2021

Why Do You Wear A Mask? Children's Conceptualizations of COVID-19 and Contagion Avoidance Behaviors

Emily Hillman

"WHY DO YOU WEAR A MASK?": CHILDREN'S CONCEPTUALIZATIONS OF COVID-19 AND CONTAGION AVOIDANCE BEHAVIORS

by

EMILY R. HILLMAN

SUBMITTED TO SCRIPPS COLLEGE IN PARTIAL FULFILLMENT OF THE DEGREE OF BACHELOR OF ARTS

PROFESSOR JENNIFER MA
PROFESSOR THEODORE BARTHOLOMEW

February 5th, 2021

Abstract

With the outbreak of the COVID-19 pandemic, a need has emerged for psychological research on children's understanding of infectious disease transmission. However, little existing research examines the link between children's cognitive reasoning about illness and their subsequent behaviors regarding its transmissibility. This study will examine children's conceptualizations of contagious illnesses such as COVID-19 and their subsequent contagion avoidance. A mixed methods approach will be used to establish the content of children's conceptualizations of contagion and level of causal reasoning related to illness transmission. Dyads will be constructed comprising 4-12-year-old children and their parents. It is expected that parental contagion avoidance behaviors will predict those of their children, although this relationship will be moderated by age. It is hypothesized that younger children will rely on social learning and mimicry of their parents to inform their contagion avoidance behaviors. However, it is also expected that as children grow older, they will be more likely to engage in contagion avoidance behaviors due to their own development of a more complex and causal understanding of illness transmission. Grounded theory and content analysis will be used to generate themes about children's motivation to engage in contagion avoidance. It is hypothesized that children's motivations will be predicted by their age and general cognitive understanding of illness. This research may inform how contagion avoidance behaviors can be encouraged in children.

"Why do you wear a mask?": Children's conceptualizations of COVID-19 and contagion avoidance behaviors

Research into children's cognitive conceptualizations of illness has become a useful metric by which to examine children's cognitive development (Campbell, 1975; Toyama, 2016). Previous research has shown that children's understanding of illness develops in a systematic and predictable manner in line with other facets of cognitive development (Banks, 1990; Burbach & Peterson, 1986; Campbell, 1975; Perrin & Gerrity, 1981; Simeonsson et al., 1979), although little research relates children's understanding of contagion to their subsequent behaviors undertaken to avoid sickness, known as contagion avoidance behaviors. With the classification of COVID-19 as a global pandemic in the spring of 2020, further research on children's understanding of contagious illnesses such as COVID-19 and their respective behavior is crucial to understand how best to inform children about the disease and encourage contagion avoidance.

As children develop cognitive processes, they gain the ability to conceptualize abstract concepts such as health and illness. Children's perceptions of the causes and physical manifestations of illness are known as *illness concepts*. As with many aspects of children's development, illness concepts become increasingly complex with maturity, and tend to follow a normative developmental trend. While there is undoubtedly a biological basis for the pattern that emerges in the development of illness concepts, Pidgeon (1985) claims that children build their knowledge of specific illnesses through personal experiences and media exposure, and Dempsey and Turner (2017) assert that parents play a large role in encouraging illness prevention behaviors by avoiding infections, responding to symptoms, and accessing medical care. These assertions align with that of Carey (1995), who suggests that children's concepts of illness are

based primarily on the behaviors of those around them. While the literature indicates some consensus on the developmental factors on the content of children's illness concepts, little research has been conducted concerning school-aged children's development of contagion avoidance behaviors, health behaviors, and causal reasoning related to illness transmission. To explore the behavioral implications of children's illness concepts, it is imperative to examine the social and developmental cognitive literature as it relates to children's understanding of illness transmission.

By far the most established theory on children's cognitive development is that of Piaget (1929), which states that children's cognitive development and conceptual processing progresses through distinct normative stages. Beginning in infancy, these stages are sensorimotor, preoperational, concrete operational, and formal operational. Throughout these stages, children's reasoning becomes more complex and logical as they move from simple associations between events to causal attributions (Piaget, 1929). *Sensorimotor* stage is often occupied by children 0-2 years old, and individuals in this stage explore the world through direct sensory and motor contact, eventually developing a concept of object permanence. *Preoperational* stage follows and is characterized by children's use of symbols—like words and images—to represent objects. Children in this stage tend to be between 2 and 6 years of age. They engage in creative play, maintain an egocentric self-concept, and usually do not employ reliable logical reasoning. *Concrete operational* children are those often between 7 and 12 years old who have developed logical reasoning about concrete objects and understand the conservation of number, time, and space. By then, children have developed theory of mind: an ability to understand that others around them may perceive the world differently. Children 12 years and older often occupy the *Formal operational* stage of development, characterized by an ability to reason abstractly, apply

concepts across contexts, and use hypothetical terms. For this reason, individuals in this last stage are able to reason about ethics, politics, and social concerns. Children are assigned to a developmental stage based on their demonstrated highest level of reasoning, and these stages are often demarcated by age, although speed and progression of cognitive development is variable for each individual (Bibace et al., 1998).

While Piaget's stages are widely endorsed by developmental researchers, it is important to realize their potential limited scope due to the age of the research and the generalizability concerns of Piaget's original study sample. Piaget's original stages were developed in 1929, and researchers have since expressed concerns that his study sample was too small and too white to be used globally and across cultural contexts. Additionally, the research is nearly a century old, leading to cognitive developmental psychologists to express concerns that the pace and progression of children's development may have fundamentally changed since Piaget's work was published (Hopkins, 2011). Other critiques extend not to Piaget's stages, but to the application of these stages to children's development of illness concepts. Hergenrather and Rabinowitz (1991) argue that it may be incorrect to use Piaget's cognitive stages to plot the development of an understanding of illness as Piaget's stages refer only to children's logic and capability for certain types of thought, not their understanding of abstract concepts, such as illness. Despite this criticism, Piaget's impact is notable in the literature, as most studies that examine children's conceptualizations of illness as a function of their cognitive development use a loose, stage-based, Piagetian framework.

In their seminal study, Bibace and Walsh (1980) demonstrated that children's development of an understanding of illness follows a sequence consistent with Piaget's research regarding the ontogenesis of causal reasoning. Using extensive pilot studies, Bibace and Walsh

developed 12 sets of questions pertaining to children's notions of types and causes of illness. To examine children's perceptions of a cold, for example, researchers created questions such as "What is a cold?" and "Why do people get colds?" and "How do people get colds?" (p. 913). These questions sought to tap into the cognitive process through which children reason about illness, as opposed to the content of their illness concepts. Bibace and Walsh found that, much like children's development of logical reasoning, the development of perceptions and understandings of illness can be ordered in a systematic manner.

From their data, Bibace and Walsh established seven developmental categories of conceptions of illness, mirroring the four developmental stages hypothesized by Piaget (1929). The first, appropriately titled Category 0, is marked by *incomprehension* of any illness concepts, and is reserved for children who have not yet entered the prelogical or preoperational stage of cognitive development. Within each following Piagetian stage of cognitive development, Bibace and Walsh demarcate two types of cognitive reasoning, creating six differential categories to which children can be assigned. The most "developmentally immature" explanation of illness is that of *phenomenism* (Category 1), in which causes of illness are believed to be external and concrete phenomena that may co-occur with the illness but remain "spatially and temporally remote," such as the weather, trees, or the sun (Siegal et al., 2011). This type of reasoning is also known as *magical thinking* (Bibace & Walsh, 1980). While children in this stage may have a conviction about an illness's cause, they are unable to explain their reasoning or causal associations. Slightly more mature children in the preoperational stage of development often explain illness using the framework of *contagion* (Category 2), which explains illness as something caused by objects or people proximate to, but not touching the child. However, the link between the cause and the illness is often explained simply as a function of proximity, if not

by ‘magic’. Children in this stage might explain a cold as occurring when “someone else gets near” to them (p. 914).

The concrete-operational stage of development is demarcated by a more pronounced differentiation between the self and others and between internal and external processes. It is often occupied by children between 7 and 10 years of age. Younger children in this stage explain illness using a *contamination* framework (Category 3), in which illness is caused by an external person, object, or action that is qualified as “bad” or “harmful” coming into contact with the child. A child may “contaminate” themselves with illness by physically contacting the person or object, or by engaging in a “bad” or “harmful” action (Bibace & Walsh, 1980, p. 914). Children then progress to an *internalization* illness explanation (Category 4). Within this explanation, illness is understood as being located within the body, whereas causes, usually a person or object, are perceived to be external. Illness is conceptualized as being internalized through processes such as swallowing or inhaling, although explanations of this process are vague and non-specific: “Bacteria gets in by breathing. Then the lungs get too soft” (Bibace & Walsh, 1980, p. 914). It is only with the emergence of concrete operational reasoning that a child could reliably link isolated concrete symptoms, such as a rash, to other bodily events, such as a fever (Perrin & Gerrity, 1981).

Children 12 years of age and older usually manifest thinking classified as formal operational, Piaget’s final cognitive developmental stage. Children within this stage have the greatest differentiation between the self and the other, and their illness explanations generally recognize that while illness is an internal process, external agents are often the ultimate cause. *Physiological* explanations (Category 5) are usually offered by younger, formal operational children. Within this category, children express an understanding that the source and nature of an

illness reside in internal physiological structures, and while external events can trigger illness, the cause can also be the disruption of an internal process or organ. Children in this stage might describe a cold as "when you get all stuffed up inside" (Biblace & Walsh, 1980, p. 915). The most mature conceptualization of illness is the *psychophysiologic* stage (Category 6), in which children represent illness in terms of internal physiologic processes—much like Category 5—yet also recognize the importance of the psychological causes of illness and health. Essentially, children become aware of the mind-body connection. Evidence for the existence of a normative progression of illness concepts that generalizes to the framework hypothesized by Piaget—such as the one created by Bibace and Walsh—has since been further substantiated in the literature (Banks, 1990; Burbach & Peterson, 1986; Myant & Williams, 2005; Perrin & Gerrity, 1981; Simeonsson et al., 1979).

While these stages align with the Piagetian framework for cognitive development, there is a distinct range of illness concepts for each age group. Bibace et al. (1998) examined the applicability of Werner's *co-existence* concept of development to a cognitive-developmental understanding of illness concepts. Whereas the theory of *replacement* holds that immature cognitive processes will be replaced with more sophisticated ones over the course of development, the theory of *co-existence*, as conceptualized by Werner (1948) states that while an individual will become more capable of complex and abstract thought as they develop—and may be inclined to use more sophisticated processes—both types of cognition can and do coexist. Werner's theory thus looks at the *range* of cognitive processes exhibited by the subject whereas the replacement theory looks at the highest level of cognition attained (Bibace et al., 1998; Werner, 1948;). In order to test the applicability of the *coexistence* concept of development to illness concepts, researchers studied the illness concepts of both children and college students

and coded them based on the framework established by Bibace and Walsh (1980). Researchers found that both children and college students exhibit variability in their causal reasoning relating to illness, though the range of cognitive reasoning abilities used by a child tends to have an upper limit based on their maturation and their relative experiences. For example, while college students were observed to sometimes employ magical thinking, they tended to also demonstrate the ability to use complex abstract reasoning about illness. Children differed, in that their cognitive reasoning did not exceed the developmental stage into which they were coded. As there is a well-substantiated range in individual cognitive processes (Bibace et al., 1998, Campbell, 1975, Perrin & Gerrity, 1981), it seems that the variability both between and within individuals translates to conceptualizations of illness. The literature indicates that both children and adults likely will not always operate at their highest level of cognition, nor will they apply their cognitive reasoning abilities equally across all fields.

There is established consensus that children's illness concepts develop in a systematic order, increasing in complexity as children's cognitive development compounds (Banks, 1990; Burbach & Peterson, 1986; Campbell, 1975; Perrin & Gerrity, 1981; Simeonsson et al., 1979). However, more recent research has suggested that while frameworks employed by Piaget (1929) and Bibace and Walsh (1980) may accurately predict some aspects of children's perceptions of illness, they underestimate children's understanding of illness causation and grasp of contagion related biological theories (Myant & Williams, 2005). In his 1996 study, Charles Kalish questioned whether children use commonsense theoretical constructs to reason about biological phenomena, such as contagion, or whether, as Burbach and Peterson (1986) suggest, children's illness concepts stem from simple associations between obvious properties. This kind of reasoning—where events are linked without the conception of underlying mechanisms—is also

known as transductive reasoning (Piaget, 1929) and is found most commonly among children in the early stages of their cognitive development. Children using transductive reasoning are likely to explain illnesses using the ideas of *phenomenism* or *contagion* established by Bibace and Walsh (1980). That is, they may perceive sickness to be caused by the weather, proximity to a sick individual, or even bad behavior, described as *immanent justice* (Kister & Patterson, 1980; Carey, 1985). Indeed, several studies have indicated that young children think that all illness is contagious (Brewster, 1982; Hergenrather & Rabinowitz, 1991; Kalish, 1996; Kister & Patterson, 1980), with the exception of some injuries, such as scraped knees (Siegal, 1988, as cited in Kalish, 1996), suggesting that children may rely on simple associations between the physical manifestations of illness and injury in their reasoning. Kalish (1996) was among the first to suggest that children's abilities to reason about illness may have been underestimated within the Piagetian framework and asserted that children's identification of certain behaviors as causes of illness—such as interacting with a sick person or eating contaminated food—may indicate that children understand the existence of underlying mechanisms that cause illness.

To test this hypothesis, Kalish provided children with 6 "benign" vignettes containing scenarios that would not normally be seen as leading to illness, in addition to 6 "dangerous" vignettes concerning instances of contamination relating to food or contagion related to contact with a sick person. Children were presented with one of two conditions: the standard condition contained no mention of germs in either type of vignette, whereas the explicit condition mentioned the presence of germs in the benign vignettes and the absence of germs in the dangerous vignettes. Kalish proposed three possibilities: 1) that young children do not see germs as a cause of illness; 2) that germs are perceived to cause illness in the same way that contact with sick people or eating food from the garbage causes illness; or 3) that germs will be

understood as the mechanism through which contagion and contamination lead to illness. Kalish found that children do appear to treat germs as the mechanism of illness causation: when there are no germs involved, children understand that even reliably dangerous actions like eating food from the garbage do not lead to illness. At the same time, children accurately predict that the presence of germs makes even innocuous actions, such as eating food that has fallen in water, cause illness (Kalish, 1996). Children's hyper-awareness to actions that may be contaminating or contagious likely stems from a disgust response to situations that have the propensity to spread disease. This biological mechanism is an evolutionary function that ensures humans do not engage with substances that could be physically harmful and may lead to early causal reasoning about contamination and the causal mechanisms of disease (Stevenson et al., 2010).

While children may be aware of biological concepts such as germs and contaminants from a young age and may even treat these mechanisms as causes of illness, researchers continue to explore *how* children encounter these theories given that adults rarely articulate such principles in an explicit or instructional manner (Toyama, 2016). As both contaminants and germs are often microscopic, and it can be impossible to observe if contamination has occurred, children must rely on learned concepts and social norms to construct their awareness of contamination and contagion (Toyama, 2015). Toyama (2016) presented preschoolers with scenarios pertaining to an event, such as the breaking of hygiene habits, and their resulting states, such as getting sick, and asked them to generate causal explanations. It was found that even 3-year-old children tended to attribute illness to germs and dirt and conceptualized germs in a somewhat sophisticated manner, describing them as moving, spreading, growing, dying, and most importantly, causing sickness. One hypothesis suggests young children's sophisticated grasp of causal mechanisms of illness stems from the deep ecological and evolutionary

significance of contamination and contagion, similar to the disgust response (Toyama, 2015, 2016). Children's early acquisition of germ theory—the idea that infection and disease occur due to the presence of microscopic microorganisms—and related illness concepts may thus be due to an innate biological predisposition to conceptualizing and avoiding illness. This would compound Kalish's hypothesis that children's conceptualizations of illness are underestimated within a Piagetian framework, as it would suggest that children's concepts of illness develop faster than their general cognitive reasoning abilities.

Another theory is that there is an important role played by parents and teachers in imbuing children with accurate and applicable conceptualizations of illness (Toyama, 2016). While Toyama (2015) found that everyday explanations of illnesses given to children by adults were rarely scientifically correct nor detailed, and included sentiments like encouraging children to eat spinach to prevent colds (p. 541), adults were observed to spontaneously refer to causal mechanisms such as germs, disgust transmission, and transferring dirtiness. Adults' treatment of germs as an indisputable scientific norm, despite the lack of explicit illness explanations related to germs given to children, likely explains preschoolers' constructions of explanations of illness using similar mechanisms (Toyama, 2016). While children are exposed to the concepts of germs, dirt, contamination, and contagion from an early age, their ability to apply these concepts to novel contamination scenarios, such as in Toyama (2016), shows a generative ability to reason about contamination and illness transmission that is not significantly predicted by parental or social influence (Legare et al., 2008).

The results from studies such as Kalish (1996) and Toyama (2015, 2016) suggest that children possess an innate, biological understanding of illness and infection. However, the literature also indicates that while any biological predisposition to identify illness or causal

mechanisms of sickness may allow children to more easily explain illness causation, children's knowledge alone does not predict their abilities to make predictions about illness outcomes or transmission (Legare et al., 2008). Legare and colleagues (2008) explored children's explanations of illness as opposed to their predictions using eight vignettes containing a contamination action such as a leaf falling in water, or a proximate non-contaminating action, such as a dog walking past a glass of water. Children 3 years of age and older were found to explain sickness outcomes with relative ease and were also able to invoke unobservable entities as causes of sickness. Even very young children provided contamination explanations such as germs, dirt, slime, or particulate matter from contaminants, which further substantiates the claims that children are able to grasp causal mechanisms of illness (Kalish, 1996). However, child participants in Legare et al. (2008) were less likely to apply these causal mechanisms to predictions of illness outcomes. The results of the study suggest the existence of an explanation advantage where children are overall better at explaining than predicting contamination and contagion.

This explanation advantage could explain the results of studies such as Perrin and Gerrity (1981), among others. Using a semi-structured interview format to observe how children conceptualize illness, Perrin and Gerrity asked children in grades K-8 questions such as "How do kids know when they are sick?" and "How do children get sick?" (p. 842). Children's scores were graded from 0-6, with a low score indicating less complex, developmentally immature answers, and higher scores indicating complex and more abstract thinking. Researchers found children's responses to the question "How can children keep from getting sick?" (p. 842) to be consistently low scoring and less accurate across all age groups than questions about how illness manifests. Prediction tasks require children to predict both the outcome of a given situation and

the reasoning behind it, whereas explanation tasks require only a proximal link between causes. Due to this, children with accurate knowledge of illness but without highly developed cognitive reasoning skills may be more likely to explain rather than predict accurately (Legare et al., 2008).

Although explanations and predictions of illness outcomes are an important tool through which to understand how children conceptualize illness, children's explanations for events do not seem to reflect the same level of causal reasoning as do their actions (Bullock et al., 1982). Young children may lack the vocabulary to explain the causes and outcomes of illness scenarios, and so it is crucial to observe children's behaviors toward both contaminants and contagious individuals to truly understand cognitive reasoning about illness (Legare et al., 2008). To examine the link between children's causal reasoning about illness and their actual practiced behaviors, Blacker and LoBue (2016) examined children's willingness to play with "sick" confederates. Overall, children were observed to avoid proximity to and contact with the sick individuals and their belongings, but researchers found that these behaviors were not reliably predicted by age. Instead, children's abilities to make predictions about illness transmission determined their avoidance behaviors (Blacker & LoBue, 2016). It is thus important to differentiate the development of the content of children's concepts of illness from children's development of causal reasoning about illness. The current literature thus suggests two related theories. Firstly, that children's knowledge about illness—the content of their illness concepts—is somewhat predicted by general cognitive development, likely informed by parents and social influences, and compounded by the experiences of the individual (Dempsey and Turner, 2017; Pidgeon, 1985). It is also likely that children are biologically inclined to be aware of the causal mechanisms of illness (Kalish, 1996). This theory may explain the explanation advantage

discussed above, as explanations of illness scenarios depend primarily on knowledge about illness, not the ability to reason about illness transmission. The second theory suggests that children's ability to predict illness outcomes and to engage in contagion avoidance is predicted by causal reasoning, not by the content of illness conceptualizations. Sophisticated causal reasoning about illness, not just knowledge about illness itself, must be in place for child to (a) predict illness transmission and (b) initiate self-motivated contagion avoidance behaviors. Due to these theories, Blacker and LoBue (2016) conclude that providing children with causal information about illness transmission—not just information about the manifestation of illness in general—has the potential to promote healthy avoidance behavior even among very young children. Programs with a focus on teaching children about risk behaviors are thus less effective than those that discuss *how* those behaviors lead to contracting an illness (Blacker & LoBue, 2016).

While causal reasoning seems to be crucial for children to understand illness transmission and to initiate contagion avoidance behaviors of their own accord, previous studies on social behavior note how young children's behavior is often directed by adults, results from mimicry, or is learned through associations. The transition from awareness of illness concepts to action in young children is not automatic, but is mediated by cognitive, developmental, and socio-cultural processes (Siegal et al., 2011). Children do indicate an early tendency to attribute illness causation to their actions, which has been hypothesized to stem from parental admonitions to observe certain health practices to avoid becoming ill (Pidgeon, 1985). However, it is unclear if children engage in certain behaviors because they have been told to do so, or because they gain a causal awareness that their actions have an effect on their health. The limited literature indicates few strong links between parental health attitudes and children's resulting illness concepts

(White, 2011). This outcome can be observed in Campbell (1975), who compared the illness concepts of children to those of their mothers. Campbell found that while children's definitions of specific illnesses typically matched those given by their mothers, comparison of mother-child dyads showed that the illness concept of any individual child was not more likely to resemble that of their parent. Similarly, Mechanic (1964) explored maternal health attitudes to the health behaviors of children using an interview study with mother-child pairs. Mechanic hypothesized that mothers who defined the physician's role in an expansive way would be more likely to use medical services for their children and for themselves, which would, in turn, mean that their children would be more likely to perceive doctors as necessary in various illness situations. While Mechanic found a slight general trend between maternal influences and children's behavior, he was surprised at how little impact maternal attitudes appeared to have on children's behavior. In his conclusion, Mechanic proposed that children's behaviors are thus more dependent on the actions of the parents, rather than the attitudes they hold toward health.

As speculated by Mechanic, there is some evidence to show that parental behaviors may predict children's behaviors, although not their illness concepts. Siegal et al. (2011) hypothesized that the relationship between parental attitudes towards contagion and contamination and their children's subsequent health behaviors may be mediated by the level of disgust emoted by parents. Disgust has been shown to correlate highly with contamination sensitivity, defined by Siegal et al. as the degree to which an individual is aware of contaminants and believes avoiding contamination of food or other substances to be salient to health. Stevenson et al. (2010) highlighted the importance of parental influence on the development of the sense of disgust that accompanies contamination sensitivity. Using self-reports and facial expression data, along with measures of contagion and contamination sensitivity, Stevenson et al. determined evidence for a

strong relationship between the amount of disgust elicited by a parent with the amount of disgust elicited by their child. Children who emoted more disgust also indicated greater behavioral avoidance of contaminants and contagious individuals overall. However, Siegal et al. (2011) found children's behavioral responses to potential contaminants and contagion to be highly dependent on social norms and contexts. For example, food dropped on the floor in a restaurant is likely to be treated with a high level of disgust and to be regarded as inedible, but children may be encouraged by parents to eat food that has dropped on the floor at home. The relationship between children's disgust responses to those of their parents may explain the variable role that parents have on their children's illness concepts and contagion avoidance behaviors. As established above, the content of children's illness concepts does not relate directly to their ability to reason about illness transmission, nor to their actioned contagion avoidance behaviors. Given that social contexts may demand different behaviors and levels of contamination sensitivity, children with nascent causal reasoning skills may be likely to mimic their parents' level of disgust and their subsequent contagion avoidance behaviors.

The effect of parental behaviors on children's behaviors can be explained by social cognitive theory, which attests that new behaviors can be acquired by observing and imitating others (Bandura, 1971). Bandura (1961) investigated whether social behaviors could be acquired through observation and imitation by observing children's play behaviors with a toy known as a Bobo doll, an almost life-size, human-like toy. Bandura assigned children between 3 and 6 years old to three conditions: a control condition, a non-aggressive model, and an aggressive model. Children in the aggressive condition observed adults behave aggressively toward the Bobo doll whereas children in the non-aggressive model behavior observed the model adult ignore the Bobo doll to play quietly with other toys. Bandura found that the children who observed the

aggressive model initiated far more aggressive responses toward the Bobo doll than children in the control and non-aggressive conditions. Children's aggressive behavior also appeared to be imitative, with children repeating the language of the aggressive adults and copying physically aggressive actions towards the dolls, such as punching and kicking them. Bandura concluded that aggression outcomes in children appear to stem from the direct observation of aggressive behavior, not spontaneous engagement in that type of play. Applying Bandura's theory to illness frameworks, it is likely that in very young children, engagement in contagion avoidance behaviors is similarly non-spontaneous, and is instead imitative and learned. While explicit health-related parental attitudes impact children's illness concepts only slightly, social cognitive theory suggests that modeled adult and parental health related behaviors are highly impactful to the subsequent behavioral outcomes of children.

While Bandura (1961) might explain how children encounter contagion avoidance behaviors for the first time, it does not provide an indication of the lasting effects of observational and imitative learning. To understand what may motivate children to continue enacting mimicked behaviors, a more in-depth analysis of Social Cognitive Theory is required. Bandura (1971) states that children are in large part motivated to engage in certain actions due to the perceived consequences to those actions. Prior to Bandura's research, behavior was conceptualized to be compelled by inner forces such as needs, drives, and impulses. The learning of new behaviors was also attributed solely to operant conditioning, an associative process where behaviors are encouraged or discouraged by reinforcement or punishment (Bandura, 1971). Bandura claims that while learning may occur as the result of observation and imitation, associations made between behaviors and their consequences may provide the reason for continued engagement in certain actions. Even though children may first engage in contagion avoidance due to the

observation of adult behaviors, it is likely that their behaviors become externally motivated by positive consequences, such as praise and reinforcement from adults.

While some previous studies have observed contagion avoidance behaviors in a social context, no research of this type has yet to be conducted in the higher-stakes context of the spread of a highly contagious and dangerous virus not in the context of a global pandemic. Contagion avoidance behaviors such as mask-wearing have been mandated in certain areas, and others, such as social distancing and hand washing, have been highly encouraged by public officials. In order to encourage contagion avoidance in children, it is important to clarify *how* children form illness concepts and develop causal reasoning related to illness transmission, in addition to what motivates children to engage in contagion avoidance behaviors. The present study will explore the motivational factors behind children's contagion avoidance behavior and will measure both parents' and children's propensity to engage in mask-wearing, social distancing, and hand washing. As Mechanic (1984) proposed that children's behaviors are more dependent on the actions of the parents, as opposed to health attitudes, the current study will explore the relationship between parent behaviors and both child attitudes and child behaviors. A qualitative approach will be taken to identify common themes in children's reasoning about illness transmission, in addition to their perceived efficacy at reducing disease through certain behaviors. As a result of the current public health concerns, the current research predicts overall high engagement in contagion avoidance behaviors among both adults and children of all ages. In line with the assertion that children are motivated to engage in behaviors due to their consequences (Bandura, 1971), the incredibly salient consequence of disease spread is likely to be highly motivating for children who can conceptualize illness causation and viral transmission between individuals.

The present study will be the first to compare children's actioned contagion avoidance behaviors with their social and cognitive motivations for doing so. The current research is also unique given that it may provide crucial data on encouraging children to engage in contagion avoidance behavior during a global pandemic. It is hypothesized that children's age will predict their level of cognitive understanding of contagious illnesses, per the stage model created by Bibace and Walsh (1980). A relationship between children's age and their concepts of non-contagious illness has been well documented, so it is predicted that children's age will similarly relate to their perceptions of contagious illnesses. It is also expected that parental observation of their children's behaviors will positively correlate with their children's self-reports of their own behaviors, given that parents and children will both likely observe accurately the actions in question. Despite this expectation, desirability effects pertaining to child's engagement in contagion avoidance behaviors may impact parental responses. Based on the above literature, it is hypothesized that children's age and cognitive understanding of illness will predict the type of motivation they have for engaging in contagion avoidance behaviors. Children with more developed causal reasoning skills are expected to engage in contagion avoidance behaviors due to reasoning about illness transmission, whereas children in a lower stage of cognitive development would be more likely to cite incomprehension or social reasons for engaging in the same behaviors. Lastly, parental engagement in contagion avoidance behaviors is expected to predict children's contagion avoidance behaviors and to be moderated by age, based on social cognitive theory.

Proposed Method

Participants

Based on past research (Blacker & LoBue, 2016), a medium effect size is anticipated. Assuming $\alpha = 0.05$, a desired power of 0.9, and a chi-square design with 5 degrees of freedom, a sample of 143 dyads is recommended (Cohen, 1992). However, due to the qualitative and labor-intensive nature of this study, it is likely that a smaller sample size will be recruited, with full acknowledgment that this may weaken the conclusions of the study.

Volunteer participants will comprise parent-child dyads, with parents recruited through an elementary school listserv, a summer camp email list, and subsequent snowball sampling in an affluent suburb of Washington, DC. To qualify for participation, children must be between the ages of 4 and 12 and have a parent over the age of 18. Children must also have enough verbal competency as assessed by their parents to engage in an interview. Consent will be obtained from the parents, after which assent will be obtained from the children. Dyads are expected to be primarily white and upper-middle to upper class, due to the nature of the area in which recruitment will take place, with an even gender split among the child participants.

Materials

This study will comprise an online survey in addition to semi-structured interviews. The survey will be hosted on Qualtrics—a cloud-based website for creating and distributing surveys—and will be completed by parents only. It will consist of two contagion avoidance measures in addition to demographic questions. The order of these measures will be randomized in order to eliminate order bias. Interviews will take place over Zoom, an online video conferencing software, and will be conducted with the children enrolled in the study.

Contagion Avoidance Behaviors

Both parents and children's contagion avoidance behaviors will be measured with a scale designed for the purpose of this study, which is detailed in Appendix B. This scale contains three items and is rated on a 5-point Likert scale with response options ranging from *rarely* (1) to *very often* (5). The prompt will ask how often parents individually engage in contagion avoidance behaviors such as washing their hands or using hand sanitizer, wearing a mask, and social distancing. While the scope of contagion avoidance behaviors is greater than these three behaviors, these actions remain those most encouraged by the Center for Disease Control to reduce the transmission of COVID-19 (Center for Disease Control, 2021). These behaviors are also controllable and are easily quantified. It is important to be aware, however, that these actions are mandated by local law in some areas, which may lead to high engagement in contagion avoidance behaviors among all participants. Additionally, the level of engagement in contagion avoidance behaviors may also be highly variable in different communities due to the varying needs of those areas. For example, mask-wearing may be less necessary in rural areas due to lower population density that makes it easy for individuals to keep their distance from one another; in dense urban areas, people may be unable to take off their masks outside of their own homes. Parents will be asked to complete the same contagion avoidance measure scale pertaining to their observation of their children's contagion avoidance behaviors. Lastly, within the interview portion of the study, children will be asked about their contagion avoidance behaviors using the same items, with interviewers marking their responses on the same scale for consistency. This scale has reasonably strong content validity, as while these three contagion avoidance behaviors do not represent each of the actions an individual can take to reduce illness transmission, they comprise the primary contagion avoidance behaviors encouraged by healthcare workers and at times, mandated by local law. The scale has strong face validity, as it

appears to measure how often individuals engage in the contagion avoidance behaviors specified. This study is the pilot test for this novel scale, and its reliability will be established in the present study.

Interview Questions

The 32 interview questions compiled for this study, found in Appendix C, are based on those used by Bibace and Walsh (1980), Banks (1980) and Blacker and LoBue (2016) to assess the content of children's illness conceptualizations and their reasoning about illness transmission. Questions are split into four categories: general sickness (7 questions), COVID-19-specific (7 questions), behavior-specific (10 questions), and motivation-specific (8 questions). Questions pertaining to general sickness ("What happens if you get sick? How do people get sick?") will be used to classify children's level of cognitive understanding of illness into categories established by Bibace and Walsh (1980). COVID-specific questions will be used to analyze broad themes in children's understanding of COVID-19. Behavior specific questions will comprise 3-4 questions each on three separate behaviors: mask-wearing, hand washing/sanitizing, and social distancing. These questions include items from the Contagion Avoidance Behaviors scale described above, such as "Do you wear a mask? How often do you wear a mask?" Other behavior-specific questions refer to the efficacy of contagion avoidance behaviors: children are asked what the function of each of these behaviors is and why they may engage in them. The interview questions compiled for this study have not been pilot tested or analyzed for reliability but have strong face validity as they appear to measure what they intend to measure.

Demographics

Demographic data will be used to assess the representativeness of the study sample. Parents will first be asked the age of their child in an open-ended format. The following two

items will inquire about the gender and race of their child, both requiring write-in responses. Gender responses will be coded into *Male*, *Female*, and *Gender Non-Conforming*. Race responses will be coded into *White*, *Black/African American*, *Native American/Alaska Native, Native Hawaiian/Pacific Islander*, *Hispanic/ Latinx, Middle Eastern*, *Asian/Asian American*, and *Other.* If participants indicate belonging to two or more of the above categories, their data will be included in analyses of both groups. The final item will ask parents how they would classify their socioeconomic status on a 5-point Likert scale with response options *lower class* (1), *lower middle class* (2*), middle class* (3), *upper-middle class* (4) and *upper class* (5). The order of demographic questions will be randomized.

Procedure

After dyads have been recruited and informed consent and assent have been obtained, the survey link will be sent to parents consisting of the two Contagion Avoidance Behaviors measures and the demographic questionnaire. The order of these three measures will be randomized. Upon completion of the survey, a 25-35-minute Zoom interview will be scheduled with children enrolled in the study. Semi-structured interviews will then be conducted. Parents will be asked to refrain from answering interview questions or prompting responses from their children, although they will be permitted to remain in the same room as the child participant. After completing the interview portion, both parent and child will be debriefed.

Ethics

Little research has been conducted on children's conceptualizations of contagious illness and no such study has been conducted during a global pandemic. As society adjusts to a new normal created by the emergence of the novel coronavirus, it is imperative to study children's cognitive understanding of contagious illnesses and their subsequent contagion avoidance

behaviors, which may be more exaggerated than in a pre-COVID-19 world. Encouraging these "contagion avoidance behaviors," such as washing hands, mask-wearing, and social distancing, is crucial in reducing the transmission of the illness, and is thus an immediate priority for many health educators. Previous studies in the field (Bibace & Werner, 1980; Pidgeon, 1985) have assessed the best ways to engage children in health education appropriate to their cognitive understandings of illness. This study will attempt to assess what motivates children at different developmental stages to engage in contagion avoidance behaviors, which will likely be useful in education efforts. This study will also integrate well with the current literature, although the previous examination of children's conceptualizations of illness has rarely observed how those conceptualizations translate to behaviors. By using a cognitive-behavioral approach, this project aims to further the scope of the field by relating cognitive ideations to their resulting behaviors. While there is merit to this study, there are no direct benefits to the volunteer participants.

Participants will face minimal risk through their engagement in this study. As discussion of the COVID-19 pandemic has become commonplace and contagion avoidance behaviors have become necessary to reduce illness transmission, it is unlikely participants will face any material in the current study that they have not been exposed to at school or at home. However, it remains that a discussion of perceptions of COVID-19 could be distressing for some, especially for young children or those who have lost relatives due to the pandemic. Parents will be aware of the subject matter of the study and the interview questions before they give informed consent, and thus can choose not to participate in the study if they see fit. The content of both survey and interview questions will be phrased in the least distressing ways possible, encouraging discussion of contagion avoidance without mentioning the tragedies of the pandemic.

Interviews with the young participants in this study are necessary in order to gain a nuanced and more complex understanding of children's illness conceptualizations. Semi-structured interviews in particular have a low propensity to induce distress, as questions can be directed or adjusted based on participants' comfort levels. While children represent a vulnerable population in psychological research, conversations with them are invaluable for understanding their cognitive processes. There are few ways to accurately measure children's cognitive conceptualizations, but first-hand accounts from children provide insight that cannot be gained from interviewing their parents alone. By recruiting children through their caretakers, asking parents to complete a questionnaire prior to enrolling their children in the study, requiring that they provide consent for their children, the child participants in this study will only enroll and participate with their parents' full support and supervision. Additionally, children will provide their own verbal assent before they are interviewed.

As an additional protective measure, participants in the present study will be reminded that they may withdraw from the study at any time without adversely affecting their relationship with the researcher or any platform or individual through whom they were recruited. Any decision to discontinue participation at any time in the study or before the second interview portion of the study will not result in any loss of benefits.

Participants are further protected throughout their engagement in this study as the proposed research does not require participants to disclose sensitive information, and although a discussion of COVID-19 could be distressing for some, it is unlikely that this study will cover material that participants have not been continually exposed to over the course of the pandemic. This study will also not include deception, and parents participating in the study will be fully aware of the topic of the study and the content of study materials before data collection. At the

conclusion of the study, both parents and children will be fully debriefed, and information on counseling services will also be provided in the event that discomfort occurs.

The data collected in this study will be confidential. This study will require adult participants to provide contact information if they wish to enroll their children in the study in order to create a parent-child dyad and to schedule the interview portion of the study. Interviews with children will take place over Zoom and only audio will be recorded. A password will be required to enter the online office in which data collection will take place, and the room will remain locked over the course of the interview. As the session begins, all participants will be reminded that the audio of the interview will be recorded and will be alerted of this by a "recording" notice in the top left of their screen. Participants will be asked to remain in a private space over the course of the interview. While parents may choose to stay in the room with their children while the interview takes place, they will be asked not to interfere with their child's participation. The interviewer will also remain in a private space where they are unable to be overheard. Interview data will be transcribed shortly after collection and the original recordings will be destroyed. Data will also be relabeled to prevent identification of participants and will be stored in a password-protected file. Given the precautions to ensure participant privacy, the informed consent and debriefing processes, and the urgent need for psychological research on children's understanding of the novel coronavirus, the minimal risk of this study is outweighed by its potential benefits to both society and the scientific literature.

Data Analysis

Coders will be hired to analyze qualitative interview data. It is expected that children will refer to some degree of social learning or behavior direction over the course of their interviews, and themes such as social motivation for engaging in contagion avoidance behaviors are

expected among all age groups. Children's answers will be examined for the presence of more complex cognitive reasoning about the efficacy of contagion avoidance behaviors in preventing sickness in the current pandemic, as described below. Two coders will be assigned to listen to the recording of each interview independently. For the General Sickness questions, coders will be asked to assign each child to one of the specified developmental stages. Predicted themes are specified for COVID-specific questions, some Behavior Specific Questions, and Motivation questions, and coders will record the presence of each theme over the course of the question set. For the remaining Behavior Specific questions, coders will first indicate participants' answers to the yes/no questions specified below and will then translate responses to the following questions to the Contagion Avoidance Behaviors scale. The parameters of these themes are described below, Following coding, interrater reliability will be calculated by comparing similarity in ratings. If coders record the presence of different themes, only those which they agree on will be used in data analysis.

General Sickness Questions

These questions will be used to code children into the stage model proposed by Bibace and Walsh (1980), which contains 7 categories, each of which are demarcated by the content of children's conceptualizations of illness. These stages will be coded numerically: a score of 3, for example, indicates assignment to the *Contamination* stage. *Incomprehension* (0) is differentiated by children's lack of understanding of sickness. *Phenomenism* (1) will be embodied by children who have some belief about the cause of illness as external to them, but who are unable to reason about this cause or explain in complex detail. Children in the *Contagion* (2) stage will explain illness as something caused by objects or people proximate to them, but their reasoning will not exceed explanations of proximity between the cause of illness and the illness itself. The

Contamination (3) stage will be occupied by children who believe illness to have an external cause, such as a person or object that has come into physical contact with the child, or even an action engaged in by the child that is qualified as "bad" or "harmful." Children may be coded into the *Internalization* (4) category if they express that illness is located within the body, although causes—like a person or object, are perceived to be external. The *Physiological* (5) stage will be demarcated by children who express an understanding that the source and nature of sickness resides in internal physiology, and both external events and the disruption of an internal process or organ can trigger illness. Lastly, children will be coded into the *Psychophysiologic* (6) category if they are able to represent illness in terms of internal physiological processes, yet also recognize the importance of the psychological causes of illness and health. The number of children assigned to each developmental stage, along with examples of reasoning within each will be indicated in *Table 1*. The table will also capture notable themes in children's explanations of illness. per While not all of these themes are relevant to contagious illnesses, children's responses to the General Sickness questions will suggest the stage of cognitive reasoning about illness they occupy and will provide some indication of the level of their causal reasoning abilities.

COVID-specific Questions

These interview questions will be used to establish participants' basic understanding of the current pandemic, in addition to establishing core themes in children's conceptualizations of the coronavirus. The first two questions will act as checks on children's knowledge of the current pandemic. Children who are completely unaware of COVID-19 or behaviors to reduce transmission will be noted as such. Some predicted themes include an understanding of contagion (e.g., "other people make me sick, I have to stay away from other people"), an

understanding of the underlying mechanisms of illness, such as germs (e.g., "I can't touch things because they have germs, people have germs that make me sick"), feelings of anxiety/worry (e.g., "I'm scared to see other people because they can make me sick, I don't want my grandparents to die"), and feelings of efficacy—or lack thereof—relating to sickness prevention (e.g., "If I wash my hands I won't get sick, I don't go to school because it will make me sick"). Frequency of the occurrence of common themes will be recorded in *Table 2*, as will examples of those themes and quotes from children's responses that align with those themes. Other potential common themes that occur in interviews will be recorded, and if these themes are observed in the responses of more than one individual, they will be included with the themes noted above. Frequency of mentions of each theme will be noted.

Behavior-Specific Questions

Behavior specific questions can be broken up into three types. The first type of question simply establishes that children engage in the specified contagion avoidance behaviors (e.g. Do you wear masks? Do you wash your hands? Do you socially distance?). Children will provide yes or no answers. If children are unaware of the term social distancing, a simple definition will be provided. The second type of question refers to how often children engage in contagion avoidance behaviors. These *how often* questions under each behavior will be translated to Contagion Avoidance Behaviors Scale parameters. Children will be given scores based on how they answer, e.g. "all the time": translates to *often*, which is coded as a 5. A Cronbach's analysis will be performed on the Contagion Avoidance Behaviors measure to explore internal consistency between items. Given high internal consistency between items, a composite "contagion avoidance behaviors" variable will be compiled. To create this composite, children's

scores across all three items will be averaged, with a 5 indicating high engagement and a 1 indicating low engagement in contagion avoidance behaviors.

The second type of question pertains to how effective children understand contagion avoidance behaviors to be, and includes items such as "What do masks do? What does washing your hands do? What is social distancing and what does it do?" Common themes within the answers to these questions will be compiled in order of complexity of reasoning, and the frequency with which each theme is invoked will be recorded. Incomprehension (e.g. "I don't know what masks do") comprises the least complex predicted theme. Broad and non-specific explanations such as "they keep people safe" or "they stop people getting sick" given without an indication of an underlying understanding of contagion mechanisms such as germs or close contact with an individual are also an expected theme. Explanations invoking complex themes such as germs and some depictions of contagion with contact are also predicted to occur (e.g. "Masks stop the germs from getting in your nose"). The most complex explanations about the efficacy of contagion avoidance behaviors are expected to contain reasoning about illness transmission and an understanding of why contagion avoidance behaviors may be effective (e.g. "If you wear a mask you stop other people getting sick because your germs can't get through the fabric into the air around you"). The frequency with which common ideas occur across ages will be noted.

Motivation Questions

As there is no basis in the current literature for what motivates children to engage in contagion avoidance behaviors, content analysis will be used to examine common themes that emerge in children's answers. Themes are expected to be either social in nature—relating to social learning, mimicry, or conditioned behavior—or to relate to cognitive reasoning about

illness. For example, for the questions “Do you like [to engage in these behaviors]? If you don’t like them why do you do them?” it is expected that an answer such as “My parents/my teachers tell me to or my mommy does, so I do too” would indicate strong social or imitative motivation for engaging in contagion avoidance behaviors. Conversely, an answer such as “I don’t want to get other people sick” or “I don’t want to get germs on me” may indicate some level of cognitive reasoning about the impacts of these behaviors on the transmissibility of illness. The question “Who tells you to [engage in these behaviors]?” is crucial to determine the messaging children are receiving related to engaging in contagion avoidance behaviors, and predicted answers include parents, teachers, and perhaps even friends. For the follow-up question “If they didn’t tell you to do [these behaviors], would you still do them?”, a “no” or more negative answer may indicate that children may engage in contagion avoidance due to expectations of authority figures, indicating a stronger social motivation, whereas a *yes* or more positive answer could indicate an understanding that contagion avoidance behaviors are effective in reducing sickness, pointing to reasoning about the efficacy of these behaviors. The latter requires follow up questions such as “Why?” to examine this hypothesis in more detail. Likewise, for the question “Do [these behaviors] stop you from getting sick?” answers that indicate an understanding that these behaviors lead to reduced transmission of illness may indicate the presence of more mature cognitive reasoning about contagious illness. The follow-up question “How?” is needed to examine whether children understand *why* contagion avoidance behaviors may work, whether they can invoke underlying mechanisms such as germs, and whether they can make predictions about illness outcomes for themselves. Similarly, answers to the question “Do [these behaviors] stop your friends from getting sick?” will be examined for indication that children can relate their prior reasoning about the transmissibility of disease to others. Themes across all motivation

questions will be compiled, and the presence of each theme in children's responses will be recorded. Expected themes include *broad social motivation* (friends, school, social norms), *authoritative/directed motivation* (parental/guardian direction to engage in behaviors), *mimicry/social learning* (copying those around them), *causal mechanism motivation* (non-specific mentions of germs, dirt, or disgust), *anxiety/worry about illness transmission*, *efficacy/power to prevent illness motivation*, and *unknown/unclear motivation* (child may be unaware of their motivation). As children may be unaware of their motivations to engage in certain contagion avoidance behaviors, a semi-structured interview format allows for probing questions to explore a child's motivations. Qualitative data also provides nuance that is necessary in this study, given that children's motivations to engage in contagion avoidance behaviors have yet to be studied.

Predicted Results

It is expected that children's age will predict their level of cognitive understanding of contagious illnesses. Past studies (Banks, 1990; Bibace & Walsh, 1980; Burbach & Peterson, 1986; Perrin & Gerrity, 1981) indicate that children's cognitive understanding of illness grows more complex as they age, and that the complexity of children's reasoning about illness can be somewhat predicted by their age. However, in some previous studies, age has often been used as a proxy for children's cognitive developmental level, an assumption which has been criticized (Bibace & Walsh, 2016; Burbach & Peterson, 1986) for its potential to weaken conclusions. While age is unlikely to be an exact predictor of children's level of cognitive reasoning due to the potential for individual differences (Bibace et al.,1998), the strong relationship expected between these two variables will substantiate the use of age as a normative marker of cognitive development both among the current sample and within past and future studies. This hypothesis

will be tested using a 1-way ANOVA between children's age, a continuous variable, and their level of reasoning about illness from 0-6, using the stages compiled by Bibace and Walsh (1980). There is predicted to be a main effect of children's age on their level of reasoning, as differences in ages between the stages of cognitive development are expected (Piaget, 1929, Bibace & Walsh, 1980). Contrasts will be run to explore any differences in the ages of children within each cognitive developmental stage.

This study will also record both parental observation of children's contagion avoidance behaviors and children's perceptions of their own behaviors, as these may differ from one another, either due to a parent's over-exaggeration of their child's behaviors, or a child's lack of awareness of their own actions. It is expected that parental observation of their children's behaviors will positively correlate with their children's self-reports of their own behaviors. A simple correlation will be run to test this hypothesis. Given a strong correlation, a *Children's Contagion Avoidance Behaviors* composite will be created, as described above, for use in the following statistical analyses. If the correlation between the two variables is weak, the following hypotheses will be tested twice, once with each variable pertaining to children's behaviors.

It is hypothesized that children's age and cognitive understanding of illness will predict the type of motivation they have for engaging in contagion avoidance behaviors. It is expected that younger children will rely on social cues and mimicry to inform their behaviors, as observed in Bandura (1961), whereas older children will be motivated to engage in the same behaviors due to more complex reasoning about their role in reducing the transmission of illness. Older children's level of causal reasoning should indicate an ability to understand the role they play in illness transmission. As people are motivated to engage in behavior with positive or non-punitive consequences (Bandura, 1971), older children are likely to be driven to engage in contagion

avoidance behaviors to reduce the "consequence" of illness transmission. Researchers will first look for common themes in children's motivations to engage in contagion avoidance behaviors, and then will examine the absence or presence of each motivational theme in children's responses. For each type of motivation found, a logistic regression will be conducted, using children's age as a continuous predictor and children's "stage" of cognitive understanding of illness (from stages 0-6, as detailed above) as a categorical predictor. Themes that relate to reasoning about contagion are expected to be more present in older children and those with more complex causal reasoning abilities. This is in line with Blacker and LoBue (2016) and Legare et al. (2008), who demonstrated that children's ability to understand illness transmission and contagion avoidance is reliant on the complexity of children's causal reasoning and understanding of causal mechanisms of illness as opposed to the content of their illness concepts. Themes that relate to the observation and imitation of parents or guardians are expected to be found primarily in younger children, due to the likelihood of young children's behaviors to be imitative (Bandura, 1971). Themes concerning fear of retribution, rule-following, or adult-directed behavior are expected to be found across age groups, as children's behaviors are often externally motivated by adult reinforcement and punishment (Bandura, 1971).

Lastly, it is hypothesized that parental engagement in contagion avoidance behaviors will predict children's contagion avoidance behaviors and will be moderated by age. A multiple regression will be conducted to examine the effects of age and parents' contagion avoidance behaviors on children's contagion avoidance behaviors. There is expected to be a main effect of parental contagion avoidance, such that increased parental engagement in behaviors such as hand washing, mask-wearing, and social distancing will predict higher instances of those behaviors among their children. There is also predicted to be a significant interaction between parental

behaviors and children's age, so that younger children will more likely to engage in similar behaviors to their parents than older children. This is hypothesized due to younger children's susceptibility to social learning and conditioned behaviors (Bandura, 1961; Bandura, 1971). Older children are also predicted to retain similar behavioral patterns to their parents, but the relationship between parent and child behaviors is expected to become less strong as children rely less on imitation to inform their behaviors (Bandura, 1971).

Discussion

The purpose of this study is to gain a better understanding of how children reason about illness transmission and how this translates to their engagement in contagion avoidance behavior. The established literature suggests that children's knowledge about illness is somewhat predicted by their general cognitive developmental stage and is additionally influenced by social context and the experiences of the individual (Dempsey and Turner, 2017). It also seems likely that children are biologically predisposed to be aware of the causal mechanisms of illness (Kalish, 1996), creating an explanation advantage where children may be able to explain the causes of known illness outcomes but are unable to reason about illness transmission. Sophisticated causal reasoning about illness must be in place for a child to predict illness transmission and to self-initiate contagion avoidance behaviors. However, children without strong causal reasoning skills are also expected to engage in some contagion avoidance behaviors, likely due to social cognitive theory (Bandura, 1971). While parental attitudes do not highly influence children's perceptions of illness, the health behaviors parents engage in are often mirrored in their children due to observational learning. Because of this theory, the results of the present study are expected to provide evidence for a strong relationship between parent and child contagion avoidance behaviors, especially among younger children in the sample. This study will explore if

children engage in mask wearing, hand washing, and social distancing because they have observed those behaviors from adults and will also examine how children may be encouraged to continue engaging in these behaviors. It is expected that this study will indicate that older children will continue to engage in contagion avoidance behaviors due to their reasoning about the transmission of illness, and their motivations to avoid the consequence of spreading disease.

The qualitative design of this study will allow for the exploration of nuance in children's motivations for engaging in contagion avoidance behaviors, and in their perceptions of the COVID-19 pandemic. However, as this research topic has never been studied, this study may be limited in its design and scope. The proposed sample population is likely to be quite homogenous in race and income level, which will weaken the generalizability of the resulting data. Additionally, the interview questions and Contagion Avoidance Behavior measure created for the purpose of this study have no established reliability or validity. The current literature will undoubtedly be confounded by the COVID-19 pandemic, as public health concerns have become much more salient for both children and parents. Whereas prior to the pandemic, children may have been unaware of their engagement in contagion avoidance behaviors, the accessible messaging about reducing disease transmission is likely to increase children's awareness of the spread of the coronavirus in addition to their knowledge concerning contagion avoidance behaviors. Due to this inescapable confound, the current study may not be generalizable outside the scope of the COVID-19 pandemic, or to populations who are not likely to have received the same incessant messaging about the spread of the virus.

Despite these limitations, the expected results could have several theoretical and practical implications for the literature. Firstly, data about what motivates children to engage in contagion avoidance behaviors has the potential to inform health educators, teachers, and parents about

how best to encourage these behaviors in children. It is imperative that children learn from a young age how to prevent or slow the transmission of illness, especially given the ongoing context of a global pandemic. Secondly, while there have been many cognitive developmental studies conducted on the content of children's health and illness concepts, there is a substantial gap in the literature concerning the implications of these concepts on children's behaviors.

As the current study will examine the presence and absence of themes in children's motivation to engage in contagion avoidance behaviors, future research could examine more closely the degree to which each type of motivation observed in the present research plays a role in impacting children's health behaviors. It may even be possible to determine evidence for stage-based models relating to reasoning about transmission of illness or motivations for engaging in contagion avoidance behaviors such as those found in Bibace & Walsh (1980) and Piaget (1929).

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Appendix A: Tables and Figures

Table 1: Stage-based analysis of children's cognitive reasoning about general sickness

Stage	N	Main themes	Quotes
Incomprehension	X	No understanding of sickness	"I don't know"
Phenomenism	X	Mention of external cause, magical reasoning and associations	
Contagion	X	Mention of cause as something in child's proximity (person or object), reasoning based purely on proximity	
Contamination	X	External cause of illness, physical touch or action of child as the reasoning behind transmissibility	
Internalization	X	Illness located inside the body, cause remains external, but vague reasoning	
Physiologic	X	Sickness occurs inside the body; cause can be external or internal: more specific	
Psychophysiologic	X	Illness as a result of internal physiological processes, cause both internal and external, most specific reasoning	

Table 2: Common themes in children's understanding of the COVID-19 virus

Theme	N	Examples	Quotes
Broad understanding of contagion	X	"Other people make me sick; I have to stay away from other people"	
Understanding of underlying mechanisms of illness (germs etc.)	X	"I can't touch things because they have germs; people have germs that make me sick"	
Feelings of anxiety/ worry about the virus	X	"I'm scared to see other people because they can make me sick; I'm worried about my grandparents getting sick"	
Feelings of efficacy about disease prevention	X	"If I engage in X behavior, I won't make other people sick; I have no control over how I may make other people sick"	

Appendix B: Contagion Avoidance Behaviors Scale

How often do you engage in the following behaviors in order to avoid sickness?

	Rarely				Often
Hand washing/hand sanitizing	1	2	3	4	5
Mask wearing	1	2	3	4	5
Social distancing	1	2	3	4	5

How often do you observe your child engaging in the following behaviors in order to avoid sickness?

	Rarely				Often
Hand washing/hand sanitizing	1	2	3	4	5
Mask wearing	1	2	3	4	5
Social distancing	1	2	3	4	5

Note: social distancing describes staying far away from others (6 feet or more) in order to reduce the transmission of certain kinds of diseases.

Appendix C: Interview Questions

General sickness

What happens if you get sick?
How do people get sick?
Have you ever been sick? What was wrong?
What happens if you play with someone who is sick?
Can you get sick from other people? How?

COVID specific

Have you heard of the coronavirus? What is it?
What is COVID caused by?
Are you worried about getting sick?
Can you do anything to avoid getting sick?

Behavior specific

Mask wearing.

Do you wear masks?
If children answer "No," interviewer will skip next question
How often do you wear a mask?
What do masks do?

Hand washing.

Do you wash your hands?
If children answer "No," interviewer will skip next question
How often do you wash your hands?
What does washing your hands do?

Social Distancing

What is social distancing?
If children are unable to answer this question, this simple definition will be provided: "Social distancing describes staying far away from others (6 feet or more)"
Do you socially distance?
If children answer "No," interviewer will skip next question
How often do you socially distance?
What does social distancing do?

Motivation

Do you think it's important to do these things? Why?
Do you like doing these things? If you don't like them why do you do them?
Who tells you to do these things?
If children answer "No-one," next question will be skipped.
If they didn't tell you to do them, would you still do them? Why?
Do they stop you from getting sick? How?
Do they stop your friends from getting sick?