uncertainty would predict intentions to vaccinate through how ill parents perceive their child to get from COVID-19, such that uncertain parents would be more likely to perceive illness as more severe, increasing intentions to vaccinate (H2a) Intensive parenting attitudes (IPAQ scores) would moderate the impact of uncertainty on the severity of COVID-19 vaccine side effects in children such that those higher in intensive parenting attitudes would perceive side effects to be more severe compared to parents with lower scores, (H2b) Perceptions of COVID-19 side effects severity in children would negatively predict intentions to vaccinate, (H2c) Uncertainty would predict intentions to vaccinate through

how ill they perceive their child to get from COVID-19 vaccine side effects, such that uncertain parents would be more likely to perceive side effects to be more severe, decreasing intentions to vaccinate. See Figure 1 for the hypothesized model.

Figure 1

Conceptual Parallel Moderated Mediation Model in Study 1 and Study 2



Study 1 Method

Participants

We recruited 302 parents in the United States through Facebook and Reddit parenting groups. After obtaining permission from the group's moderators, researchers posted visual advertisements, including the link to the survey, to their group's forum. We excluded 98 parents with missing data on the key study variables for a final sample of 204 parents. Table 1 shows participant demographics.

Table 1

Participant Demographics in Study 1

	<i>N</i>	%
Age		
18-24 years old	6	2.7
25-34 years old	105	47.5
35-44 years old	89	40.3
45-54 years old	18	8.1
55-64 years old	1	0.5
65+ years old	2	0.9
Gender		
Women	203	91.9
Men	13	5.9
Non-binary	5	2.3

	<i>N</i>	%
Area of Residence		
Urban	51	23.1
Suburban	135	61.1
Rural	35	15.8
Race/Ethnicity		
White	194	87.8
Black/African American	2	0.9
American Indian/Alaska Native	1	0.5
Asian	5	2.3
Latino	3	1.4
Multiracial	12	5.4
Other	4	1.8
Annual Income		
Below \$10K	3	1.4
\$10-50K	37	16.7
\$50K-100K	56	25.3
\$100K-\$150K	61	27.6
Over \$150K	64	29.0
Education		

	<i>N</i>	%
Some high school, no diploma	1	0.5
High school graduate or equivalent	7	3.2
Some college, no degree	27	12.2
Trade/technical/vocational training	11	5.0
Associate degree	19	8.6
Bachelor's degree	85	38.5
Master's degree	56	25.3
Professional degree	7	3.2
Doctorate degree	8	3.6
Employment Status		
Working full-time	76	34.4
Working part-time	25	11.3
Unemployed and looking for work	1	0.5
Homemaker/Stay-at-home parent	105	47.5
Student	5	2.3
Other	9	4.1
Relationship Status		
Married	191	86.4
Widowed	1	0.5

	<i>N</i>	%
Divorced/Separated	4	1.8
Single	7	3.2
In a relationship	18	8.2
Number of Children		
One	91	54.8
Two	48	28.9
Three	23	13.9
Four or more	3	1.8
Age of Eldest Child		
0-1 years	53	31.9
1-2 years	31	18.7
3-5 years	41	24.5
6-8 years	15	9.0
9-11 years	4	2.4
12-14 years	9	5.4
15-17 years	3	1.8
18+ years	10	6.0
Political Identification		
Republican	12	5.4

	<i>N</i>	%
Democrat	126	56.5
Independent	54	24.2
Other	16	9.6
No preference	15	6.7

Note. $N = 221$ for all demographic characteristics, besides political identification ($N = 223$), and number of children ($N = 166$), and age of eldest child ($N = 166$).

Procedure

We conducted this study through Qualtrics, an online survey platform. The participants were informed that they were taking a survey about their attitudes toward parenting, parenting groups, and child-rearing practices. After participants agreed to take part in the study by providing informed consent, they answered questions about the number of children they had and their age(s). Next, participants disclosed the COVID-19 vaccination status of their children with a yes or no question. Participants then completed an adapted measure of the self-uncertainty scale, with additions of "I am concerned for future generations" and "I am worried about my children's or potential children's futures" $\alpha = .86$ (e.g., Rast et al., 2012). Next, participants completed an adapted version of the intensive parenting attitude questionnaire (IPAQ), including the fifteen items with the highest factor loadings (Liss et al., 2012). Example items are "parents never get a mental break from their children, even when they are physically apart" and "the child's schedule

should take priority over the needs of the parent's," $\alpha = .78$. Participants then completed a 3-item measure of intentions to vaccinate their children against COVID-19, consisting of the items "I intend to," "I plan to" and "It is likely I will get my child the COVID-19 vaccine when it is offered" $\alpha = .99$ (Hagger & Hamilton, 2022; Ajzen, 2002). We assessed risk perceptions of COVID-19 illness without vaccination with the question, "According to you, without being vaccinated, how ill do children get from COVID-19?". We assessed risk perceptions of COVID-19 vaccine side effects with the question, "According to you, how ill do children get from side effects of the COVID-19 vaccine?". All questions were measured on a 1 to 7 Likert scale. Participants then completed a measure indicating their level of conservatism, $\alpha = .83$. Finally, participants answered a collection of demographic questions. Table 2 shows descriptive statistics and correlations for the study variables. Survey measures are available in the appendices.

Table 2.*Descriptive Statistics and Correlations for Study 1 Variables.*

Variable	N	M	SD	1	2	3	4	5	6
1. Uncertainty	267	5.50	1.15	--	-.01	.21**	.09	-.04	.18*
2. Intensive Parenting Attitudes	255	3.92	0.74	-.01	--	-.11	.15*	.14*	-.10
3. Conservatism	221	5.50	1.36	.21**	-.11	--	.16*	-.24**	.38**
4. Perception of COVID-19 disease severity without vaccination	204	3.67	1.04	0.9	.15*	.16*	--	.01	.36**
5. Perception of COVID-19 vaccine side effects	204	2.19	1.11	-.04	.14*	-.24**	.01	--	-.44**
6. Intentions to vaccinate against COVID-19	204	5.92	1.88	.18*	-.10	.38**	.36**	-.44**	--

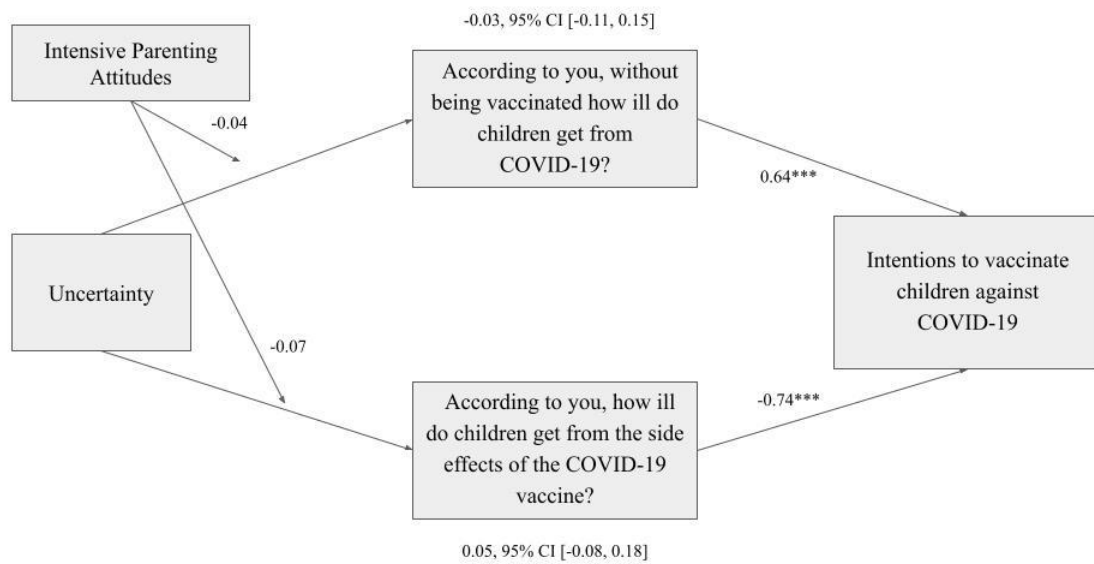
Study 1 Results

We conducted a parallel moderated mediation using Hayes Process 7 with the perception of disease risk and perception of side effect severity entered simultaneously as mediators in SPSS (Hays, 2013). See Figure 2 for a model with path coefficients.

Intensive parenting attitudes did not significantly moderate the impact of uncertainty on risk perceptions of COVID-19 disease ($\beta = -0.04$, $t = -0.65$, $p = .517$) or risk perceptions of COVID-19 vaccine side effects ($\beta = -0.07$, $t = -0.91$, $p = .361$), failing to support hypothesis 1a or 2a. However, we found support for hypotheses 1b and 2b. As the perception of COVID-19 disease severity increased, intentions to vaccinate increased ($\beta = 0.64$, $t = 6.20$, $p < .001$). Additionally, as the perception of COVID-19 vaccine side effects increased, intentions to vaccinate decreased ($\beta = -0.74$, $t = -7.70$, $p < .001$). Still, the index of moderated mediation was not significant for the indirect effects of the interaction between uncertainty and intensive parenting attitudes on intentions to vaccinate through perceptions of COVID-19 disease severity (index = -0.03 , $SE = 0.07$, 95% CI = $[-0.113, 0.153]$), or perceptions of side effect severity (index = 0.05 , $SE = 0.06$, 95% CI = $[-0.070, 0.175]$). Thus, the data do not support hypotheses 1c or 2c.

Figure 2

Indirect Effect of Self-Uncertainty by Intensive Parenting Attitudes on Intentions to Vaccinate Through Perception of Illness Severity and Side Effect Severity in Study 1.



Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Study 1 Discussion

The results of Study 1 did not support the hypothesized moderated mediation. Intensive parenting had no significant interactions with the perceptions of disease severity or vaccine side effects. Neither perception of disease severity nor vaccine side effects significantly mediated the relationship between self-uncertainty and vaccine intentionality. One explanation is that participants might have relied on other social identities, such as political identities, to inform their decision to vaccinate. The majority of this sample identified as partisan Democrats, which may have informed their perceptions over and above their parent identity. Uncertain individuals who identified as liberal could have perceived vaccination as a core group attribute and should be more willing to support a decision reflecting their political identity. Additionally, the demographics of this sample were majority white, wealthy, and had an above-average level of education. This sample may have different experiences with parenting than the general parenting population due to their socio-economic advantages, access to resources, and social networks. These parents may have more emotional and practical support, both before and during the pandemic, providing a buffer against stress and difficulties. Finally, this sample was likely underpowered to detect meaningful differences in the regression analyses.

We designed Study 2 to address several limitations and questions developed from Study 1. First, the sample size in Study 1 was likely too small and homogenous to detect the effects of the moderated mediation. By surveying a larger, nationally representative sample, we could gain insight into how self-uncertainty and intensive parenting attitudes

are related to vaccination intentions through risk perceptions in parents of diverse backgrounds. We wanted to investigate these relationships among parents with varied political and socioeconomic identities. We designed Study 2 as a conceptual replication of Study 1 that uses the same methodology to test the same theoretical proposition in a different population of parents, thus extending the generalizability of our results.

Study 2 Method

Participants

We recruited 559 parents living in the United States to participate in a survey through the research marketing company Rex Direct. We excluded 47 participants with missing data on the key study variables for a final sample of 512. Table 3 shows participant demographics.

Table 3.

Participant Demographics in Study 2

	<i>N</i>	%
Age		
18-24 years old	25	5.0
25-34 years old	133	26.4
35-44 years old	216	42.9
45-54 years old	114	22.7
55-64 years old	13	2.6
65+ years old	2	0.4
Gender		
Women	408	81.0
Men	93	18.5
Non-binary	2	0.2
Prefer not to say	1	0.2

	<i>N</i>	%
Area of Residence		
Urban	150	29.8
Suburban	189	37.5
Rural	165	32.7
Race/Ethnicity		
White	383	76.0
Black/African American	53	9.5
American Indian/Alaska Native	11	2.2
Asian	17	3.4
Latino	19	3.8
Multiracial	13	2.6
Other	4	0.8
Annual Income		
Below \$10K	57	11.3
\$10-50K	226	44.8
\$50K-100K	149	29.6
\$100K-\$150K	50	9.9
Over \$150K	22	4.4
Education		

	<i>N</i>	%
Some high school, no diploma	30	6.0
High school graduate or equivalent	149	29.6
Some college, no degree	130	25.8
Trade/technical/vocational training	37	7.3
Associate degree	64	12.7
Bachelor's degree	60	11.9
Master's degree	29	5.8
Professional degree	3	0.6
Doctorate degree	2	0.4
Employment Status		
Working full-time	231	45.8
Working part-time	62	12.3
Unemployed and looking for work	35	6.9
Homemaker/Stay-at-home parent	137	27.2
Student	6	1.2
Other	33	6.5
Relationship Status		
Married	270	53.6
Widowed	15	3.0

	<i>N</i>	%
Divorced/Separated	59	11.7
Single	69	13.7
In a relationship	91	18.1
Number of Children		
One	141	25.9
Two	165	30.3
Three	130	23.9
Four or more	109	20.0
Age of Eldest Child		
0-1 years	17	3.1
1-2 years	35	6.4
3-5 years	50	9.2
6-8 years	52	9.5
9-11 years	68	12.5
12-14 years	86	15.8
15-17 years	74	13.6
18+ years	163	29.9
Political Identification		
Republican	166	32.9

	<i>N</i>	%
Democrat	135	26.7
Independent	134	26.5
Other	14	2.8
No preference	56	11.1

Procedure

Study 2's procedure was identical to Study 1. Participants completed the adapted self-uncertainty scale, $\alpha = .90$, the adapted IPAQ, $\alpha = .80$, and the 3-item measure of intentions to vaccinate their children against COVID-19, $\alpha = .98$. Risk perceptions of COVID-19 illness in unvaccinated children and COVID-19 vaccine side effects in their children were assessed with two questions measured on a 7-point Likert scale. Participants then completed a measure indicating their level of conservatism, $\alpha = .93$. Table 4 contains means and standard deviations for the sample.

Table 4*Descriptive Statistics and Correlations for Study 1 Variables.*

Variable	N	M	SD	1	2	3	4	5	6
1. Uncertainty	539	5.04	1.29	--	.33**	.16**	.18**	.07	.12**
2. Intensive Parenting Attitudes	527	4.50	0.80	.33**	--	.17**	.18**	.13**	.18**
3. Conservatism	505	3.85	1.69	.16**	.17**	--	.23**	-.02	.32**
4. Perception of COVID-19 disease severity without vaccination	513	3.39	1.57	.18**	.18**	.23**	--	.25**	.52**
5. Perception of COVID-19 vaccine side effects	513	3.89	1.63	.07	.13**	-.02	.25**	--	-.08
6. Intentions to vaccinate against COVID-19	513	3.24	2.10	.12**	.18**	.32**	.52**	-.08	--

Study 2 Results

We conducted a parallel moderated mediation using Hayes Process 7 with the perception of disease risk and perception of side effect severity entered simultaneously as mediators in SPSS (Hayes, 2013). Based on the results of Study 1, we ran the same analysis covarying for conservatism. Conservatism was not a significant covariate, so the reported results are from the original analysis. See Figure 3 for path coefficients.

In support of hypothesis 1a, intensive parenting attitudes moderated the impact of uncertainty on risk perceptions of COVID-19 disease ($\beta = 0.17, t = 2.96, p = .003$). As self-uncertainty increased, perceived COVID-19 disease severity increased more for parents higher than lower in intensive parenting attitudes. In turn, reported intentions to vaccinate increased as perceived disease severity increased ($\beta = 0.77, t = 14.98, p < .001$), and this relationship was stronger for people with higher rather than lower in intensive parenting beliefs (See Figure 4). As such, these results are consistent with hypothesis 1b.

Conversely, data did not support hypothesis 2a. Intensive parenting attitudes did not moderate the effect of self-uncertainty on perceptions of side effect severity ($\beta = 0.10, t = 1.64, p = .101$) (See Figure 5). Still, perceptions of side effects severity significantly predicted intentions to vaccinate, such that as perceptions of side effects increased, intentions to vaccinate decreased ($\beta = -.29, t = -5.97, p < .001$), which supported hypothesis 2b.

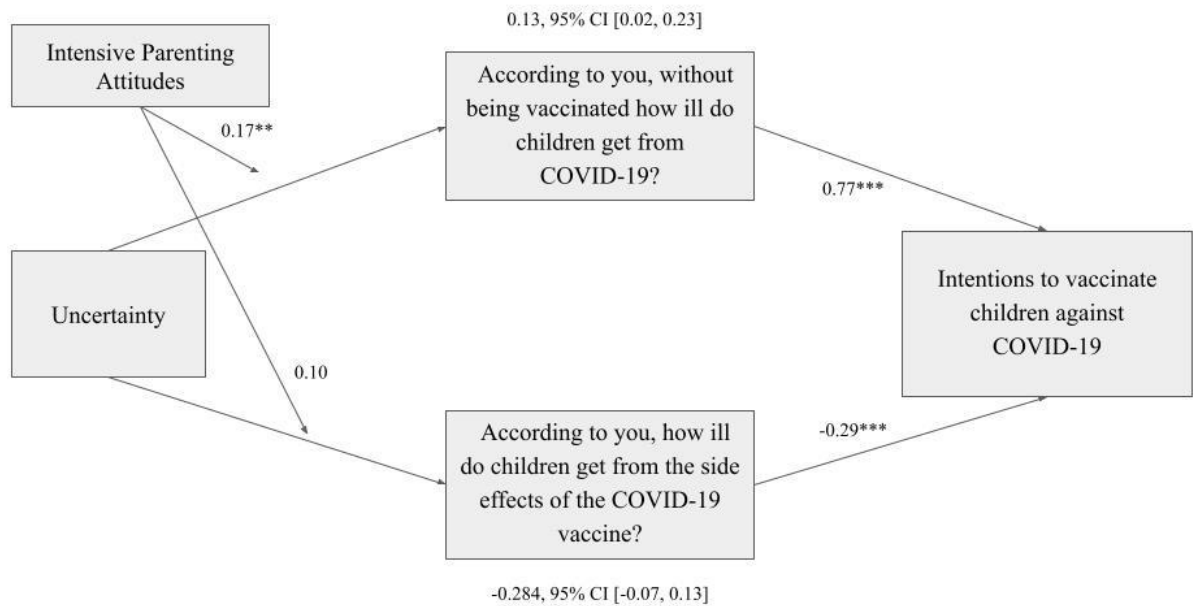
The index of moderated mediation was significant for the indirect effect of the interaction between uncertainty and intensive parenting attitudes on intentions to vaccinate through perceptions of COVID-19 disease severity (index = 0.13, SE = 0.05,

95% CI = [0.02, 0.223]). Perceptions of COVID-19 disease severity fully mediated the relationship between self-uncertainty and intentions to vaccinate for parents high in intensive parenting attitudes. Still, it was not significant through perceptions of side effect severity (index = -0.03, SE = 0.02, 95% CI = [-0.070, 0.012]). Perceptions of side effect severity did not significantly mediate the relationship between self-uncertainty and intentions to vaccinate. Thus, the data support hypothesis 1c but not hypothesis 2c.

The results of the parallel moderated mediation indicate that perceptions of disease severity and perceptions of side effects severity have different associations with COVID-19 vaccine intentionality. Only for those high in intensive parenting beliefs, self-uncertainty is associated with increased vaccine intentionality through the perception of COVID-19 disease severity. However, self-uncertainty and intensive parenting attitudes were not related to increased perceptions of vaccine side effects. Still, the perception of side effects severity was associated with decreased vaccine intentionality, regardless of self-uncertainty or intensive parenting beliefs. See Figure 3 for path coefficients.

Figure 3

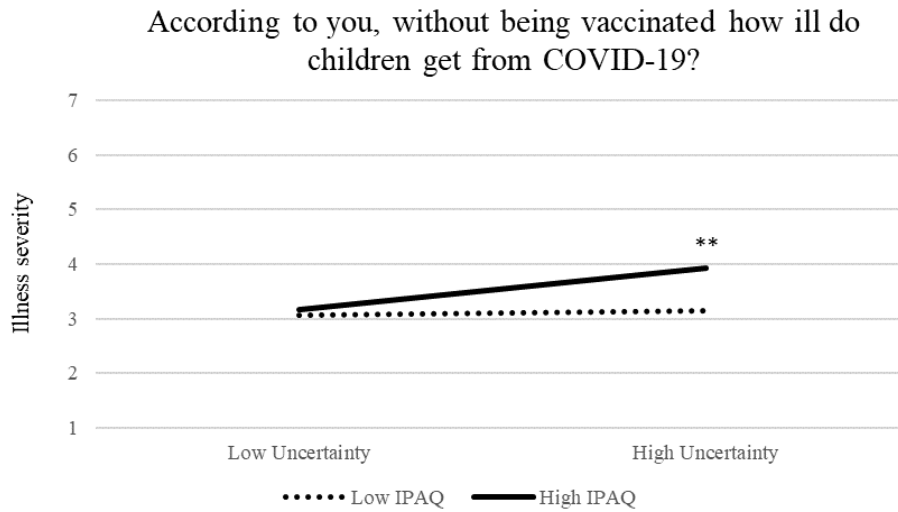
Indirect Effect of Self-Uncertainty by Intensive Parenting Attitudes on Intentions to Vaccinate Through Perception of Illness Severity and Side Effect Severity in Study 2.



Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 4

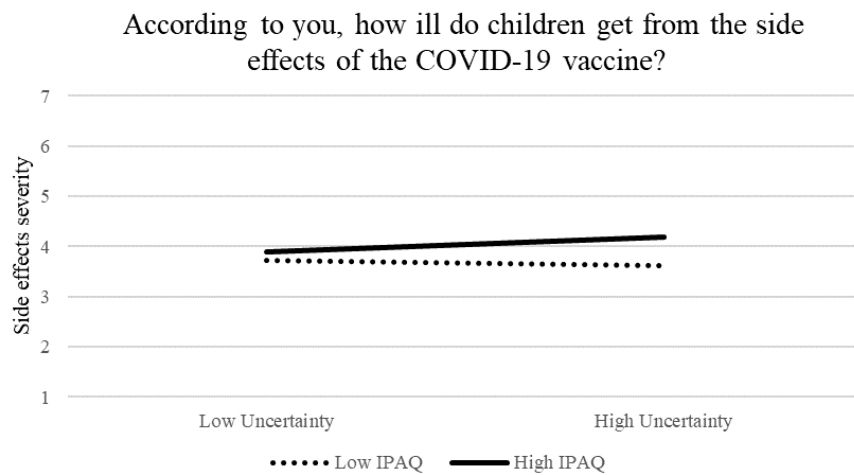
Perceived Illness Severity Without Vaccination Predicted by Uncertainty, Moderated by Intensive Parenting Attitudes in Study 2.



Note. ** $p < .01$

Figure 5

Perceived Vaccine Side Effect Severity Predicted by Uncertainty, Moderated by Intensive Parenting Attitudes in Study 2.



Study 2 Discussion

Differing from Study 1, Study 2 results supported our hypothesis that perceptions of COVID-19 severity in children mediate the relationship between uncertainty and vaccine intentions for parents high in intensive parenting attitudes. As self-uncertainty increased, parents with higher rather than lower intensive parenting attitudes scores perceived that the COVID-19 disease would be more severe for their unvaccinated children. Only self-uncertain parents high in intensive parenting attitudes perceive greater COVID-19 severity without vaccination, which in turn predicted increased intentions to vaccinate. Compared to parents with lower intensive parenting attitudes, self-uncertain parents with higher intensive parenting attitudes may be more concerned about protecting their children from the COVID-19 illness. Derived from uncertainty-identity theory (UIT), this work predicted that parents high in intensive parenting attitudes should look towards their intensive parenting identity to inform their perception of the world and reduce uncertainty. Within this context, intensive parenting norms dictate that parents have a child-centered, protective approach to parenting. Thus, UIT predicts that self-uncertainty should strengthen perceived illness severity for these parents, as a means of validating their beliefs, attitudes, and behaviors.

In a similar manner as Study 1, intensive parenting attitudes did not moderate the effect of uncertainty on the perception of COVID-19 side effects. Perceptions of side effect severity also did not mediate the relationship between uncertainty and vaccine intentions. However, we found further support that as perceptions of side effects severity

increased, intentions to vaccinate decreased, despite levels of uncertainty or intensive parenting attitudes.

One explanation for the discrepancy in Study 2's mediation results may be that parents perceive illness without vaccination as more severe than the risk of potential vaccine side effects. This is further corroborated by the higher correlation between IPAQ scores and disease severity, compared to the correlation between IPAQ scores and side effects severity (See Table 4). With this in mind, the results of this study are consistent with the predictions of UIT. UIT posits that group norms (like intensive parenting) should dictate which aspects of COVID-19 (illness or vaccine side effects) are perceived as most severe in children and prescribe a group normative manner to respond to this perception. Intensive parenting attitudes indicate beliefs that children are sacred and need to be protected (Liss et al., 2012). Although our model predicts that self-uncertain parents with higher levels of intensive parenting beliefs should perceive greater levels of both illness severity and vaccine side effects, intensive parenting norms may indicate protection explicitly through vaccination. If parents with higher intensive parenting beliefs perceive that the benefits of COVID-19 vaccination outweigh the potential harms, protection through vaccination would be consistent with group norms.

General Discussion

Across two correlational studies, we demonstrated that parents' perceptions of COVID-19 disease severity in unvaccinated children and perception of COVID-19 vaccine side effects are associated with intentions to vaccinate. In a nationally representative survey of American parents, self-uncertain parents high in intensive parenting attitudes showed a positive association between intentions to vaccinate through the perception of COVID-19 illness severity in unvaccinated children. These findings support the body of literature showing that self-uncertainty ties perceptions and behaviors to group norms and extends this into group norm-based COVID-19 vaccine perception and corresponding behaviors. An interesting finding is that regardless of parents' uncertainty or intensive parenting beliefs across both samples, perceptions of vaccine side effect severity were negatively associated with child vaccine intentions. However, perceptions of COVID-19 illness severity in unvaccinated children had a stronger relationship to intentions to vaccinate in the nationally representative sample of parents than in parents involved in online parenting groups. This might suggest that parents involved in online parenting communities have different norm-based perceptions of vaccine benefits and risks. Another interesting note is how the family dynamics between samples in Study 1 and Study 2 were different from one another. Most parents in Study 1 were not only younger and married, but they had children under the age of eight. In contrast, parents in Study 2 were overall older, fewer were married, but most importantly, a significant amount (29.9%) had children over the age of 18. Parents with adult children

likely would have responded differently to the intention to vaccinate measure because the decision was not necessarily theirs to make.

Our theoretical model predicted that self-uncertain parents with high intensive parenting beliefs should perceive the illness and side effects as the most severe, which was not supported by Study 1, but was partially supported with Study 2. It is possible that self-uncertainty promotes adherence to group norm-based perceptions and that parents perceive child vaccination as protective rather than harmful overall. Still, perceptions of vaccine side effects severity were negatively associated with intentions to vaccinate. Thus, the relationship between parents' uncertainty and intensive parenting attitudes on intentions to vaccinate may be more nuanced than originally hypothesized.

Limitations and future research directions

As these data are correlational, there is a clear need for experimental replications and extensions to properly test the theoretical model we initially proposed. For example, manipulating self-uncertainty and measuring intensive parenting attitudes along with perceptions of illness severity and vaccine side effects would provide more information as to whether a self-uncertainty motive is responded to differently by parents with varying degrees of intensive parenting attitudes. Such an experiment would also test whether self-uncertainty maximizes group normative perceptions and behaviors simultaneously. In addition, we did not conduct a sensitivity analysis following the multiple regression tests, which would have increased our results' validity and reliability. Study 1 was also likely underpowered to detect robust effects.

Collecting data only in the United States means these findings may not generalize to parents globally. Another limitation may be the timeframe in which we collected data. Though the vaccine was made available for children in October 2021, these data were collected three to four months after their release. Parents may have had different perceptions of illness severity and vaccine side effects earlier in the pandemic, for instance, before the vaccine was FDA approved. As previously discussed, we did not limit analyses to parents with the responsibility of vaccine decisions for their children (parents with adult children). A follow-up study may be informative of how child age impacts parental decision to vaccinate. Finally, our intention to vaccinate measure was limited because it relied on self-reporting intentions rather than actual behaviors.

Conclusion

The COVID-19 pandemic led to significant instability, which undermined people's ability to predict and understand the world. This heightened uncertainty resulted in a shift in attention towards relevant group identities, such as intensive parenting, that provide normative frameworks for responding to the pandemic, particularly for decisions regarding their children. Our findings support the uncertainty identity theory's hypothesis that self-uncertainty ties individuals' perceptions and behaviors to salient group membership. Major external events frequently trigger a range of uncertainties and threats. Further research could examine whether self-uncertainty enhances group normative threat perception and behavior for parents with high and low intensive parenting beliefs outside of the COVID-19 context.

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Appendix A : Self-Uncertainty Measure

1. I am uncertain about myself and the future.
2. I am worried about myself and the future.
3. I am concerned about myself and the future.
4. I am concerned for future generations.
5. At this very moment, I am uncertain about the future of my country.
6. I am worried about my children's, or potential children's futures.

Items were presented on a scale from 1 = (*strongly disagree*) to 7 (*strongly agree*)

Appendix B: Intensive Parenting Attitudes Questionnaire (IPAQ)

1. Although fathers may mean well, they generally are not as good at parenting as mothers.
2. Parents should begin providing intellectual stimulation for their children prenatally, such as reading to them or playing classical music.
3. Parents never get a mental break from their children, even when they are physically apart.
4. Being a parent brings a person the greatest joy they can possibly experience.
5. It is important for children to be involved in classes, lessons, and activities that engage and stimulate them.
6. The child's schedule should take priority over the needs of the parents.
7. Child rearing is the most demanding job in the world.
8. Holding his or her baby should provide a parent with the deepest level of satisfaction.
9. Men do not naturally know what to do with children.
10. A parent should feel complete when they look in the eyes of their infant.
11. Children should be the center of attention.
12. Men are unable to care for children unless they are given specific instructions about what to do.
13. Finding the best educational opportunities for children is important as early as preschool.
14. It is harder to be a good parent than to be a corporate executive.
15. Children's needs should come before their parents.

Items were presented on a scale from 1 = (*strongly disagree*) to 7 (*strongly agree*)

Appendix C: Risk Perceptions

1. According to you, without being vaccinated how ill do children get from COVID-19?
2. According to you, how ill do children get from side effects of the COVID-19 vaccine?

Response options were presented on a 7-point scale. (1) *Normal, not at all ill*; (2) *Minimally ill*; (3) *Mildly ill*; (4) *Moderately ill*; (5) *Markedly ill*; (6) *Severely ill*; (7) *Very severely ill*

Appendix D: Intentions to Vaccinate Children Against COVID-19

1. I intend to get my child the COVID-19 vaccine when it is offered.
2. I plan to get my child the COVID-19 vaccine when it is offered.
3. It is likely I will get my child the COVID-19 vaccine when it is offered.

Items were presented on a scale from 1 = (*strongly disagree*) to 7 (*strongly agree*)

Appendix E: Conservatism

1. In general, how liberal or conservative are you on social issues?
2. In general, how liberal or conservative are you on economic issues?
3. In general, how liberal or conservative are you overall?

Items were presented on a scale from 1 = (*Very conservative*) to 7 (*Very liberal*)