Monogamy as Protection Against COVID-19?:

Non-monogamy stigma and Risk (Mis)perception

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Abstract

COVID-19 public health messages largely communicated that Americans were "safer at home." Implicit in this advice are messages about protections ostensibly also offered by monogamy–that having more relationships is always more dangerous than having fewer relationships and that closer relationships are always safer–from a disease transmission perspective–than unfamiliar relationships. These heuristics may have led people to discount other COVID-19 dangers (such as spending more time with others of unknown infection status) and to ignore COVID-specific safety measures (such as mask-wearing, ventilation). We conducted three studies in which we used experimental vignettes to assess people's perceptions of COVID-risky targets in monogamous relationships with a close, committed partner versus targets who were described as non-monogamous with casual partners but relatively COVID-

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safe. Participants perceived monogamous-but-COVID-riskier targets as more responsible and safer from COVID-19. Non-monogamy stigma seems to extend analogously to COVID-19 risk. Public health messages that fail to attend to the specifics and nuances of close relationships risk contributing to this stigma and ultimately undermining the goals of reducing spread of infectious disease.

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In March 2020, Americans were advised, and in many cases mandated, to associate only with members of their immediate household (Moreland et al., 2020). These measures were implemented, of course, to prevent the spread of COVID-19. The message was tidy and easily encapsulated– there were "stay-at-home" orders and Americans were told that they were "safer at home" (Brito, 2020).

In the construction of messages related to COVID-19, the CDC and other public health organizations were most likely assuming that the U.S. population would pick up the nuances of their necessarily laconic messages. That is, we presume that the public was presumed to understand that (as one example) although it is highly safe to associate only with members of your household if no member of your household is infected with COVID-19, it is highly *dangerous* to interact with other members of your household if they happen to be infected. That is, because the effects of COVID exposure are cumulative, and spending a great deal of time with an infected person (which is what people do when they share households with others) is especially dangerous. In other words, living in the same house is obviously no talisman against COVID-19 transmission (Grijalva et al., 2020; Lei et al., 2020).

Yet stay-at-home orders and the media surrounding them did not explicate these assumptions. Instead, we argue, they conveyed two interrelated implicit messages. The first is

that people with whom you have close relationships are safer than strangers (which is why you should be at home with members of your household). Of course, very familiar people (i.e., people with whom you have closer, more intimate relationships, such as the family or housemates with whom you live) who do *not* have COVID-19 are indeed safer than strangers who do have COVID-19. But it is hard to imagine that this is useful health advice–there was no way, at the time the stay-at-home messages were crafted, to definitively sort out who was COVID-positive or COVID-negative. Moreover, even after COVID-19 tests became available, it was still impossible to know a person's status at any given time. COVID-19 tests are not always accurate due to false negatives, missed detection windows, or because a partner contracted COVID-19 after taking the test (Toth et al., 2021). Without knowing the infection status of one's household members, one might incorrectly presume that household members pose less risk of COVID-19 transmission than do individuals with the same risk factors who live *outside* of the household.

The other implicit message provided by COVID public health messages is that the fewer people you interact with, the safer you are from COVID-19, irrespective of any other aspects of risk. Of course, if all risk factors were equivalent across the people with whom one interacts, and if the risk reduction behaviors taken by the interaction partners were exactly the same, it is true that every additional person with whom one interacts contributes to additional risk of infection. However, interacting with multiple people of unknown COVID-19 status for short periods of time or with masks on, is safer than interacting with people of unknown status for a longer period of time without masks (which people do while cohabitating; Grijalva et al., 2020; Lei et al., 2020). From a statistical perspective, one long, unmasked period of contact with a close friend is worse than several brief, masked contacts with a stranger. But this probability may be obscured because intimate or close relationships imply positive or desirable connotations that are not necessarily accurate (Boyes & Fletcher, 2007; Gagne & Lydon, 2004).

As many health researchers know, feelings of trust and intimacy are not truly diagnostic criteria for accurately assessing the risk posed by a relationship partner (McDonald, 2009; Swan & Thompson, 2016; Treas & Giesen, 2000; Whisman & Snyder, 2007). Yet the U.S. exalts intimate and close relationships, exemplified by the fact that monogamy is both public policy and a dominant narrative surrounding sexuality (Conley & Piemonte, 2020). Therefore, we might expect that overlearned beliefs that having "fewer relationships are always better" and that "interactions with close partners are always safer" would extend to the context of COVID-19. First, people may assume that fewer encounters of any type are better than more encounters of any type – for example even if a single encounter lasts a long time in a poorly-ventilated environment and each of multiple encounters are very brief in well-ventilated environments. Second, people may assume that encounters of any type with an intimate partner (e.g., a household member, a close friend, a romantic partner) are better than encounters of any type with an unfamiliar person – even if the familiar person disregards health behaviors and the unfamiliar person follows them.

Close Relationships and Health Messaging

When people use intimate relationships as a heuristic for positive associations (such as health, happiness, or safety) they may inadvertently increase their risk of disease, harm, or danger (Boyes & Fletcher, 2007; Gagne & Lydon, 2004). And indeed, some strategies for reducing risk of COVID-19 transmission played on these themes of familiarity and closeness: some news media outlets promoted "pods" or "bubbles," made up of a select few others who are deemed close or intimate enough to justify regular contact (Smith & Winters, 2020).

However, avoidance of everyone outside of one's household was never the only means of preventing COVID-19. For example, limiting time with other people, properly ventilating enclosed environments or staying outside, and wearing masks also reduce the odds of COVID-19 transmission (Bazant & Bush, 2021; Honein et al., 2020; Li et al., 2021) and could all be

employed by individuals (as opposed to stay-at-home measures, which required participation of all members of the household). Some Americans probably did not comprehend that even if one is interacting with people outside one's household, there are many ways to stay relatively safe, perhaps because of overlearned associations with monogamy as a health strategy. But providing pithy and straightforward messages, we argue, might lead people to believe that restricting encounters to seeing only other household members is foolproof against disease transmission – given that monogamy has been well-publicized public policy for several decades (Conley & Piemonte, 2020).

This line of reasoning is consonant with the fact that public health messages have been misinterpreted in the past (Conley et al., 2015; Swan & Thompson, 2016), which necessitates examining them closely. In particular, the emphasis on limiting contact to people within a person's household as a means of preventing the spread of a disease–in this case COVID-19–parallels a different epidemic in which public health messages were misinterpreted to deleterious effect. Specifically, Americans have misinterpreted messages about HIV-prevention and STD-prevention in ways that limited the effectiveness of those public health campaigns.

Misinterpretation of HIV/STD-prevention Public Health Messages

Throughout the past several decades, public health officials have generated messages about restricting contact with others, with the goal of preventing the transmission of HIV and other STDs. Two interrelated messages developed to combat HIV/STD transmission that were misconstrued by the public are 1) the 1980s directive to "Know your partner" and 2) the ongoing emphasis on monogamy to prevent the transmission of sexually transmitted diseases and infections.

Know Your Partner. One early public health message to emerge from the AIDS crisis in the 1980s was the behest from Surgeon General C. Everett Koop to "Know your partner" (Koop,

1987). The assumption in this case was, presumably, that knowing your partner means definitively determining their HIV status, and then refusing to have sex with them if they are HIV-positive (Conley & Piemonte, 2020). However, in practice, people seemed to have interpreted that advice differently (Kaiser Family Foundation, 2006; Swann et al., 1995). In an experimental study, Swann and colleagues (1995) indirectly assessed risk perceptions by providing participants information about some target individuals, but not others. They found that when people received completely non-diagnostic information about these individuals, they judged them less likely to have HIV than when this information was not provided (Swann et al., 1995); participants' judgments and risk perceptions were altered by the inclusion of irrelevant contextual information about the target individual's life. Thus, people seem to have interpreted the prescriptive advice to "know your partner" to mean that you are fairly safe from HIV as long as you avoid sex with strangers. Of course, knowing someone does not mean that person does not have HIV. Therefore the message is, at a literal level, at least incomplete, and the public's misinterpretation of the message renders it likely useless (see Swan & Thompson, 2016).

Numerical monogamy as STD-prevention. In the same vein as the 1980s "Know your partner" directive is the contemporary pressure on Americans to be numerically monogamous to prevent the transmission of STDs. We use the term *numerically monogamous* to indicate that someone is only having sex with one person–and to distinguish *numerical monogamy* from developing an identity as a monogamous person irrespective of the number of sexual partners one had in the past, has currently, or plans to have in the future (see Conley, Matsick et al., 2015; Conley & Piemonte, 2020). By contrast, identity-based monogamy means that an individual thinks of oneself as monogamous– even if they are having multiple partners over time, such as in serial monogamy (Abramson & Pinkerton, 2002; Anderson, 2010; Conley, Ziegler et al, 2013).

On its face, numerical monogamy is extremely (though not perfectly) effective. That is, if everyone were indeed having sex with only one person, with adequate time and rigorous testing

between partners, there would be many fewer STDs. The reason STDs persist, then, has to do with the definition and implementation of monogamy (see e.g., Conley & Piemonte, 2020; Swan & Thompson, 2016).

As we document elsewhere (Conley & Piemonte, 2020), monogamy–including identity-based monogamy–is widely regarded as effective against STDs (Conley, Moors et al., 2015). Perhaps because of this misunderstanding, the public health advice to be monogamous has persisted despite any evidence of monogamy's effectiveness in practice–at least as monogamy is implemented. Rates of STDs have actually increased during the time period that monogamy has been recommended (CDC, 2019a; Pearson et al., 2017; Scott-Sheldon & Chan, 2020). And in fact, unprotected sex with one person of unknown HIV status is less dangerous than having sex with a hundred people using condoms (Pinkerton & Abramson, 1993). Thus the advice that numerical monogamy is the best way to prevent STDs (while still having sex, for a review see Conley, Matsick et al., 2015) is also irrational: condoms are more effective than monogamy in practice. However, Americans have tended to discount the safety of condoms and instead elevate the status of numerical monogamy – with a "well-known," committed partner – as a protective strategy (Misovich et al., 1996). And because people misinterpret monogamy or generate idiosyncratic definitions of monogamy, these problems are compounded. That is, people who are not numerically monogamous develop an identity as monogamous people (e.g., Andersen, 2010; Abramson & Pinkerton, 2002) and via years of health messaging, the public has been conditioned to believe that a monogamous *identity* protects against STDs (Conley & Piemonte, 2020).

Of course, these two implicit messages - the partner familiarity directive and the numerical monogamy directive - are intertwined. Koop's (1987) advice was to "Know your partner"– not, notably, "Know your partner*s*" – thus invoking numerical monogamy. And the numerical monogamy advice is predicated on the assumption that one's monogamous partner is

being fully transparent (i.e., a monogamous partner is assumed to be fully *known*, corresponding to Koop's message), thus implying closeness and familiarity.

Parallels Between COVID-19- and HIV/STD-prevention Public Health Messages

The American public has been conditioned to believe (erroneously) that monogamy (in all its interpretations) is the safest form of sex and precludes the need for any other safer sex practices. We have posited elsewhere (Conley & Piemonte, 2020) that people assume interacting with more individuals is *always* more dangerous than interacting with fewer individuals. In essence, people believe limiting the number of people one has sex with is the best way to avoid STDs and makes other safety measures unnecessary (Wind, 2013; Swan & Thompson, 2016). Here, we test whether these messages extend to people's perception of COVID-19 risk. If overlearned beliefs about monogamy's protective value in preventing HIV/STDs influence risk perceptions surrounding other diseases, people may (erroneously) believe that the number of relationships and closeness of those people, rather than the behaviors of the individual participants in the encounter, are the most important factor in determining risk. For example, people may discount the danger of sharing the same house with a person of unknown infection status (and, as mentioned earlier, given the imperfect nature of testing, most people's COVID-19 status is unknown at any given moment).

Both the COVID-19- and HIV/STD-prevention messages were presented to individuals as useful advice, but describe behaviors that could only be enacted by more than one person. That is, one is only safe in monogamy if the other partner has been cleared of disease and is mutually monogamous. The only way a household is safe from COVID-19 is if all members were uninfected and none of them were interacting with anyone outside of the people who live together. Misinterpretations of "monogamy" (in the case of HIV/STD-prevention with sexual partners) or "staying at home" (in the case of COVID-19-prevention with household members) are at the center of these inaccurate risk assessments. Just because a person claims to be

monogamous does not guarantee that the person actually is numerically monogamous (see Conley et al., 2013; Anderson, 2010). Likewise, a person being a member of one's household does not necessarily mean that the person is behaving safely vis a vis COVID-19.

Impact of Public Health Messages that Imply Monogamy

The similarities we outlined between COVID-19-prevention messages and HIV/STD-prevention messages may have mitigated the effectiveness of the 2020 pandemic advice simply because the two diseases differ. One important distinction between COVID-19 and HIV/STDs is that the amount of time spent with anyone adds to one's COVID-19 risk, but the amount of time spent with partners does not directly contribute to one's risk for HIV/STDs, due to differences in transmission methods (Morris et al., 2020). Thus, it is inappropriate to apply messages about monogamy (i.e., that having fewer and psychologically close sex partners is safer) to COVID-19 (i.e., that having fewer and psychologically closer interaction partners is safer). Reducing the number of contacts one has increases one's risk for COVID-19, but a more important predictor of acquiring COVID-19 is the amount of time spent in the presence of others (Toth et al., 2021).

The 2020 COVID-19 pandemic context provided an especially complicated set of circumstances under which official public health policy could be communicated and implemented. There was no way to tell whether one's immediate household members moved from the uninfected category to the infected category due to the virus' range of symptom presentation, the variety of case severity, and the fourteen-day incubation period. Many people also had household members who were essential workers, requiring them to spend extensive time in public settings, often interacting with numerous contacts of unknown COVID-19 infection status. Others had household members who were not following the health guidelines, either with or without the knowledge of the other people living with them. These situations were not sufficiently addressed by official advice, which does not convey that said advice is only effective if followed perfectly by the entire household. Yet American health messaging for

COVID-19 was given to individuals, who rarely would have actual control over the behaviors of an entire household. The straightforward messages of "safer at home" and "stay-at-home orders" do not account for this limitation in individual's control, nor do they convey the nuances of the COVID-19 pandemic's unique public health circumstances.

Non-monogamy Stigma and Interpretation of Public Health Messages

A central component of STD stigma is stigma about promiscuity, likely fueled in part by these same monogamy directives. Within the past decade, researchers have unearthed a strong bias against non-monogamy–that is, non-monogamous people are perceived negatively on a variety of dimensions: people judge them more poorly globally, they are thought to have weaker relationships (e.g., Balzarini et al., 2018; Conley et al., 2013; Hutzler et al., 2015; Moors et al., 2013; Rodrigues et al., 2018; & Vaughan et al., 2019; Vil et al., 2022), and they are even perceived more negatively on traits completely irrelevant to their monogamy status – such as being responsible about daily dog-walking (Conley et al., 2013). These negative judgments are often driven by the stigma surrounding STDs themselves. Prior research has documented that perceived risk for STDs is a primary factor explaining negative judgments directed toward people who have more sexual partners as compared to people with fewer sexual partners (Conley et al., 2013; Moors et al., 2013). This stigma persists even when objectively unwarranted, as evidenced in studies comparing reactions to monogamous and non-monogamous people with similar risk profiles (Conley, Moors et al., 2013; Conley et al., 2015). Much of the aforementioned research on non-monogamy bias has compared perceptions of consensually non-monogamous people to monogamous people. However, because of our interests in perceptions of known and unknown partners, we compared perceptions of presumably monogamous relationships to perceptions of a greater number of casual relationships.

In both the cases of HIV/STD- and COVID-19-prevention messages, close relationships could trigger a cognitive bias towards underestimating the risk of disease transmission. The stigma attached to non-monogamy conflicts with an assumption made in the development of both HIV and COVID-19 health messages; namely, that the public will realize that contact with infected people–regardless of how well you know those people–is dangerous and that infection status is *not* lower simply because you are familiar with a person. Given the tendency for Americans to misinterpret pithy public health messages, and given that the idea that "monogamy is best" is well-accepted in the U.S., we wondered whether Americans misinterpreted the advice to "stay at home" and to only associate with members of one's household.

Specifically, people may have interpreted such messages to mean that if an individual has an ongoing relationship with a person (i.e., that they "know" or are close with them), that individual inherently presents a lesser risk of disease transmission. They may then be more likely to excuse risky behaviors that are engaged in within an intimate or close relationship (because they have learned via monogamy messaging that "known" partners are safer). They may perceive multiple contacts with a close partner as inherently more risky than single contacts with different, more casual partners, even when that perception is objectively unwarranted. For example, interacting with a member of an intimate relationship (such as a member of one's household) of unknown COVID-19 status for several hours is riskier than interacting with a less familiar partner of unknown COVID-19 status for a few minutes, but this subtlety is not captured in brief health messages about COVID-19 safety. Similarly, the shorthand belief that restricting the numbers of sexual partners one has is more protective against STDs than other risk-reduction factors is also, ultimately, erroneous (Abramson & Herdt, 1990; Swan & Thompson, 2016). Both HIV/STD- and COVID-19-prevention messaging imply that limiting number of people (sexually in the case of HIV and non-sexually in the case of

COVID-19) is the best means of preventing disease spread, irrespective of whether additional protective measures are observed or ignored. People may interpret these messages to mean that the more contacts an individual has with others (i.e., non-monogamous sex, seeing less familiar people) the less safe that individual is–without mentioning the infection status or safety behaviors of those contacts, i.e., without including the idea that COVID exposure is cumulative and more time spent with even one person is dangerous.

The Current Research

In the current research, we specifically studied perceptions of people who departed from general safety guidelines. We wondered whether people are more lenient in their judgments about departures from COVID-19 guidelines when observing someone break the rules to be with an intimate (i.e., a presumed monogamous) partner than when they break the rules to be with a casual partner. In particular, are they more lenient even when the observed someone is safer during their interactions with casual partners than with a presumed monogamous partner? We also were curious whether people would rate those who have encounters with a great number of people as riskier than those who had contact with only one person– even in cases in which the person having encounters with more people is objectively safer. That is, we wondered whether associating with fewer and/or closer people will be perceived as more protective than associating with more and/or less familiar people, irrespective of other protective practices. We tested these ideas by analyzing data from U.S. adults' responses to experimental vignettes.

We used an indirect approach to assess how people interpreted public health messages about COVID-19 prevention measures. Using person perception paradigms, we assessed whether participants believed that a person who was behaving in accordance with a societal standard of health for preventing STDs (presumed monogamy) would be perceived as safer from COVID-19 than a person who was actually following safer COVID-19 practices, but not

being monogamous. Specifically, we compared people's perceptions of target characters who take more precautions to stay safe from COVID while engaging in non-monogamous behavior with "casual partners" or "friends with benefits" to perceptions of target characters who take fewer precautions to decrease COVID transmission while engaging in monogamous behavior with an intimate. We also tested the hypothesis that more numerous partners are perceived as more dangerous than a single partner, in sexual and non-sexual settings. We wondered whether people would irrationally apply societal standards that are presumed to prevent STDs (numerical monogamy) to a different disease with a completely different method of transmission (COVID-19).

We conducted three studies in which we determined whether people perceived targets who were described as numerically monogamous but COVID-risky as more responsible and safer than targets who were described as non-monogamous but relatively COVID-safe. We conducted pilot studies prior to beginning these studies. Inclusion criteria for each of our studies were completing at least one of the dependent measures, being 18 years of age or older and being a resident of the United States.

In the first two studies we examined these dynamics in an overtly sexual context. We then confirmed our hypotheses about perceptions of close versus unfamiliar sexual relationships (derived from Studies 1 and 2) in a third preregistered study. In the third study, we examined the same dynamics in a non-sexual context–children's play dates–and also determined whether number of partners alone changed perceptions of risk. The aim was to determine whether this biasing effect of quantity held even when familiarity of the partners is held constant. Throughout the current research we used person perception methods to indirectly assess perceptions of responsibility and risk.

All data were collected with U.S. citizens or residents between September 2020 and April 2021. Over this time period in the U.S., COVID-19 restrictions differed from state to state

and legal restrictions changed rapidly. These studies were designed to assess general perceptions of safety, not specific COVID-19 restrictions that were in place.

In the method sections below, we have reported all conditions and data exclusions. Our materials are provided at https://osf.io/w5vmn/?view_only=9baef29af0b2437a8e7caf0f29c6fe56 and data are available from the first author upon request. We attempted to garner at least 50 usable participants per cell in each study and have presented sensitivity power analyses for each study. No further data were collected after we conducted the analyses. Finally, Study 1 and Study 2 were run within approximately the same time frame, with two slightly different sets of researchers. Therefore, they are conceptually the same with slight variations in the dependent variables.

STUDY 1

In the first study, we randomly assigned participants to read a vignette about one of two targets. One target character was described as having multiple sexual partners while observing strict safety measures to reduce the risk of COVID-19 transmission. The other target character was described as having one exclusive partner, but the behaviors the target engaged in actually put them at a higher risk for contracting COVID-19. Note that we manipulated monogamy in a numerical sense– that is, how many sexual partners the target person has. Participants rated the target's personality traits and their risk of contracting COVID-19 based on the behaviors detailed in the vignette.

Method

Participants and Procedure

Study 1 involved a convenience sample of 157 participants. In addition to following the exclusion criteria described above, we excluded one participant who admitted in the comments

to not having read the scenario, bringing the final number of participants to 156. The participants were on average 32 years old (*SD* = 16) and were 60% female, 38% male, and 2% gender non-conforming. Ethnically, participants were 10% African American, 4% Asian American, 79% European American/White, and 4% Latine, with the remainder identifying as other ethnicities. Student research assistants recruited participants by posting the web link to the survey on their social networking sites (e.g., Twitter, Instagram).

The experiment was administered through the Qualtrics survey platform. After providing informed consent, participants read a brief vignette about a target individual who was either behaving monogamously but undertaking more COVID-19 risk, or who was engaging in non-monogamy, but undertaking less COVID-19 risk. Thus, this was not a full factorial design. The two main effects in Study 1 would provide less relevant or interesting information on our key dependent measures, which were related to perceptions of risk (in both an objective and subjective sense). The effect of participants rating risky conditions as higher risk than lower risk conditions is theoretically uninteresting. Likewise, as discussed above, there is already extensive research demonstrating that non-monogamous people are perceived as more risky than monogamous people; this finding is also not of interest. Therefore, we included the only two conditions that are most relevant to the research question: Does monogamy stigma work such that a participants' non-monogamy is perceived to be more important that actual preventative measures?

Participants indicated their perceptions of the target person in terms of a) personality traits and b) risk of contracting COVID-19 as a result of the activities portrayed in the vignettes.

Survey Instrument

Vignettes. Participants read about a target named James who broke COVID-19 quarantine to engage in sexual activity either in the context of either meeting with a numerically

monogamous relationship partner or with casual sex (and by definition, non-monogamous) partners. Both vignettes began with the following paragraph: *James is among those who were able to fully work from home during the COVID-19 quarantine this year, but, living alone, he got really bored and restless during the pandemic. He tried all the activities that were recommended to stave off boredom (cooking, Zoom happy hours with friends), but then after a month he couldn't take the isolation any longer.*

Then the vignettes diverged. The non-monogamous but COVID-safer vignette read: *He found some friends with benefits -- people who would be willing to hook up even during the stay-at-home order. James devised a set of rules to try to stay safe: they would wear masks and engage in activities that did not require them to remove their masks. They would also make their encounters quick, 30 minutes or less. All the partners adhered to his rules. Sticking to these rules, he never hooked up with more than five different people each week. He continued these encounters throughout the remaining two months of the lockdown.*

We note that James is behaving very responsibly in these sexual contacts vis a vis COVID-19. The participants are wearing masks and the encounters are quite brief (Coclite et al., 2021; Wang et al., 2020).

In the other condition, the monogamous but COVID-riskier vignette read: *He started going to visit his partner, an essential worker who lives about 30 minutes away and missed James terribly. They started spending the night together twice a week, always making sure neither felt ill. James and his partner enjoyed cuddling, eating dinner together, and sleeping next to one another. They did this through the remaining two months of the lockdown.*

The numerically monogamous James is behaving far less responsibly in terms of susceptibility to COVID-19. James' partner is an essential worker, they are not wearing masks,

and they are not limiting the duration of time spent together (thus increasing the chances for COVID infection; Kim et al., 2021).

Personality trait ratings. Participants used 6-point scales to rate the target on personality trait ratings of *very responsible-very irresponsible, very selfish-very unselfish, very warm-very cold, very silly-very serious, very smart-very dumb*, and *very bad-very good*. Higher numbers indicate higher levels of the second trait.

Judgments of COVID-19 risk. We used two measurements of risk for contracting COVID-19. Participants responded to the item, "How likely is James to contract COVID-19 as a result of the encounters described in the story?" on a 6-point scale ranging from highly unlikely to highly likely. They also responded to the item, "What is the chance (likelihood) that James contracted COVID-19 during these encounters?" on a scale out of 100.

Subsequently, participants answered some additional questions about perceived risk for COVID-19, attitudes toward COVID-19 restrictions, and their political affiliation--items developed for a separate research project. These are not included here but the full questionnaire is available in our supplementary materials, located at https://osf.io/w5ymn/?view_only=9baef29af0b2437a8e7caf0f29c6fe56.

Results

We conducted a series of independent-samples *t*-tests comparing perceptions of monogamous James to non-monogamous James. Given an alpha significance criterion of .05 (one-tailed), and a power criterion of 80%, the minimum detectable effect size is d =.41 for the main analyses reported here. The results are presented in Table 1.

Participants believed that the numerically monogamous James was significantly more responsible, warm, smart, good, and serious, and significantly less selfish than the numerically

non-monogamous James. Despite the fact that monogamous James was behaving in a more risky fashion vis a vis COVID-19 than non-monogamous James, participants perceived monogamous James as significantly less likely to contract COVID-19 than non-monogamous James. Similarly, participants also rated the numerically non-monogamous-but-safer James almost 20 points higher (M = 53) than the monogamous-but-riskier James (M = 34) in likelihood of contracting COVID-19 from the described encounters.

Table 1

Means, Standard Deviations, and Tests of Significance for the Monogamous/Risky and non-monogamous/safer conditions in Study 1

Dependent Variable	Non-monogamous and safer *M (SD)*	onogamous and riskier *M (SD)*	Test of Significance	*p*	*d*
Irresponsible*	4.21 (1.33)	3.15 (1.44)	$t(148) = 4.72$	<.001	0.78
Selfish*	3.61 (1.31)	2.64 (1.12)	$t(148) = 4.88$	<.001	0.79
Cold*	3.69 (1.12)	2.67 (1.14)	$t(148) = 5.40$	<.001	0.87
Serious*	2.95 (1.25)	3.93 (1.22)	$t(148) = -4.89$	<.001	0.80
Dumb*	3.92 (1.63)	2.91 (1.24)	$t(148) = 4.76$	<.001	0.78
Good*	3.15 (1.18)	4.24 (1.25)	$t(148) = -5.50$	<.001	0.90
Likelihood of Contracting COVID*	4.65 (.98)	3.63 (1.25)	$t(143.4) = 5.65$	<.001	0.90
Probability of Contracting COVID**	54 (29)	34 (27)	$t(150) = 4.41$	<.001	0.68

* Responses ranged from 1 - 6
** Out of 100

Discussion

In this study, participants rated a target who is numerically monogamous and acting in a more COVID-risky way to be *safer* than someone who is numerically non-monogamous but actually behaving in a COVID-safer way. We suggest that this study provides our first indication that U.S. residents apply monogamy messages (i.e., that familiar partners are safer and that having fewer partners is always better, irrespective of other risk mitigation strategies) used in preventing STDs to COVID-19 transmission–that is, they assume that monogamy is more effective for reducing COVID-19 risk than actual COVID-risk-reduction strategies (Grijalva et al., 2020).

We also find evidence that the stigma of non-monogamy (Rodrigues et al., 2018; Vaughan et al., 2019) colors people's perceptions of individuals' characteristics from a public health perspective, such as how responsible, safe, and intelligent they consider the individuals. In other words, people erroneously used James' numerical monogamy as an indicator of his COVID risk.

In sum, people may have misconstrued COVID-prevention messaging around "safer-at-home" as shorthand for the idea that sharing a household is protective against COVID-19. We find that public health directives encouraging Americans to "know" their partners in the early HIV era, and the continuing exhortations to be monogamous to prevent STDs have much in common with the messages Americans recently received to "stay at home" to avoid COVID-19. Both messages make the case that unfamiliar people (i.e., people you don't "know," people outside your household) are more dangerous than familiar people (people you do "know," people inside your household), regardless of any other factors. That is, those in the monogamy condition disregarded the impact of the riskiness of the individual with whom one interacts, the riskiness of encounter, and specifically in terms of COVID-19, the amount of time spent in the

presence of the other person–a factor which is irrelevant to STD prevention but very relevant to COVID-19; Morris et al., 2020).

Study 1 results seems to indicate that people are applying monogamy rules that are actually only arguably applicable to STD-prevention (i.e., fewer partners are safer) to a context in which monogamy rules do not apply– that is, COVID-19.

In Study 1, numerically monogamous James was described as spending two nights a week with his partner while the numerically non-monogamous James was described as having up to five encounters a week. In the next study, we separate out the familiarity of the partners and the number of contacts to determine if one or both of those factors drive the effects. In Study 2, a 2x2 design better manages this in that one factor manipulates number of partners (is the target behaving monogamously or non-monogamously–which in this case we characterized as primary relationships or casual relationships) and the second factor manipulates number of sexual encounters (one or several), thereby controlling for the amount of potential disease exposure.

STUDY 2

In Study 2, we again presented participants with vignettes and asked them to rate the target's personality traits and risk for COVID-19. The vignettes in this study describe a target character who either has monogamous sex or non-monogamous sex, either one time or multiple times. Importantly, in both of the one-time conditions, the target character behaves in accordance with the public health mandate to quarantine for 14 days (to allow for COVID-19 symptoms to appear; CDC, 2021). Regardless of whether the character is having sex with a relationship or casual partner, the same degree of risk should be observed.

In the *multiple-times* conditions, we indirectly described the target character as improperly observing quarantine in between sexual encounters (e.g., she travels between her

home and those of her partners; Kim et al., 2021; Rowe et al., 2021). Therefore, the target character is objectively at more risk in the *multiple-times* conditions than in the *one-time* conditions and regardless of whether the targets are behaving monogamously or non-monogamously; we expected the participants to assign higher risk to the multiple times condition than the single time condition. However, given non-monogamy stigma, we expected participants to rate the target characters having sex with casual partners–regardless of how COVID-risky they are–as at a higher risk for COVID-19 than those having sex with committed partners.

For this study we also were interested in whether the non-monogamy stigma would mitigate this difference in risk perception within the monogamy conditions. Would the target character who has sex with a relationship partner multiple times (without properly quarantining between visits) be perceived as at greater risk for contracting COVID-19 than the target character who has sex with her relationship partner only once? If participants are operating within the cognitive context of COVID-19 risk, they should perceive the monogamous target who makes multiple visits to see a relationship partner as more risky than the monogamous target who makes the single visit to see the partner. But if they are applying monogamy advice to a COVID situation, we would expect the additional visits to be perceived as yielding negligible additional risk. According to health messages surrounding monogamy, it is permissible to see a single partner as many times as one desires (a point which is debatable, as mentioned previously; Abramson & Pinkerton, 2002; Conley et al., 2015; Conley & Piemonte, 2020).

Study 2 also differs in that the target character is female, a factor that may elicit stronger reactions from participants given that women are more stigmatized when it comes to sexuality and sexual behavior (Marks et al., 2018), and ensures any effects replicate across female (Study 2) and male (Study 1) targets.

Method

Participants and Procedure

This convenience sample of 214 participants had a mean age of 26 (*SD* =19) and included 6% African Americans, 24% Asian Americans, 51% European Americans/White, and 5% Latine, with others identifying as other ethnicities; 54% female, 41% male with the remainder choosing other gender categories. We did not exclude any participants from this study. The procedure was the same as Study 1.

Design

We utilized a 2 (type of encounter: monogamous, non-monogamous) X 2 (number of encounters: one, several) between-subjects design. The numerically monogamous conditions describe the target character having sex with their relationship partner, while the numerically non-monogamous conditions describe the target character having sex as a single person (i.e, outside of a relationship).

Vignettes

All vignettes began with this expository statement: *Jasmine lives alone and is bored in the beginning of quarantine, and tries out painting, at-home workouts, and baking bread.* Following this sentence, the vignettes varied per condition.

For the Monogamous, one-time encounter condition, the remainder of the vignette read: *Jasmine is in a long-term relationship with her boyfriend, and after two weeks of quarantine decides to meet up with him. They meet up once and spend a few hours watching a movie and having sex. She only saw him that one time and then went back to quarantining.*

For the Monogamous, several encounters condition, the remainder of the vignette read: *Jasmine is in a long-term relationship with her boyfriend, and after two weeks of quarantine*

decides to meet up with him. They meet up every week and spend a few hours doing something fun like watching a movie together and then having sex.

For the Non-monogamous, one-time encounter condition the vignette read: *Jasmine is single and after two weeks into quarantine decides to hook-up with someone she met on Tinder. She meets up for a few hours and they have sex. She only saw him that one time and then went back to quarantining strictly.*

Finally, for the Non-monogamous, several encounters condition, the vignette was: *Jasmine is single and after two weeks into quarantine decides to hook-up with a few different people. She meets with a new person on Tinder every week. Every time she meets up she spends a few hours with the person and usually watches a movie or something fun and they have sex.*

Measures

We asked participants to indicate "what is the likelihood that Jasmine will get COVID-19 as a result of these activities?" on a scale ranging from 0 (extremely unlikely) to 100 (extremely likely). Participants also rated Jasmine on the following traits: *responsible-irresponsible, selfish-generous, stupid-intelligent*, and *moral-immoral*, on six-point scales where higher numbers indicate greater levels of the second trait. We also included a number of exploratory items that were not specifically related to COVID-19, but rather to determine if stigma surrounding non-monogamy extends to irrelevant traits among people who are engaging in casual sex (cf. Conley et al. 2013). A full list of these items is available from the first author.

Results

With an alpha significance criterion of .05 (one-tailed) and power of 80%, the minimum detectable effect size is d =.35 for the main analyses reported here. We conducted a series of 2

(Partner type: monogamous partner vs. non-monogamous or casual partner) X 2 (Number of encounters: single vs. multiple) ANOVAs.

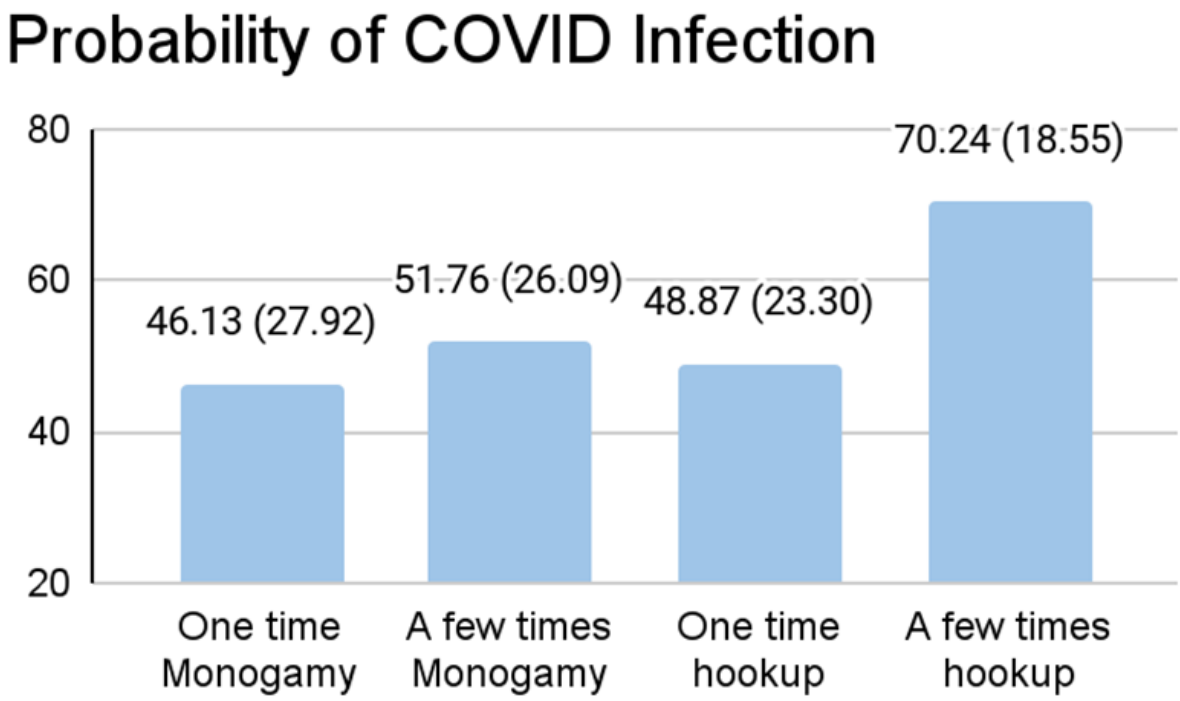
COVID-19 Likelihood

A 2X2 ANOVA on likelihood of contracting COVID demonstrated main effects for both independent variables, as displayed in Figure 1. First, when Jasmine engaged in non-monogamous sex (e.g., sex with [a] casual partner[s]), she was perceived as being more likely to get COVID-19 than when she engaged in monogamous sex, F (1, 210) = 10.29, p = .002, eta-squared = .05. Likewise, a predictable main effect emerged for the number of encounters, F (1, 210) = 16.64, p < .001, eta-squared = .07. When Jasmine had multiple encounters she was perceived as having a greater risk for contracting COVID-19 than when she had a single encounter. Importantly, however, these main effects were qualified by a significant interaction between type of partner and number of encounters, F (1, 210) = 5.66, p = .018, eta-squared = .03. A Bonferroni post-hoc test confirmed that the difference between the non-monogamous multiple-encounter condition and all the other conditions were significant. The interaction demonstrated that, as we would expect, when Jasmine had multiple casual encounters, she was perceived as significantly more at risk for COVID-19 than when she had a single encounter with a casual partner. In contrast, numerically-monogamous Jasmine was perceived as *equally* likely to contract COVID-19 when she had multiple encounters as when she had a single encounter. In other words, in the case of monogamy, adding more encounters adds no perceived risk. This is in direct contrast to what we know about how COVID-19 is spread– namely that risk goes up with the amount of time a person spends with another person–regardless of whether that person is someone they know well. None of the other pairwise comparisons reached significance.

Notably, participants did accurately recognize that, in the context of the probability measure (but not the other measures of risk) a single encounter is equally dangerous,

regardless of the intimacy of the partner, as evidenced by the lack of a significant difference between the single monogamous encounter and the single casual encounter. Therefore, the number of encounters may be more salient in people's judgment of risk, at least in the way they estimate probabilities.

Figure 1.



Personality Traits

When Jasmine broke quarantine to participate in casual sex she was perceived as more irresponsible, selfish, stupid and immoral than when she broke quarantine for a monogamous encounter (Table 2; note that even though we conducted ANOVAs, the results are presented as *t*-tests, making it easier to compare the magnitude of the effects across the three studies). Not surprisingly, we found a main effect for the number of encounters. Participants believed that Jasmine was less intelligent when she broke quarantine several times (M = 3.58; SD = 1.41) versus only once (M = 4.01; SD = 1.22), F (1, 197) = 5.48, p = .02, partial eta-squared = .027 They also perceived her as more irresponsible when she broke quarantine several times (M = 3.80; SD = 1.52) versus only once (M = 3.21; SD = 1.29), F (1, 197) = 8.95, p = .003, partial eta-squared = .043. We did not observe any interactions in judgments of Jasmine's personality traits.

Table 2

Means, Standard Deviations, and Tests of Significance for the difference between monogamous and casual sex conditions (Study 2)

Dependent Variable	Casual Sex *M (SD)*	Monogamous *M (SD)*	Test of Significance	*p*	*d*
Irresponsible*	3.80 (1.47)	3.18 (1.33)	*t* (199) = -3.15	.002	0.44
Intelligent*	3.49 (1.18)	4.11 (1.40)	*t* (199) = 3.40	.001	0.48
Selfish*	3.93 (1.20)	3.47 (1.12)	*t* (199) = -2.86	.005	0.40
Moral*	3.46 (1.28)	4.03 (1.18)	*t* (199) = 3.28	<.001	0.46

* Responses range from 1 - 6

Discussion

Study 2 provides additional evidence supporting the impact of non-monogamy stigma on character evaluation and risk perception. Across the number of encounters, participants rated Jasmine as less risky for COVID-19 when her sexual partner was her long-term boyfriend as opposed to someone she met on Tinder. It seems that people associate a more intimate relationship (i.e, with a committed partner) with safety and reduction of COVID risk. Of course, there is no actual relationship between how well a person knows another and that person's risk for COVID-19. Thus, this study provides more evidence to support our hypothesis that people use close relationships as a heuristic for safety, even when the degree of familiarity one has with a partner is wholly irrelevant to their disease risk (see Swann et al., 1995; Grijalva et al., 2020).

An interesting outcome of this study is the interaction between monogamy and number of encounters (see Figure 1). Part of the interaction is entirely expected: the Jasmine who had several sexual encounters (both the relationship condition and the Tinder condition) was objectively more at risk for COVID-19 than the Jasmine who only had one sexual encounter that was book-ended with two-week quarantines. Thus it was no surprise (and evidence of a

sufficiently strong manipulation) that people perceived Jasmine at greater risk when she had multiple encounters than when she had one. However, this was only true within the non-monogamous conditions. Even though Jasmine was objectively riskier when having sex with her boyfriend multiple times (she was breaking safety protocols each week when visiting him by failing to properly quarantine in between), people did not rate her any more likely to contract COVID-19 than when she only had sex with her boyfriend one time, as compared to the multiple-times condition. Of course, the amount of non-sexual time spent with a person does not increase risk for STDs, but the amount of non-sexual time spent with a person does influence the likelihood of contracting COVID-19 (Kim et al., 2021; Morris et al., 2020).

In sum, participants in the numerically non-monogamous conditions correctly interpreted the difference in COVID-19 risk between the Jasmine who had one sexual partner in safer conditions and the Jasmine who had several sexual partners in riskier conditions. Meanwhile, participants in the numerically monogamous conditions mistakenly rated the Jasmine who had sex with her boyfriend multiple times in riskier conditions (i.e., more time together) as equally likely to contract COVID-19 as the Jasmine who had sex with her boyfriend only once in safer conditions. Therefore, having a romantic relationship serves as an indicator of protection against disease transmission. Interestingly, participants indicated that one encounter with a monogamous partner is just as risky as one encounter with a casual partner.

The results from Study 2 provide expanded evidence of the power of stigmatized versus endorsed types of relationships in U.S. culture, and of the fact that the overlearned message of monogamy is being applied erroneously in the context of COVID-19. Participants assumed that people who were objectively riskier but only saw one partner were less likely to contract COVID-19 than those who were being objectively safer but seeing multiple partners. They also assumed that several contacts with a committed partner is no more dangerous than multiple contacts with the committed partner, which is certainly not true.

To confirm our expectations about non-monogamy stigma's impact on risk misperception, we conducted an additional study comparing people's perceptions of a target character who engages in either monogamous but riskier behavior or non-monogamous but safer behavior. We preregistered our study design, hypotheses, and planned analytical approach, hosted here: https://osf.io/w5vmn/?view_only=9baef29af0b2437a8e7caf0f29c6fe56. The unrelated measures from Study 1 related to risks associated with COVID, attitudes toward COVID-19 restrictions, and political attitudes were included in Study 3 as well: a copy of our measures is available at https://osf.io/w5vmn/?view_only=9baef29af0b2437a8e7caf0f29c6fe56. We also note that in the preregistration document, we indicate that data collection has begun. This was meant to indicate that the data for Studies 1 and 2 in the present manuscript had already been collected at the time of preregistration. When preregistering this study, we described the James and Jessica vignettes as separate but parallel studies. That is, we reported our planned participants in our preregistration and method for the James vignettes first, then for the Jessica vignettes, even though the procedure, measures, desired sample, and planned analyses are identical. We described them separately for organizational purposes, but in practice, we ran the studies at the same time and they therefore comprise the same study.

STUDY 3

We again asked participants to assess the risk of an individual who broke quarantine to interact with a single person or with multiple people, across two conditions in which we manipulated the degree to which their behaviors reduced their objective risk of COVID transmission. We predicted that the less risky but multiple-partner individual would be perceived more negatively and as more likely to contract COVID-19 than the more risky but single-partner individual. Importantly, we also assessed whether non-monogamy stigma would extend–analogously–to non-sexual contexts, as we were also interested in whether a person

who has many non-sexual contacts but is COVID-safer is perceived as more risky than one who has a single non-sexual contact but is COVID-riskier. To examine this dynamic we examined single- versus multiple-partner dynamics in the wholly nonsexual context of children's play dates. The non-sexual children's play date condition also allows us to disentangle the number of partners from the familiarity of those partners. In the play date conditions, all partners were equally familiar, and we manipulated only the number of partners. This allows us to ascertain whether the number of partners independently affects perceptions of risk, by holding the level of familiarity constant across conditions.

To reiterate, we included monogamous and non-monogamous sexual conditions as in the previous studies, but in this study we also incorporated conditions where a target character socially interacts with either one or multiple people in non-sexual situations, thus providing non-sexual conditions analogous to numerical monogamy/non-monogamy. This comparison between sexual and non-sexual scenarios will allow us to evaluate how much the positive connotations of a monogamous, romantic relationship boost people's perception of safety from disease transmission.

Method

Participants and Procedure

We recruited 425 participants on Mturk and excluded 51 for the following reasons: responses from IP addresses from outside the U.S.; suspicious responses, such as those indicating a non-English speaker or an automated response (e.g., bot); those who failed the manipulation/attention checks built into the demographic block at the end of the survey; and responses that indicate an impossible completion time (e.g., 30 seconds or less). The final sample was 374 U.S. adults.

Participants were 15% African American, 10% Asian American, 70% European American/White and 4% Latine, with the remainder identifying as other ethnicities. The sample was 58% male and 42% female and the mean age was 38. The survey was advertised as a short research study on perceptions surrounding COVID-19 and respondents were paid $1.00 for completing the study.

Vignettes

We included two sets of vignettes. One set addressed a sexual context and the other set addressed a non-sexual context (children's play dates).

Sexual monogamy/casual sex vignettes. There were two vignettes in this set. The participants either read about a person who was engaging in casual sex, but taking strong precautions to prevent the spread of COVID-19, or who was engaging in monogamous sex without taking COVID-19 precautions.

Each vignette began: *James is among those who were able to fully work from home during the COVID-19 quarantine this year, but, living alone, he got really bored and restless during the pandemic. He tried all the activities that were recommended to stave off boredom (cooking, Zoom happy hours with friends), but then after a month he couldn't take the isolation any longer.*

The risky/monogamous vignette continued: *So he started going to visit his romantic partner, an essential worker who lives about 30 minutes away and missed James terribly. James and his partner started spending the night together twice a week, always making sure neither felt ill. He and his partner enjoyed cuddling, eating dinner together, and sleeping next to one another. They did this through the remaining two months of the lockdown.*

The attenuated risk/casual sex vignette read: *So, James found some 'friends with benefits' -- people who would be willing to hook up even during the stay-at-home order. James devised a set of rules to try to stay safe: they would wear masks and engage in activities that did not require them to remove their masks. They would also make their encounters quick, 30 minutes or less. All the partners adhered to his rules. Sticking to these rules, he never hooked up with more than five different people each week. James continued these encounters throughout the remaining two months of the lockdown.*

Non-sexual children's play date vignettes. The second set of vignettes were not about sexual monogamy and non-monogamy per se, but allowed us to observe whether the general principle "fewer people is safer" – derived from monogamy public policy advice, is applied (analogously) to non-sexual contexts. In these vignettes, a mom (Jessica) is managing the situation of her young daughter being socially isolated and wanting to play with friends. In one condition, she allows her daughter to have a playdate with only one other child, but is relaxed about the children following behavioral measures to reduce the risk of transmission (such as not wearing masks and playing indoors together in close quarters for extended periods of time). In the other condition, the mom coordinates separate playdates with multiple children, but ensures that each time, everyone is observing safety precautions (including wearing masks and remaining outdoors). Therefore, we have two conditions: single contact/COVID-riskier and multi-contact/COVID-safer.

All the children's play date vignettes began: *During the COVID-19 lockdown, Jessica's daughter (who is five years old) was really suffering from the lack of social interaction with other kids.*

The single contact/COVID-riskier vignette read: *Jessica reached out to another family with a child the same age as her daughter (the other family was being pretty good about quarantine restrictions). Jessica organized a playdate for her daughter and the other child,*

allowing the two kids to play at Jessica's house for several hours. Jessica's daughter was so much happier after seeing a friend for a few hours! That play date was just what her daughter needed. The two families decided that the two kids could have play dates with each other a couple of times a week throughout the lockdown.

The multi contact/COVID-safer vignette read: *Jessica reached out to other families with kids the same age as her daughter (the other families were being pretty good about quarantine restrictions). Jessica organized a brief (30 minute) outdoor play date for her daughter every day for a week. She made play dates with five different kids on five days. Jessica's daughter was so much happier after having a few play dates! Those play dates were just what her daughter needed. Jessica continued organizing brief outdoor play dates with these five families every day throughout the lockdown.*

Measures

Participants rated James and Jessica on qualities similar to those used in Study 1 and Study 2. For personality characteristics, participants indicated whether the target was *very responsible-very irresponsible, very selfish-very unselfish, very warm-very cold, very silly-very serious, very smart-very dumb*, and *very bad-very good*. These items, as before, were measured on six-point scales where higher numbers indicate higher levels of the second trait.

Participants also responded to two questions regarding COVID-19 risk. First they were asked: "How likely is (the target) to contract COVID-19 as a result of the encounters described in the story?" with responses ranging from 1 = "highly unlikely" to 6 = "extremely likely." Next we asked participants "What is the chance (likelihood) that [James/someone in Jessica's family] contracted COVID-19 as a result of the encounters described in the story? The chance [he/someone] contracted COVID-19 is ___ out of 100."

Results

Sensitivity power analyses indicate that for our main hypotheses about monogamy versus non-monogamy, given error probability of .05 (one-tailed), and power of .80, the minimum detectable effect size is .29. First we conducted a 2 (condition: single contact/COVID-riskier vs. multi contact/COVID-safer) x 2 (relationship context: sexual/nonsexual) MANOVA including all the aforementioned dependent variables. The results demonstrated a main effect of condition, with target characters in the single contact/COVID-riskier arrangements being rated more positively and at less risk for COVID-19 transmission than the target characters in the multi contact/COVID-safer arrangements, F (8, 363) = 4.92, p < .001, partial eta-squared = .098. We also found a main effect of encounter type, such that when the context was children interacting, the target was rated more positively and less at risk for COVID-19 than when the target was having a sexual encounter, F (8, 363) = 11.45, p < .001, partial eta-squared = .20.

The interaction approached significance, F (8, 363) = 1.83, p = .071, partial eta-squared = .039. Moreover, the magnitude of the main effect of condition varied between the sexual and non-sexual contexts: some items demonstrated statistical significance within the sexual context but non-significance within the non-sexual context. In the spirit of transparency, we therefore report the remaining results separately. Specifically, we conducted independent samples t-tests on participants' perceptions of the targets' personality traits and perceived likelihood of contracting COVID-19 separately for James (who either had one or several sexual partners) and Jessica (who either arranged for her child to have playdates with one or several other children). We were interested in further investigating the extent to which perceptions of risk based on number of relationships differ between sexual and non-sexual contexts, as these subtle effects may have been obscured or minimized in our initia MANOVA.

Personality Traits

The numerically monogamous but COVID-riskier James was perceived as more unselfish, more serious, and more positive overall than the numerically non-monogamous but

COVID-safer James. Likewise, the non-monogamous but COVID-safer James was perceived as more irresponsible, colder, and dumber than the monogamous but COVID-riskier monogamous James, as shown in Table 3.

Table 3

Means, Standard Deviations, and Tests of Significance for the effect monogamous and casual sex conditions on perception of target (James) personality traits and likelihood of contracting COVID based on his relationship style

Dependent Variable	Casual sex *M* (*SD*)	Monogamous M (SD)	Test of significance	*p*	*d*
Irresponsible*	4.58 (1.47)	3.72 (1.35)	*t* (186) = -4.20	< .001	0.61
Selfish*	4.59 (1.46)	3.94 (1.27)	*t* (186) = -3.28	.001	0.47
Dumb*	4.32 (1.44)	3.42 (1.17)	*t* (186) = -4.72	<.001	0.69
Cold*	3.47 (1.36)	2.47 (1.18)	*t* (186) = -5.37	<.001	0.79
Serious*	2.94 (1.41)	3.66 (1.14)	*t* (186) = 3.90	<.001	0.56
Good*	2.86 (1.35)	3.81 (1.11)	*t* (186) = 5.28	<.001	0.77
Likelihood of contracting COVID*	4.56 (1.17)	4.03 (1.33)	*t* (186) = -2.90	.004	0.42
Probability of contracting COVID**	48.41 (38.26)	36.23 (27.74)	*t* (186) = -2.87	.005	0.36

* Responses range from 1 - 6
** Out of 100

The effects were in the same direction for perceptions of Jessica, but weaker. Multiple-playdate-partner but COVID-safer Jessica was perceived as significantly more selfish and irresponsible than single-playdate-partner but COVID-riskier Jessica, who was in turn perceived

as more serious than the former. The other effects dipped below significance but were in the same direction (see Table 4).

COVID-19 Likelihood

Participants thought the numerically monogamous but COVID-riskier James was less likely to get COVID-19, and assigned him a lower probability of contracting COVID-19 than numerically non-monogamous but COVID-safer James, as shown in Table 3. Jessica's family was perceived as less likely to get COVID-19 when she arranged for her daughter to engage in COVID-riskier playdates with one other child than when she had arranged for her daughter to engage in separate, COVID-safer playdates with multiple different children. Her probability of getting COVID-19 did not significantly differ but mean scores were in the expected direction; see Table 4.

Table 4

Means, Standard Deviations, and Tests of Significance for the effect of single child and multiple-child conditions on perception of target (Jessica) personality traits and likelihood of contracting COVID based on her playdate scheduling behaviors

Dependent Variable	Multiple children M (SD)	One child M (SD)	Test of significance	*p*	*d*
Irresponsible*	3.47 (1.58)	3.02 (1.42)	*t* (184) = -2.05	.042*	0.29
Selfish*	3.53 (1.54)	3.04 (1.42)	*t* (184) = -2.23	.027*	0.33
Dumb*	2.95 (1.26)	3.22 (1.52)	*t* (184) = 1.31	.192	0.19
Cold*	2.17 (1.15)	1.90 (1.06)	*t* (184) = -1.66	.099	0.24
Serious*	3.55 (1.18)	3.90 (1.17)	*t* (184) = 2.06	.041*	0.3
Good*	4.18 (1.44)	4.54 (1.27)	*t* (184) = 1.78	.076	0.27

Likelihood of contracting COVID*	3.88 (1.28)	3.47 (1.34)	t (184) = -2.12	.035*	0.31
Probability of contracting COVID**	36.94 (25.67)	29.20 (27.10)	t (184) = -1.77	.079	0.29

* Responses range from 1 - 6
** Out of 100

Discussion

In this study, we examined the role that monogamy plays in assessments of objective and subjective risk. We found that presumed monogamy is associated with lower COVID risk– even when that effect is unwarranted because of differences in other risk factors across conditions. Specifically, we demonstrated that people believe a presumably monogamous person who is engaging in COVID-risky behaviors (e.g., seeing an essential worker without a mask for many hours) has a lower chance of catching COVID-19 than a non-monogamous person who is more closely following public health recommendations to prevent transmission (i.e., having brief and masked encounters, staying outdoors with a different partner each time). In sum, more COVID-risky monogamous people were perceived to have a lower chance of contracting COVID-19 than less-COVID-risky non-monogamous people.

In Study 3, we confirmed that the stigma of sexual non-monogamy impacts the accuracy of people's risk perception. Participants in this study considered James to have a less responsible character and to be at greater risk of contracting COVID-19 when he had multiple sexual partners -- even though he and the partners were all described as practicing safer health behaviors than the James with a relationship partner. This evidence again suggests that people infer much from monogamy that may not have grounding in objective reality; namely– that a person who sees a monogamous relationship partner is inherently less likely to transmit COVID-

19 than a person who is not. Thus, people are more lenient in their risk judgments in the context of a committed relationship.

The main effect wherein the target in the vignettes about children's playdates was perceived more positively and less at risk than the target in the vignettes about sexual encounters may have emerged because children are not as susceptible to catching or experiencing COVID-19 symptoms as are adults (Lei et al., 2020). It may also reflect the stigma of participating in sexual activity at all (Owens et al., 2020).

Finally, this study showed that the number-of-partners heuristic is strong enough on its own (i.e., independent of the effect for familiarity of partners) to have some effects. That is, in the non-sexual children's play date vignette, all partners were equally famliar, but there were still some effects of number alone on perceptions of risk.

GENERAL DISCUSSION

In three studies we demonstrated that people believe that those who had casual, or non-monogamous, sex during the pandemic were more likely to contract COVID-19 than people who had presumed monogamous sex during the pandemic, even when the person having non-monogamous sex was objectively at less risk for COVID-19 than the monogamous person. That is, we demonstrated that non-monogamy stigma, known to bias people's perceptions of sexual health (Conley et al., 2013; Ferrer, 2018; Hutzler et al., 2015; Rodrigues et al., 2018), extends analogously to COVID-19 risk. We captured evidence of people's bias against non-monogamous relationships, even in situations where the protective factor of monogamous sexual practices are orthogonal to ways to protect oneself from the threat–in this case, COVID-19 (e.g., the amount of time one spends in the presence of a person with an STD does not affect one's risk of getting an STD but the amount of time one spends in the presence of a person with COVID-19 does affect the chance of contracting COVID-19; Morris et al., 2020). Unreliable monogamy-

related criteria - the closeness of the partner and the number of people that a person saw - trumped the more effective measures taken by the targets in the vignettes, such that they had undue influence on the participants' perceptions of the targets' COVID risk.

The suspicions and stigma surrounding the risks posed by non-monogamy can be thought of as a cognitive bias or heuristic: people infer a lack of many positive individual and interpersonal qualities among people who engage in non-monogamy, such as trust, loyalty, health, or safety (Balzarini et al., 2018; Conley et al., 2013). This heuristic may be more or less accurate within any given situation. What influence does this cognitive shortcut have on perceiving objective reality and determining probability? How does it impact people's ability to accurately assess health risks and practically interpret public health messages and other cultural narratives?

Public health messages that ignore nuances related to the health benefits (or lack thereof) of close relationships for transmission of infectious disease contexts contribute to non-monogamy stigma. People attribute an inherently increased risk to people who engage in non-monogamy, relative to monogamous people. In the present research, people's risk perceptions and character judgments appeared to be guided by COVID-19 restrictions with implicit messaging about the importance of both numerical monogamy and relationship closeness/familiarity for risk reduction. This effect was evident even when other safety factors objectively mitigate the concerns of interacting with someone who is not a primary relationship partner.

Practical Implications

The COVID-19 stay-at-home orders paralleled public health advice surrounding HIV/STDs by suggesting that using closeness of relationships, and reducing the number of people one interacts with (sexually in the context of HIV/STDs and non-sexually in the case of

COVID-19), will provide the best safeguards. During the early AIDS era, the public was advised to "Know your partner," and during 2020, the public was advised through "stay-at-home" orders to avoid anyone outside of one's household (Ballotpedia.org, 2021; Moreland et al., 2020). To avoid STDs, people are told to be numerically monogamous (to limit their sexual contact to one person) and to avoid COVID-19, people were (functionally) advised to limit their contact to no more than the number of people who lived in their household. Notably, a number of researchers have elucidated the potential damage caused by public health messages surrounding monogamy in the mission to reduce STDs (Britton et al., 1998; Conley et al., 2015; LaSala, 2004).

With the current findings, we suggest that the presumed benefits of monogamy can also cause damage outside of the realm of close relationships, opening up those who misunderstand the public health messages to the possibility of consequences that extend beyond STD transmission and relationship dissolution. Perhaps America's promotion of monogamy has clouded people's ability to process risk information about the transmission of infectious diseases. These favorable connotations may also extend to close relationships that are not romantic or sexual, such as parent-child relations or friendships. When posed with a threat – in this case, the threat of COVID-19 – it appears that people use the number and closeness of relationships as a heuristic to determine relative risk or safety. This despite the fact that a more relevant factor for COVID-19 is the riskiness of the behaviors engaged in by the people with whom you interact and the amount of time you spend with them.

Implications for population-level health messaging. Literatures on health communication largely agree that messaging with the intention to promote behavior change is best served by targeting two sets of beliefs: outcome beliefs, and efficacy beliefs (Nan et al., 2022). Outcome beliefs pertain to what people understand to be the positive and negative implications of the encouraged or discouraged behavior (such as "I could catch COVID"), and efficacy beliefs pertain

to how confident people understand themselves to be in complying with health messages (such as "It's easy to wear a mask"). Public health campaigns tend to leverage efficacy beliefs over outcome beliefs because outcome beliefs often draw on people's fears of a negative outcome, which reduces likelihood of action (Shen & Dillard, 2007). Meanwhile, efficacy beliefs encourage agency and use more positive framing to increase likelihood of compliance or adherence (Bandura, 2004).

Public health messaging targeting efficacy beliefs may focus on self-efficacy - or beliefs about the self's capabilities (for example, an individual's ability to access and successfully wear masks), or on collective-efficacy - or beliefs about the group's capabilities (for example, the shared belief among a community that the group can administer vaccines to 75% of the population). The research we have conducted here suggests that the goals of public health communication may be impeded when the messaging leverages self-efficacy.

On the one hand, self-efficacy is largely an individual-level construct so it may conflict with public health goals to reduce infection rates at the population level. If successful health promotion or risk reduction requires widespread implementation or practice of a behavior, relying on critical masses of individuals to successfully enact a behavioral change may not suffice. Using messaging that targets self-efficacy may therefore be the wrong choice for health promotion aimed at groups or communities.

But on the other hand, messages about collective efficacy may be too macro or deindividualized to effectively impact the behavior of independent persons. Therefore, we suggest developing health communications that address beliefs about 'group efficacy': shared beliefs among a group or organization. A middle-ground between the single self and a collective population may be a fruitful path forward in delivering message content of an appropriate size and scope to successfully promote beliefs about the efficacy of the group to accomplish goals too big for an individual and too small for universal application.

For example, the household may indeed be an appropriately-sized unit for people to cognitively and emotionally manage, and we understand the motivation behind the messaging that Americans were safer "at home" from COVID-19. However, the participants in our studies seem to have misinterpreted the pandemic-focused public health messages related to social distancing and staying at home. At least implicitly, they appear to believe that seeing many people for shorter, safer periods of time is worse than seeing one person for a long, more vulnerable period of time. Perhaps "the home" and its implicated relationships may have too strong of connotations, or too vague of definitions, to avoid biasing people's understandings of what risks their home actually mitigate. The precise reasons for the misunderstanding await further study. However, it certainly would seem that, to help public health messages achieve their goals, policy makers and communications officials should take into consideration the ways that people interpret health messages. Understanding the context in which public health messages are received (such as, in this case, within a culture where monogamy is so strongly endorsed and has been promoted as a means to prevent STDs; Fortenberry, 2019; Koop, 1987), could help public health officials understand how messages can be misinterpreted.

Implications for general health messaging. Our findings also indicate the need for better communication about general forms of health promotion or risk reduction that require the participation of more than one person. Scholars have already observed this dynamic in the context of clinical care for STDs. As the first and second authors have described elsewhere (Conley & Piemonte, 2020), advising individuals to "be monogamous" to prevent STDs is a logical error because monogamy is a dyadic behavior, not an individual one. Although the cooperation of two people is required for monogamy, physicians typically counsel patients individually and many practices in medical establishments regularly assume that patients who report being married or in a long-term, committed relationship do not need to be screened for STDs (Treas & Giesen, 2000). Thus, even healthcare providers themselves appear to

misunderstand health messages surrounding monogamy (Fischhoff et al., 2011; Vaughan et al., 2019; Warren et al., 2012). We see this misunderstanding of how effective monogamy is at protecting against STDs as a parallel to the misunderstandings we observed of how effective it is to use close relationships as criteria for protecting against COVID-19. Although the average individual's risk of catching an STD in their everyday life is a different probability than the average individual's risk of catching a viral infection during a centenary pandemic, in both cases people's abilities to accurately assess probability is clouded by inferences made about the protections offered by close relationships.

Limitations and Future Directions

These studies utilized convenience samples of U.S. resident and it would be ideal if they were replicated with a representative sample. Beyond this standard limitation, we carefully consider two below–specifically the use of vignettes and the conflation of familiarity and numerical monogamy.

Use of vignette methods. The present studies are limited by the gap between hypothetical scenarios and "real life" practices. What people believe they would do in a given situation often departs from how they behave in a real-world context (Mah et al., 2014). Vignettes in person perception or moral reasoning studies, however, often have aims separate from approximating or representing participants' real-life actions. Judging targets who engage in sensitive or controversial behaviors – and the COVID-19 pandemic has certainly been an American political controversy (Hart et al., 2020; Perry et al., 2020) – allows participants to distance themselves psychologically from the issues or topics, decreasing the chance of socially desirable responses (Barter & Renold, 2000). Mah and colleagues (2014) analyzed the benefits and complexities posed by the method for research on public health policy. They found that vignettes are particularly additionally useful for this domain because the fictional stimuli "situate key ingredients in reliable ratios" (Mah et al., 2014, p. 1830).

Across our own studies, the use of a factorial design in vignette-based experiments allowed us to isolate the planned manipulations and hypothesized variables. The vignettes explicitly stated the information necessary to convey the "key ingredients," and also allowed space for participants to "fill in" additional information about the scenario or character(s)-- two factors which are especially promising for conceptual replications of a general effect (Barter & Renold, 2000). In the present research, this served our aims well because of our interest in capturing evidence of people misinterpreting public health messages (via their inconsistent judgments of target characters). We were not interested in identifying specific mechanisms by which people process authoritative health information, which would have required a great deal of additional detail in the vignettes. That approach to vignette development tends to work best for comparing very specific case studies, where people making judgments should have as much information as required to engage in the processes under research (Mah et al., 2014). Instead, we consider it a strength of the current research that we identified a consistent pattern of results when using vignettes that supplied non-exhaustive information that allowed participants to make their own inferences about the target characters.

In sum, we used an indirect approach to capture people's understandings of COVID-19 prevention messaging via judgments of target characters behaving in ways that align with or depart from the COVID-19 prevention messages (i.e., "stay at home") and behaviors (i.e., wearing masks, interacting in well-ventilated environments, and limiting contact) instructed by the CDC (CDC, 2021). This is a better way to unearth biases than direct questions, because it is less subject to social desirability influences. We found that people judge the risk of COVID-19 posed to target characters based on the number and closeness of relationship contacts in which the target characters engaged, but we cannot yet confirm that participants would judge their *own* risk of COVID-19 using similar thought processes. Subsequent studies might fruitfully assess how people believe the risk of widespread infectious disease transmission changes as a

function of closeness of relationships, as long as those studies employ methods to counteract social desirability concerns. This approach would provide further evidence of cognitive fallacies and heuristics that contribute to people's biased judgments of people and their inaccurate evaluations of risk.

Conflation of closeness and numerical monogamy. Because numerical monogamy and closeness are such interrelated concepts, we did not always distinguish between the two in these studies. Importantly, however, neither did the public health messages we have reviewed and analyzed in the current research. As we described above, "Know your partner" may be explicitly about familiarity, but numerical monogamy is implied, and "monogamy protects against STDs" implies that closeness is fail-safe protection against STDs. In terms of the COVID-19 pandemic, "safer at home" messaging and "stay at home" orders draw on qualities people likely attribute to their household relationships: fewer, closer contacts. Both narratives (on how to avoid HIV/STDs and how to stay safe from COVID-19) imply that cognitive shortcuts using quantity (one or several) and quality (closeness or distance) of relationships are useful in individuals' risk assessments and behavioral conduct.

What conclusions can we draw from the current research about the effects of closeness of partners versus number of contact? First, closeness of partners (independent of the number of contacts) generally had positive effects on people's perceptions. That is, participants in all of the studies thought that targets who interacted with close partners were safer and more responsible. However, in Study 2 our results were mixed: participants did accurately recognize on one measure– risk out of 100 for contracting COVID-19– that a single encounter from a close partner was just as dangerous as a single encounter from a casual partner. But on this same measure, they also thought that many encounters would be just as safe as one encounter with a close partner. And in Study 3, participants thought that having many encounters with various contacts was more dangerous than a single encounter with a friend, even when the many

contacts were far safer. Thus, overall, we demonstrated that both closeness of the relationships and fewer contacts predicted perceptions of safety.

These two dimensions should be considered separately in future research. Further investigation could assess the circumstances under which people are more likely to process risk information using the numerical heuristic versus the closeness heuristic. For example, people who are polyamorous can have very close, non-monogamous relationships. Therefore, comparing perceptions of polyamorous and monogamous individuals would allow researchers to better disentangle the separate stigmatizing effects of non-monogamy and partner closeness. This strategic approach could help researchers understand how people weigh or rank the importance of a) the number and b) the closeness of partners in their assessments of specific transmissible diseases.

Researchers may also consider the extent to which members of the medical community differ from non-medical people in both the accuracy of their risk assessments when considering close relationships and non-monogamy, as well as the decisions they make based on their conclusions. For example, it may be that public health officials and health care providers can accurately evaluate the probability of a person's risk of infectious disease, but does their clinical treatment or dispensed advice match the level (i.e., individual, dyadic, group, etc.) at which the risk can most objectively be mitigated?

Conclusion

We are not privy to all the conversations and decisions that transpired leading to the particular health messages of "stay-at-home" orders and exhortations that Americans will be "safer at home," but it seems likely that public health and policy officials who developed this message believed that Americans would realize that they would not be safer (from COVID-19) "at home" if their cohabitants were not following COVID restrictions precisely and thus, sharing

a household with a person is not protective against COVID-19. Did Americans accurately construe these messages? Our findings suggest that they did not.

Across three studies, we found evidence that U.S. participants believed the risk of COVID-19 transmission can be reduced in 1) closer relationships (as opposed to casual or relatively unfamiliar ones), and in 2) monogamous relationships (i.e., maintaining only one relationship in a given context). We were able to capture this biased perception even when the closer and/or monogamous relationships included objectively riskier behavior for the transmission of COVID-19.

The present research identifies the COVID-19 pandemic as a contemporary context in which the general public misconstrues health messaging in ways that undermine the messages' effectiveness. This is the next example in a historical pattern wherein Americans misperceive public health policy and messaging based on unsubstantiated inferences about monogamy and/or close relationships. Similar to HIV/STD-prevention public health directives to prioritize a restricted number of close relationships, COVID-19-prevention messaging that people are "safer at home" allows for people to infer that the qualities of close or household relationships inherently offer protection from infectious disease transmission. Future public health messages should account for people's cognitive bias in overestimating risks posed by non-monogamous and/or unfamiliar others.

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