

# Empowering Uncertainty Resolution for Vulnerable Populations

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**Ph.D. Thesis Proposal**

June 25, 2019

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## **Acknowledgements**

To be written as a part of my final dissertation.

## Abstract

We all experience uncertainty every day. What will the weather be like? Will I be able to do well on that test today? Will my sister call me back this evening? Sometimes the uncertainty we experience can be overwhelming and the stakes can be very high. Will my paycheck arrive on time to pay my rent? What was the result from the medical scan I had yesterday? For people from vulnerable populations, the stakes of even those ‘everyday’ types of uncertainty can become overwhelming and provide unique and difficult threats. Did the teacher not call on me because I’m a woman of color? Did that police officer pull me over because of my race? In my research, I study the impact of varying levels of uncertainty on vulnerable populations. In some situations, uncertainty can be used to create enticing motivation to learn more and gain competence. For example, puzzles present uncertainty that can be fun and in fact encourage learning. However, in other situations, overwhelming uncertainty can be stressful and cause undue burdens to cognitive load and disengagement. For example, acts of discrimination in the workplace can create uncertainty about a person’s standing and ability to perform well at their job. In this thesis I seek to study and design tools to empower uncertainty reduction for people from vulnerable groups. In previous research I have designed tabletop games using uncertainty to help increase comfort in STEM contexts for underrepresented group as well as studied how people cope with racism through meaning-making via uncertainty reduction. In my proposed work I will conduct an interactive vignette study to understand how aware of uncertainty a person may be in-the-moment of experiencing racism. I will also conduct co-design and participatory design session with stakeholders in design for support-seeking and uncertainty reduction.

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## Chapter 1: Introduction

We all experience uncertainty every day. Consider an undergraduate student at a university in the U.S. When she wakes up she might wonder, what will the weather be like? During a lecture in her advanced statistics course, she raises her hand to answer a question but her professor calls on another male student. She may or may not wonder why she was not called on. Later in the day when she is purchasing groceries at a local convenience store, the cashier may be unfriendly to her. She also may or may not speculate why the cashier was being unpleasant. Depending on the context and situation the student is in, the uncertainty she experiences throughout the day may have a varying impact on her. As a woman who is underrepresented in mathematics, she might question if she was ignored in class due to her gender. The stakes may be raised if this is a repeated event and she has never been called on by her professor despite repeated attempts to participate. However, as a white woman, she may have little uncertainty or care very little about the cashier. As a woman of color, the situation might change entirely. Now the unfriendliness of the cashier could pose the additional question, are they being unfriendly because they are suspicious of me due to my race or were they just in a bad mood today? If it was due to my race, will it be safe for me to shop here again in the future? Again, uncertainty and anxiety are likely compounded for this student after repeated experiences being followed in stores by store clerks who are similarly exhibiting prejudice and racism.

Depending on the context, uncertainty may be viewed as either an aversive or motivating state. In those every day innocuous experiences, uncertainty might spur you into action (e.g., checking the weather) or may just be lingering in the back of your mind. When the stakes are higher or the uncertainty greater there is a larger impact on your cognition, perhaps causing stress or anxiety. For people from vulnerable populations, the stakes of even those ‘everyday’ types of uncertainty can become overwhelming and provide unique and difficult threats. Did the teacher not call on me because I’m a woman of color? Did that police officer pull me over because of my race? If it was because of my race, how often will this happen to me in the future? Not only do these forms of uncertainty pose legitimate and serious threats, but the experience of constantly evaluating

interactions through a lens of marginalization causes undue burden over a lifetime of accumulating aggressions and microaggressions.

In my work I study the impact of varying levels of uncertainty on vulnerable populations (used interchangeably in the context of my work with marginalized populations). In this work I use information-gap theory to describe uncertainty as a person's awareness of a gap in their own knowledge (Loewenstein, 1994). The perceived size of the information gap as well as the person's feelings of competence to narrow or close the gap impacts their desire to information avoidance or acquisition, as well as desires for risk or ambiguity.

When uncertainty is at a manageable level, it can be pleasurable and in fact, people have individually-varying levels of preference for uncertainty. It helps define the parameters of what they know and what they do not yet but desire to know. And small uncertainty following a positive event can actually lead to prolonged feelings of pleasure (Wilson et al., 2005). However, when information gaps are too large and uncertainty is overwhelming, it can cause people to feel threats to their sense of self and ability, feel anxious, or disengage entirely. For people from marginalized groups, there are often additional layers of uncertainty when it comes to ambiguous experiences - often relating specifically to marginalized identities. That overwhelming uncertainty gap can have both short term and long-term consequences such as anxiety, disengagement, and long-term impacts to physical wellbeing. The primary goal of this work is to empower people to keep their uncertainty at manageable levels, specifically by providing tools and methods for either reducing uncertainty, expressing uncertainty, or feeling comfortable living with uncertainty.

I have studied uncertainty in two specific contexts with varying levels of stake for vulnerable populations. First, in the SCIPR (Sensing Curiosity in Play and Responding) project I have studied how uncertainty can be used to motivate curiosity and action in STEM and educational game contexts. Games are a natural delivery mechanism for uncertainty and provide a safe context for experiencing negative emotions related to failure and the risk of failure (To et al., 2017). The goal of this project is to empower marginalized adolescents to express their

uncertainty, regularly encounter and live with uncertainty, and feel they have the tools and competence to reduce their uncertainty.

Second, in the CARE (Coping After Racist Experiences) project I have studied how uncertainty can motivate social support-seeking following experiences with racism. In experiences with racism, the impact of uncertainty can span every aspect of the experiences (e.g., the nature of it, the motivation of the perpetrator, the future consequences, etc.). Prior work indicates that uncertainty reduction through validation from friends and family can be a powerful tool in coping with racism (Sue, 2010). A goal of this project is similarly to empower uncertainty reduction, but further work is needed to determine the appropriate framing of this goal. For example, is it that targets of racism should try to accept certain levels of uncertainty and learn to cope with that, or that tools for reducing or even eliminating uncertainty are necessary in this context? This question will be addressed in my proposed work.

In chapter 2, I discuss background and related work. First, I will provide the definition I am utilizing for uncertainty which focuses on the awareness of an information gap. Second I will provide background on different contexts of vulnerability and marginalization and the specific impact of uncertainty for vulnerable populations. Finally I will discuss design principles and considerations when designing for and with uncertainty.

In chapter 3, I will discuss my first study, embedding uncertainty in an educational game that encourages students who are marginalized in STEM contexts to be curious. This work discusses how to design contexts that make uncertainty comfortable and safe as opposed to threatening and how to make players feel competent in reducing their uncertainty.

In chapter 4, I will discuss my second study, which examines how people experience uncertainty related to experiences with racism. This work explores how uncertainty motivates social support-seeking behaviors as a type of coping mechanism, as well as the different sources of uncertainty that arise when people experience racism.

In chapter 5, I will present my proposed work, which seeks to design interventions to encourage uncertainty awareness and reduction when people cope with racist experiences.



Finally, chapter 6 concludes with a description of the timeline for my proposed work.

Everyone deals with uncertainty. In some situations these experiences can be enjoyable and encouraging. In others it can be unpleasant and stifling. For people from vulnerable populations, there are unique circumstances that multiply the impact of uncertainty largely in threatening ways. In this thesis I propose to address this inequity of experiences by studying and creating tools to empower people from vulnerable and marginalized groups to reduce their uncertainty.

## Chapter 2: Background

Related work discusses how we define uncertainty, the impact of manageable and unmanageable amounts of uncertainty, the specific contextual impact of uncertainty for vulnerable and marginalized populations, and finally, how to design for uncertainty. The focus of this review is the emotional experience of varying levels of uncertainty.

### 2.1 Defining Uncertainty

In my early work I define curiosity through an uncertainty lens in order to design games for curiosity. A survey of the literature on curiosity provided insights about the affective and behavioral experiences of and responses to curiosity, in particular the emotional consequences of uncertainty and the risk of failure and the key mediating role played by exploratory responses, such as question-asking, in managing those emotional consequences. These insights directly informed the development of a working design model of curiosity and, as we foreshadow in each of the following subsections, produced concrete game design goals that directed the development of *Outbreak*.

Curiosity can be understood as an appetite for information or the desire to fill an information gap (Loewenstein 1994). This gap, a violation of what is known or expected, can motivate a range of responses depending on the affective state that the newly salient uncertainty triggers. Among the factors that affect whether this discomfort is felt as a curiosity “itch” rather than an aversive “irritant,” an individual must see themselves as able to close that information gap and resolve the uncertainty (Proulx & Inzlicht, 2012). If the gap in knowledge is too wide to be perceived as surmountable - for example, if a student believes they are not capable of learning a new subject - it can result in frustration, disengagement, or trivialization (Proulx & Inzlicht, 2012). If the gap is too narrow - as in the case of a student who gets the answers to the test ahead of time - it can inspire indifference, as the gap is not seen as challenging, surprising, or compelling enough to merit further investigation (Engel, 2013).

## 2.2 Uncertainty and Marginalization

For people who are vulnerable or marginalized, the impact of uncertainty is amplified. This section provides critical theory and context for the work. This includes 1) modern theories of race and racism, particularly as they pertain to the United States and 2) marginalization in STEM contexts which applies both to people from racial minority groups as well as women. We emphasize theories and research explaining how subtle forms of racism manifest and impact people from racial minority groups. We also discuss the role of uncertainty and social support in processing and coping with those experiences.

### 2.2.1 Theories of Race and Racism

A large portion of the population in the U.S. deals with racism on a near daily basis. For the purpose of this paper, we are focusing on the construct of race from a U.S. perspective and acknowledge that racial and ethnic identity often operate differently and have entirely different historical contexts in other parts of the globe. Racism can be defined in three parts: 1) one group believes itself to be superior, 2) the group that believes itself to be superior has the power to carry out the racist behavior, and 3) racism affects multiple racial and ethnic groups (Soloranzo et al., 2000). The belief of superiority need not be conscious in order to perpetuate racism. In situations of aversive racism, a person's denial of their racial prejudices (which are often reinforced through sociocultural processes) may manifest in interactions with racial minority members as discomfort, fear, uneasiness, disgust, and/or avoidance (Dovidio & Gaertner, 2004).

In fact, race scholars state that in modern society racism has not gone away, but, rather, it has morphed (Dovidio et al., 2002, Nelson & Pang, 2006). Derald Sue defines “modern racism” (aka aversive racism, racial microaggressions, symbolic racism, etc.) as: 1) “highly disguised, invisible, and subtle forms that lie outside the level of conscious awareness,” 2) “hiding in the invisible assumptions and beliefs of individuals,” and 3) “embedded in the policies and structures

of our institutions" (Sue, 2010). Modern racism is covert, implicit, and not always under conscious control (Dovidio et al., 2002; Jones, 1997; Nelson & Pang 2006).

Microaggressions can refer to unintentional insults in regards to race (as well as gender and sexuality) (Minikel-Lacoeque, 2013). For example, complimenting an Asian American person on their "good" English language skills betrays an expectation of poor command of the language and, in the process, negates the target's U.S. heritage and reinforces their status as a perpetual foreigner (Sue et al., 2007).

The unintended nature of microaggressions makes them inherently ambiguous. Targets often feel uncertainty about the racist nature of the aggressive act. In the example just provided, the individual paying the compliment may have done so with the best intentions of giving praise, oblivious to the fact that their statement was biased and offensive. For targets, ambiguously negative experiences, especially those that are easy to dismiss as "small" such as microaggressions, tend to linger longer and weigh heavier in a person's mind (Gilbert et al., 2004). In fact, cardiovascular response is notably elevated in response to ambiguously racist events compared to overtly racist ones; subtle racism erodes heart health over time through psychological stress (Merritt et al., 2006). People tend to downplay and underestimate how those microaggressions will impact their lives and thus may be less likely to seek support to counteract those effects.

For this reason, validation of the target's experience is crucial. Otherwise, targets often question whether they are being overly sensitive or petty, rather than accepting that the interaction was a microaggression (Sue et al., 2007). In these instances, the 'sanity check' is the most frequent and necessary social support a target desires. It allows them to reaffirm their experiential reality, feel that others share their experiences, and immunizes them against future microaggressions by forming the notion of a shared group experience (Sue, 2010).

To this end, communicating these experiences to others and seeking their support can be a critical part of coping with the event. However, on many occasions, the process of relaying an experience with racial microaggressions can be discouraging. Specifically, the person to whom the target communicates their experience might display *microinvalidations* - subtle cues that

signal a lack of belief or acceptance of the subjective reality of a marginalized person and directly negate, rather than validate, the target's lived experience (Sue., 2008). This work seeks to understand how ambiguity and uncertainty as experienced by the targets of the racist experience impact their processing, meaning-making, coping, and social support-seeking related to the event.

Although beyond the scope of this paper, a final point we want to acknowledge about race and racism is its intersectionality. Intersectionality is an identity framework that asserts that we cannot treat portions of our identity discretely (Crenshaw, 1990). In the canonical example, treating the experiences of black woman as a combination of the experiences of black men and the experiences of women results in erasure of that unique experience. In this paper we focus on racial experiences, but acknowledge that for many of our participants, their experiences with racism are inextricably tied to other aspects of their identities which may complicate their support-seeking tendencies.

### 2.2.2 Marginalization in STEM

In STEM contexts (i.e., science, technology, engineering, and mathematics) both women and racial minority group members are marginalized and underrepresented at nearly every level of the pipeline (Burke et al., 2007). In the STEM context, marginalized groups may be dealing with higher levels of uncertainty broadly while assessing their standing, ability, and perceptions of their peers and superiors. In this section I briefly describe some of the contextual factors that marginalize women and racial minorities in STEM.

Lack of representation and marginalization has both short-term and long-term impacts for people in STEM. Women and racial minority group members see far fewer examples of successful peers and superiors in STEM and are provided with fewer opportunities (Burke et al., 2007). These opportunity gaps can bear out in individual contexts (e.g., a teacher calling on female students less than male students for in-class participation) but can also bear out in larger systemic contexts. For example, a 2001 study for the National Action Council for Minorities in

Engineering found that while interest in advanced mathematics was greater amongst racial minority girls in 5th to 11th grade, the availability of those courses was far less at the minority students' schools (Heaverlo, 2011).

Even for someone who has overcome those hurdles, the pressure of being a part of an underrepresented group can be damaging to performance. For example, stereotype threat research demonstrates that the activation of stereotypes about one's identity group creates a state of cognitive load that detracts from available for working memory and interferes with optimal problem solving and decision making in learning contexts (Schmader & Johns, 2003). Additional factors outside the classroom can also impact performance for marginalized students. For example, students from low-socioeconomic backgrounds tend to live with higher levels of cognitive load from the daily realities of dealing with poverty, stress, or trauma (Mani et al., 2013; Sirin, 2005).

The SCIPR project focused on addressing marginalization in STEM at the middle school level when identity formation is at its earliest stages. Around adolescence children develop firm beliefs are formed around which subjects in school they are good or bad at, which becomes a more permanent fixture of their self-image. At this age, STEM coursework tends to also drastically increase in difficulty (Jones, 2000) resulting in increased feelings of anxiety around ability to do well (Beilock et al., 2010). These two combined factors of difficulty and identity formation create huge barriers to STEM long-term engagement. While this is challenging for all students, students who are marginalized face additional barriers discussed above when it comes to STEM engagement. In order to interfere in this relationship between perceived ability and identification with a topic, the SCIPR project focused on designing curiosity transformational games to increase comfort feeling uncertain as well as comfort with risk of failure as a buffer to long-term disengagement with difficult or challenging topics in STEM.

## 2.3 Designing for Uncertainty

Knowing that uncertainty can both be a force for and barrier to action, we may consider how we can design both for and with uncertainty. When uncertainty is a motivator for action, it is because it provides enticing curiosity gaps that a person may feel competent and even excited to bridge. Manageable uncertainty can be utilized to present pleasurable experiences that empower a person to engage and gain new knowledge. When uncertainty is a barrier to action, it is typically because the uncertainty has become unmanageable. Perhaps the stakes of the uncertainty are too high. Perhaps the person does not feel they have the skill or ability to address the uncertainty. In all of these cases, both the pleasant and unpleasant ones, feelings of competence to reduce uncertainty and action taken to reduce uncertainty is the goal. In this section I describe two contexts in designing for uncertainty. In 2.3.1, I describe designs that motivate question-asking and necessary encounters with the risk of failure as a way to encourage people who are marginalized in STEM to regularly confront uncertainty while being given tools to reduce it. This design is performed within game contexts to increase feelings of comfort and competence with uncertainty that can translate outside of the game. In 2.3.2, I describe the stakes and context in designing for uncertainty around racism. The proposed work of this thesis addresses the open question of how best to design for uncertainty within that context.

### 2.3.1 Designing for Curiosity and Uncertainty in Games

The goal of the SCIPR project is to encourage and foster curiosity by embedding uncertainty within transformational games. During our design process we utilized playtesting and iterative design methods that account for the particular needs of marginalized and underrepresented groups (Fath et al., 2018). In designing for curiosity, I provide background for two kinds of motivating uncertainty: 1) designing for comfort with questions and 2) designing for comfort risking failure. Both question-asking and risking failure require added vulnerability for people from marginalized groups.

In designing for curiosity, we need to create compelling information gaps that game players can become aware of and feel challenged by, but that they also feel capable of resolving. Presenting players with elements or experiences of uncertainty is a key component of existing models of game engagement (Costikyan, 2013), and our own work has begun to further elucidate the links between curiosity and uncertainty from a game design perspective (To et al., 2016a). At the same time, if uncertainty becomes unmanageable or uninteresting to players, it has the potential to disrupt the experience of flow by creating an imbalance between perceived challenges and perceived skills (Csikszentmihalyi, 2014).

As game designers, we can seek to create games that encourage an instance-specific curiosity known as state curiosity (Carlin 1999). In addition to presenting moments of uncertainty to players, ensuring that the uncertainty presents the appropriate level of challenge, and equipping them with the skills to navigate and resolve that uncertainty, supporting uncertainty means triggering positive affect. Challenge is known to be one of the core pleasures of gameplay (Hunicke et al. 2004). In moments when players have both the ability and the desire to answer questions, a “virtuous cycle” of curiosity can therefore occur, in which players cyclically uncover information gaps, become immersed in the search for answers, and become more deeply engaged in the play experience (Engel 2013; Jirout & Khlar 2012). That is the primary focus of this paper. As discussed in more detail below, the design of *Outbreak* specifically aimed to provide social and instrumental supports for confronting and overcoming uncertainty - for example, by making the confrontation of uncertainty a shared, collective experience and equipping players with resources to scaffold the question-asking process. Of course, game design may also aim to have a lasting impact on player’s trait-level curiosity (i.e., their individual preferences for uncertainty). While the concepts discussed here may be extended towards long-term changes in trait curiosity, that is beyond the scope of the present work.

One safeguard against disengagement is the provision of tools that allow players to mitigate uncertainty and build self-efficacy around their ability to close information gaps (Proulx & Inzlicht 2012). The tool that we focus on here is the use of *questions*. When players encounter uncertainty, they can ask questions in order to express their curiosity, and they can use the



information they receive to resolve information gaps. Questions are particularly useful for games utilizing hidden information or unsolved puzzles to build uncertainty (Costikyan 2013). Players can pose inquiries (e.g., to the game itself, to one another in social deception games, etc.) to reduce the information gap. Furthermore, in collaborative games like *Outbreak*, in which players have unique resources, questions may also aid in collective knowledge assessment. When players discover new information through their questions, question-asking can invoke the pleasures of discovery and exploration (Hunicke et al., 2004). Even the feeling of anticipation as the player waits to see what they will discover can be a source of pleasure in gameplay (Schell 2014).

While questions are a valuable tool for reducing uncertainty, guiding players toward greater comfort asking questions can be challenging. People's relationship with questions influences their likelihood to entertain and willingness to voice those questions when facing uncertainty. First, individual personality factors such as assertiveness, self-esteem, and social anxiety determine one's general likelihood of asking questions (Mahdikhani et al., 2015). Second, social and situational cues indicate the cultural norms of question-asking in a given environment (Rocca 2010). For example, voicing uncertainty through question-asking can pose a social risk, but can also serve as a valuable means of assessing the relative or collective knowledge of the group (Mohammed & Dumville 2001). Finally, a person's perception of an authority figure can alter their relationship with questions. In the classroom, students' perceptions of a teacher as supportive versus condescending can dramatically alter their likelihood of asking questions (Mahdikhani et al. 2015). In game contexts, this might include player relationships with a gamemaster or with fellow players who have more information. In addition to comfort asking questions, we acknowledge that the content of those questions is of great importance but falls beyond the scope of this work. While developing better question formulation skills can increase the odds of getting information that reduces information gaps, good questions can also reveal new gaps through the knowledge they yield.

Designing for curiosity means supporting positive affective experiences in the face of uncertainty, particularly when risking failure. However, positive affect is by no means a given when it comes to confronting uncertainty. Acknowledging a lack of information or a gap in

knowledge can be an aversive state. Leading theories of curiosity posit that self-efficacy, the perceived ability to fill an information gap, plays a key role in determining whether uncertainty triggers affective states that are more positive or negative (Loewenstein 1994). If the level of uncertainty is too high, if the information gap is not obvious, or players do not perceive themselves as being capable of surmounting the challenge, curiosity may be stifled through the threat of failure (Berlyne 1966; Litman & Jimerson 2004; Loewenstein 1994; Proulx & Inzlicht 2012; Engel 2013; Rinkevich 2014). In contrast, when individuals experience the risk of failure as energizing, knowledge gaps can be framed and experienced as a challenge to overcome (Litman & Jimerson 2004; Loewenstein 1994; Berlyne 1966). Finally, in group settings, attitudes toward failure are often socially constructed - groups develop norms about expressing uncertainty and enforce social consequences for disclosing ignorance (Feldman 1984). These norms affect how much a person is willing to disclose their own knowledge, or lack thereof, to the group.

In particular for young students who may be marginalized, games are effective tools for designing interventions (Hughes, 2007; Kaufman et al., 2015). In games, the affective and social consequences of failure may be reduced compared to non-game contexts. Klopfer, Osterweil, and Salen (2009) identified failure as one of the five “freedoms” of play - while we cannot truly “fail” at play, we can do things during play that look like failure in other contexts but with lower risk and a more explicit opportunity for learning and growth. Similarly, Gee (2003) writes that in games, the risk of failure is lowered and, in fact, that failure is a good thing - players can feel empowered to take more risks, get feedback when they fail, explore more, and ultimately learn from the experience. Juul (2013) argues that failure may be the central aesthetic experience of play. By confronting players with their limitations, games can provide players the opportunity to emerge victorious over their past failures. According to Juul’s analysis, becoming a better player means becoming a better fail-er. In short, games are already suited to pose potential failures as learning opportunities. However, game designers must still take into account players’ varying emotional relationships with failure and imbue their games with safeguards to help players maintain a positive affective state (i.e., one that is motivated and energized rather than discouraged or disinterested). Below, we detail how we identified such safeguards in the iterative

design of *Outbreak*, including the reduction of game elements that heightened players' anxiety about the consequences of failure (such as the potential loss of a character) and the importance of replayability in helping players realize opportunities to learn from and rectify their previous failures.

### 2.3.3 Designing for Uncertainty Around Social Support and Vulnerable Self-Disclosure

In designing for coping after racist experience, there are additional considerations for vulnerability. Namely, seeking social support following racist experiences often necessarily requires high levels of vulnerable self-disclosure. Support-seekers must consider not only who is available and who has the tools to help, but also who is a "safe" person to disclose to. Will a potential supporter be comfortable discussing the sensitive topic of racism? Am I exposing myself to additional scrutiny and additional racism?

Social support is generally accepted to be helpful in mediating stress through a proactive coping strategy (Greenglass, 2002). The presence of support helps individuals deal with uncontrollable and emotionally difficult life events by providing a "buffer" against the potentially adverse effects of stressful or difficult situations (Sharma & De Choudhury 2018).

Social support can happen through a variety of avenues, whether it is in-person or mediated through communication technology (e.g., online, phone call, etc.). Some forms of in-person social support such as formalized psychological support groups may not be fully utilized by some populations due to fundamental differences in receiving formal treatment or legal barriers to official support from licensed psychologist across state lines (Dietrich, 2010; Barnett, 2011). In these cases, informal support options may be preferable. For example, simply engaging in social acts of meaning-making has been shown to contribute positively to trauma survivors' coping processes (Park & Ai, 2006).

People may go online for informal social support due to the lowered logistical barriers. They may utilize social networking sites such as Facebook to privately message those in their

immediate network, to post to their entire network through a status update, or to reach out beyond their network to the community at large (Ellison et al., 2014). People who don't actively post, but instead "lurk" also reap the benefits of social support by reading about other's experiences as they gain access to other people with similar challenging conditions (Lieberman & Goldstein, 2005). Even in formal social support, such as online therapy, clients have reported feeling less self-conscious, less inhibited, and better able to express themselves online (Loue, 2016). The anonymity afforded by online interactions means that individuals have more freedom to share potentially stigmatizing experiences without as much fear or disapproval (Dietrich, 2010). On the other hand, anonymous interactions entail concerns about the lack of accountability, dubious quality, and loose confidentiality (Ghenai & Mejova, 2018). Furthermore, anonymity is a double-edged sword, where the person reaching out is susceptible to hostile or derogatory comments and online harassment, problems that are exacerbated by the inhibition that comes with a lack of identifiability (Highton-Williamson et al., 2015).

To a certain extent, seeking social support for personally traumatic experiences such as racism inherently requires self-disclosure (i.e., sharing information about oneself). Self-disclosures on social media networks pose both benefits and serious risks when it comes to support-seeking. For the most part, social media disclosure tend towards positive or indirect revelations in public spaces. That is, when facing a broad and partly unknown audience, people avoid writing negative posts and/or indirectly referencing negative emotions and events due to potential stigma (Vitak & Kim, 2014). For disclosure of sensitive topics, these concerns may be amplified to risk of harassment, damage to reputation, and rejection (Debatin et al., 2009).

In particular, when discussing race and racism online, anonymity often gives way to the expression of negative racial attitudes and an eschewing of the normal constraints of accountability and social desirability that curtail the expression of racist views (Glaser et al., 2002; Steinfeldt et al., 2010). Picca & Feagin's "Two-Faced Racism" theory posits that racial ideologies still exist in modern America, but that social desirability has shifted their locus (Picca & Feagin, 2007). Racism tends to occur more in private spaces (i.e., backstage) as opposed to public spaces (i.e., frontstage). Online forums exist in between the front and backstage spaces by

protecting perpetrators from the social consequences of public expressions of racial prejudice, while still exposing people from racial minority groups and others to expressions of racial discrimination and other harmful attitudes (e.g., invalidation, etc.). These risks present additional hurdles for self-disclosure of racist experiences.

However, there are many benefits to online social support. For one, the ability for global reach of social media makes available a great number of community resources and immediate support options (Andalibi et al., 2018; Debatin et al., 2009). Additionally, there are many tools that allow support-seekers to curate and target their audience. Indirect posts about sensitive topics allow the poster to selectively address audience members who understand their message while filtering out those who may criticize the poster (Andalibi et al., 2018). Typically, direct self-disclosures about sensitive topics are posted in private groups or communities that are built around the specific topic. By selectively choosing what to post and where to post, support-seekers can mitigate the risks of public alienation.

Online spaces can also provide unique benefits when discussing race and ethnicity. For example, accessing racial-ethnic communities online can allow for connection as a way to construct and explore identity at a large scale (e.g., Asian-Pacific Islander identity deliberation on Reddit (Dosono et al., 2017)). Online spaces can provide unique access to communities of color that racial minorities might not otherwise have a chance to interact with in their daily lives (e.g., queer youth of color expression and self-disclosure on Tumblr (Cho, 2018)).

In this work we seek to understand what offline and online sources of support targets of racism turn to as well as how the medium of communication affects their experiences.

## Chapter 3: Modeling and Designing for Key Elements of Curiosity: Risking Failure, Valuing Questions

In this chapter, I present a design model of curiosity that articulates the relationship between uncertainty and curiosity and defines the role of failure and question-asking within that relationship. This work was published at the Digital Games Research Association Conference (DiGRA) in 2017 in collaboration with Jarrek Holmes, Elaine Fath, Eda Zhang, Geoff Kaufman and Jessica Hammer.

We explore ways to instantiate failure and question-asking within a cooperative tabletop game, share data from multiple playtests both in the field and lab, and investigate the impact of design decisions on players' affective experiences of failure and their ability to use questions to close information gaps. In designing for comfort with failure we find that helping players manage the aversiveness of potential failure can help prevent it from stifling curiosity and that affective responses to failure can be modified by aesthetic decisions as well as by group norms. In designing for comfort with questions we find that empowering quieter players supports the entire group's efforts to express curiosity, flexibility in enforcing rules fosters curiosity, and questions can serve multiple simultaneous roles in supporting and expressing curiosity. We discuss how these findings can be used in other games to support curiosity in play.

Fostering curiosity - a mindset that relishes uncertainty and motivates its reduction through inquiry and exploration - is a common goal in game design, but is nonetheless an undertaking that presents considerable challenges to designers. Whether player curiosity is viewed as a means of triggering and sustaining engagement during play or as a transformational aim of game play itself (e.g., to trigger players' curiosity about a particular topic or context featured in the game), designers must contend with the fact that curiosity involves acknowledging gaps in one's own knowledge and taking steps, often without any guarantee of success, to reduce them (Loewenstein 1994). Thus, curiosity requires individuals to frame *uncertainty* and *the risk of failure* in a positive light, to be motivated and energized by unknowns, and to accept that one is bound to make mistakes in the pursuit of discovering new knowledge. A key factor in

facilitating this positive framing, we argue, is an individual's affective (i.e., emotional) experience of uncertainty and failure. In the face of uncertainty, will individuals feel capable, well-equipped, and secure in their ability to reduce a gap in knowledge, or will the anxiety of the unknown, a lack of self-efficacy, or insufficient agency prevail?

Within a game, designers can construct contexts and situations that influence individuals' curiosity-relevant affective states. Games are rife with moments of uncertainty and failure and, if designed with an understanding of the role of player affect, can offer players a safe environment in which to experience these potentially aversive states as motivating rather than threatening (Gee 2003). For example, most games are repeatable experiences, giving players the opportunity to learn from or correct previous mistakes - and to view past or present failures as challenges, not threats. Presenting players with the *right* amount of safety to confront uncertainty and failure, however, requires a delicate balance - if repeatability completely removes uncertainty and the potential for failure, then curiosity itself is thwarted. Thus, shifting the safety balance too far in one direction can result in either disinterest if excessive familiarity or predictability breeds habituation and boredom or disengagement if excessive uncertainty or unmitigable randomness becomes overwhelming rather than energizing.

At the same time, curiosity-focused design requires more than simply igniting and sustaining the motivation to inquire and explore - it also means providing the support and the tools to do so effectively. We focus here on *questions* as a specific tool that can let players express and potentially satisfy their curiosity. Through question asking, game players can make knowledge gaps concrete, voice their uncertainty (thereby creating social norms of uncertainty in multiplayer settings), and ultimately reduce uncertainty through developing and deploying “good” questions.

In this paper, we aim to articulate the complex relationships between curiosity, uncertainty, failure, and questions through a design model of curiosity. We demonstrate this design model through description of design work on our curiosity tabletop game, *Outbreak*. *Outbreak* is an asymmetric, cooperative board game for two to five players. Together, players must explore a rogue scientist's laboratory to find the antidote to a dangerous disease. One player takes the role

of a robot, who can explore dangerous spaces within the laboratory. The rest of the players, in their role as scientific investigators, must question the robot to discover what challenges stand between them and the antidote, collaboratively develop hypotheses about overcoming those challenges, and manage limited resources in executing their plans.

In *Outbreak*, we operationalize curiosity through two specific curiosity elements: (1) *comfort with uncertainty* which relates to players' perceptions of failure, their comfort and willingness to take risks, and their search for unanswered questions and (2) *comfort with questions* which relates to players' perceived abilities to fill a knowledge gap and cope with uncertainty, their persistence towards understanding, and their assessment of their own knowledge states. We detail a three month period of playtesting in both lab and field settings, discerning player responses to these curiosity goals through both observational and self-report measures deployed during these sessions. In our analysis of this data, we centered on two key themes: (1) shifting players' orientation toward failure as a challenge rather than a threat and (2) developing effective question formulation skills in curiosity-driven exploration. We then link these emotional and behavioral outcomes to specific design decisions and game mechanics related to curiosity and detail our iterative game design process. We close by presenting a set of implications and general considerations for curiosity-oriented design.

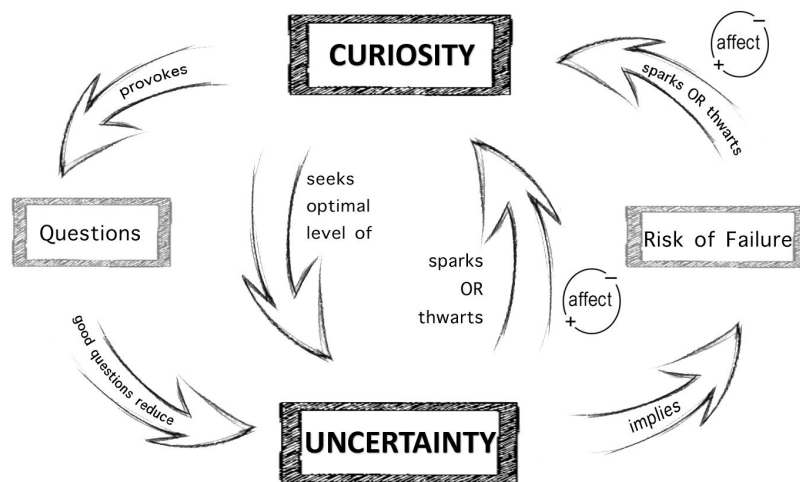
### 3.1 Building a Design Model of Curiosity and Uncertainty

When creating games, game designers have limited control over player experience. They can produce rules, game systems, resources, narrative elements, and audio-visual assets. However, they cannot directly control player experience, and have limited control over player behavior. Game design theories, such as the MDA model (Hunicke et al. 2004), acknowledge this limitation. Designers can create systems of game mechanics, but they must predict both the dynamic behaviors that emerge from those mechanics when players interact with them, and the aesthetic experiences that players will have as a result. This model suggests a design challenge in creating games for curiosity. Curiosity is a player experience that can be *provoked* by game



elements and *expressed* during play, but not directly manipulated by game designers. Creating games for curiosity therefore means developing a design model of the relationship between curiosity and uncertainty, and exploring how that relationship is mediated by specific elements that can be instantiated in gameplay.

Building on the literature reviewed above, we understand curiosity and uncertainty as existing in a dynamic system (Thelen & Smith 1996) with their interaction mediated by players' comfort with the risk of failure as well as their comfort and proficiency with questions. Figure 1 illustrates the working model of the cyclical interrelationships between these elements that guided the present work.



**Figure 3.1:** Uncertainty and curiosity have a cyclical relationship that is mediated by the risk of failure as well as by questions.

This model proposes that in order to spark and sustain players' curiosity and increase engagement and exploration, designers should strive to:

- (1) Present players with a level of uncertainty that is “optimal” - that is, a level that is experienced as challenging rather than overwhelming

- (2) Provide players with opportunities, in facing uncertainty, to fail in their attempts to reduce information gaps, and to perceive failures as energizing rather than threatening
- (3) Equip players with the ability to ask questions, and to increase their proficiency with question-asking, in the pursuit of resolving uncertainty

In this way, the the right-hand side of the model can be thought of as a “growth” cycle between curiosity, uncertainty, and failure. If curiosity is triggered by a manageable level of uncertainty and players construe failure as a challenge, both uncertainty and failure are more likely to elicit positive affective responses and spark higher levels of curiosity. The left-hand side of the model represents a “reduction” cycle between curiosity, uncertainty, and questions. Curiosity motivates inquiry, and good questions ideally (but not inevitably) reduce levels of uncertainty. In both of these cycles, designers must help ensure player comfort (e.g., comfort with the expression of uncertainty, the possibility of failure, and the process of formulating and posing questions) to sustain engagement and, at the same time, prevent player complacency (e.g., by helping players to manage but not fully remove the risk of failure and reduce but not fully resolve uncertainty).

This model provided us with a set of guidelines and goals for our design of the game *Outbreak*: creating an overall level of uncertainty that would be experienced as challenging rather than overwhelming, helping players experience failure as energizing, and increase player proficiency with question-asking. The following sections describe how the iterative design and testing of the game were informed by this model and reveal the design lessons and implications that emerged in the process.

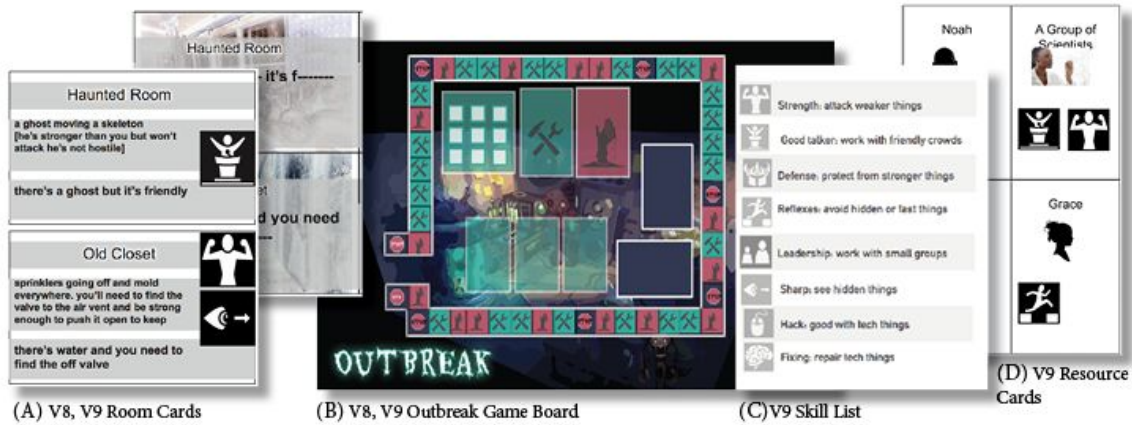
### 3.2 Outbreak Game Design and Development

The “Sensing Curiosity in Play and Responding” (SCIPR) project aims to design and study game-based interventions for encouraging curiosity through play, particularly for marginalized students who may benefit from increased comfort with curiosity (e.g., female science students, racial minorities). These games are targeted toward middle school (9-14 year old) students. As a

part of the SCIPR project, we have iteratively designed and prototyped several games. This paper focuses on one of those games, *Outbreak* (Figure 2). We use tandem transformational game design which emphasizes iterating game designs alongside theoretical understanding of transformational goals - in our case, our design model of curiosity (To et al., 2016b).

*Outbreak* is a cooperative question-asking game for two to five players, in which the group must save a town from a rogue scientist by searching their laboratory for antidotes to a disease. Most players assume the role of scientific investigators, while one player takes the role of their robot assistant. Each investigator player receives a set of resource cards (e.g. characters or pieces of equipment) that include different skills (Figure 2D), such as strength, computer hacking, and friendliness (Figure 2C). Each time they enter a new room in the mad scientist's lair, the robot player can enter first and safely investigate the room. However, the robot cannot describe what they see. They can only respond to questions put forward in the *question-asking phase* by the investigator players, who then select which resource cards will neutralize the threats inside and unlock the antidotes for that room.

On a given round, the robot player reads the back of a room card, which includes a description of the room and lists the skills needed to survive (Figure 2A). Because the robot player portrays a "sensing" robot, they cannot read out the card description. They can only answer questions posed by the other players. Investigator players have limited time during the question-asking phase to ask questions, following which they enter the *discussion phase* where they collaboratively either choose which cards to risk in that room or may choose to pass the room. If they choose a successful combination of cards, they keep their cards and roll to receive antidote tokens. If they fail, they must discard their cards. If they choose to pass on the room, they keep their cards, but the countdown to the end of the game continues.



**Figure 3.2:** *Outbreak* game with components from V9 including (A) room cards, (B) the game board, (C) the list of skills, and (D) resource cards.

*Outbreak*, to date, has gone through 12 iterations. In this paper we discuss versions five, eight, and nine (V5, V8, V9) of *Outbreak*, all of which were studied with players from our target demographic, and which reflect major shifts in both our playtesting and design. Between V5 and V8, we moved from playtesting in the lab to playtesting in the field and adjusted affective elements of the game; between V8 and V9, we changed the question-asking system and added new data collection measures. We discuss these choices further in the next section of this paper.

### 3.3 Methods

This paper reports on the iterative design and playtesting process for *Outbreak*. Over the span of four months we playtested V5, V8, and V9 with participants in our target age demographic, 9-14 years old. Other versions of the game were playtested with players outside our target audience (e.g. for game balance) and are not reported in this analysis. We conducted two playtests of V5 in a controlled lab setting, referred to as the lab playtests (“Lab”). We conducted ten field playtests with versions eight (V8) and version nine (V9) at two local summer programs in Pittsburgh, PA, referred to as the field playtests. Site one was a local science center (“SC”) and

site two was a YMCA in a primarily black, low-SES neighborhood (“YMCA”). See Table 1 for playtest details and codes.

Our playtesting process included 1) development of tools to measure players’ responses, 2) deployment of those measures, and 3) analyzing their responses. We focused our analysis on understanding players’ affective responses, particularly around uncertainty and failure, and on their ability to ask questions.

Group ID	Site	Game Version	Group ID	Site	Game Version
L1, L2	Lab	V5	Y2a, Y2b	YMCA	V9
Y1a, Y1b	YMCA	V8	Y3a, Y3b	YMCA	V9
S1a, S1b	SC	V8	S3a, S3b	SC	V9

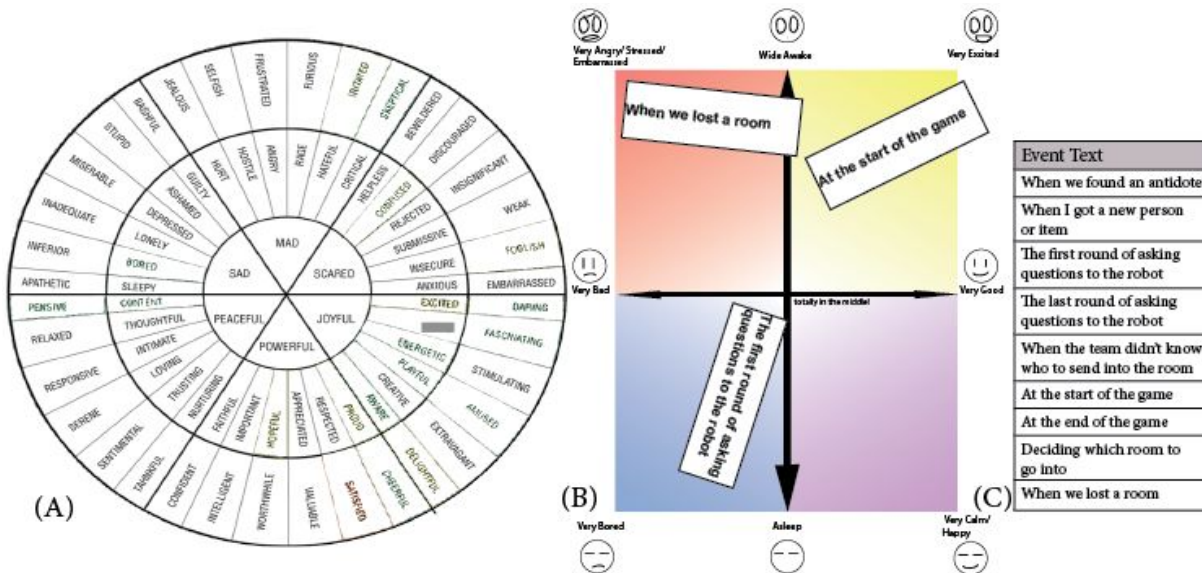
**Table 3.1:** Group IDs for the *Outbreak* playtest groups. Each ID represents a single group of 3-4 players. With the exception of the lab studies, groups with the same number were played on the same date.

### 3.3.1 Measure Development

In addition to regular playtesting practices (e.g., observing player behavior, focus group interviews about player experience) we set out to measure player experiences related to *Outbreak*’s transformational goals. We adapted best-practice methods from related fields when a validated measure did not yet exist, and then iterate those measures based on usability observations in the field.

In lab playtests of V5 and field playtests of V8, we collected player affective data using the Feelings Wheel (Kelley 2016). The Feelings Wheel includes six core emotions in the center of the diagram, and expands each outward into more specific emotions for a total of 77 feelings (see

Figure 3A). To adapt this measure to our audience, we removed the emotion “sexy” as it was deemed inappropriate and uninformative. By circling emotions, players could capture how they felt during the game even if they did not have the language to generate emotion words on their own.



**Figure 3.3:** (A) The Feelings Wheel where participants circle distinct emotions felt (B) The valence-arousal map with sample event slips that participants place as a marker for emotions felt (C) List of game events used for *Outbreak*

For V9, we developed a version of a valence-arousal map for children’s emotion self-report. Our goal was to connect player emotional reactions to specific elements of gameplay. To accomplish this, we combined emotion valence mapping diagrams (Barrett, 2004) and design-based post-it clustering activities (Hanington & Martin, 2012). These cross-disciplinary tools both seek to capture and describe the user’s self-reported spectrum of emotion with as much granularity and detail as possible. The map asks players to place prompts related to game moments (see Figure 3C) on a quadrant (see Figure 3B). The instrument was validated through multiple rounds of expert heuristic evaluation by cognitive psychologists and designers, and tested for usability in the field with children.

Game events were selected for their relationship to curiosity, uncertainty, failure, and question-asking. We coded each event for different types of curiosity (e.g., conceptual curiosity), different types of uncertainty (e.g., hidden information), game outcomes (e.g., failure/negative events), and when in the game we expect events to occur (e.g., early in the game).

Valence-arousal results were coded based on the x,y coordinate of the top left corner of each slip and the quadrant or quadrant boundary where it was placed. We also captured the relative horizontal and vertical placement on the graph in comparison to the other game events, using a ranking of 1-9. Slips that were placed on top of one another were given the same ranking.

We developed a field notes template for our playtest observations, both to standardize data capture across members of the research team and to ensure we captured relevant data. In our field playtests, we were unable to record video due to the limitations of the spaces available, in which children who had not consented to being videotaped were regularly present. We therefore manually captured the questions that investigators asked the robot player during the question-asking phase. Researchers were also directed to capture visible emotional responses to the game, unusual player behavior, and the gist of side conversations between players. When possible, researchers noted the game outcome, whether players succeeded in a particular room, and other observations related to playability and balance.

We coded the questions based on their form and content. A codebook was developed through a bottom-up analytic process led by researchers who had not participated in the design of the game. For example, questions were coded “skill word” if players directly asked about a word from the skill sheet (e.g., “Is it strong?”), “discovery” if they asked about the existence or something in the room (e.g., “Are there any computers?”), and “building off” if they ask a question that builds on information received within the round (e.g., “Are there zombies?”, “Are the zombies friendly?”). Questions could have multiple codes and every question was coded as “concrete” or “abstract”. Questions coded as concrete were ones that cited specific concepts or seemed to represent a specific hypothesis (e.g., “is there a zombie?”, “is it dark?”) whereas questions coded as abstract asked for non-specific information or closely referenced the skill words without a supporting hypothesis (e.g., “is there a threat?”, “do I need to fix something?”).

After the codebook was complete, two researchers independently coded the questions and discussed diverging codes until they reached agreement. Additionally, we captured the group and gameplay round associated with each question. In some cases, we were able to use this data to code whether questions were asked during rounds that succeeded or failed, and whether players had won or lost the prior round.

### 3.3.2 Playtesting and Measure Deployment

In all playtests, participants played *Outbreak* in groups of three to five, with a researcher taking the role of the robot player. In L1 and L2, players did not know each other before the playtest. To create familiarity between players, both groups were asked to participate in an icebreaker game (To et al., 2016c) before playing *Outbreak*. In the field playtests, which were conducted in the context of ongoing summer programs, players were typically familiar with one another, so no icebreaker was used. Players were randomly assigned to groups and playtests were scheduled as part of the regular activities of the program.

Participants were introduced to *Outbreak* as a cooperative board game currently in progress, and that their early feedback would help the game designers improve the game. The designers were implied to not be present in the room in order to get as honest feedback as possible. Next, one researcher reviewed the rules with the players and played a scripted practice round that included a diverse set of sample questions. The same researcher adopted the role of the robot player for the remainder of the game. The researcher would answer questions about game mechanics if players explicitly asked or if they could not proceed with gameplay. Participants played until they won, they lost, or 40 minutes had passed.

After gameplay, we collected emotion data. For the V5 and V8 playtests, each player was given a paper copy of the Feelings Wheel and asked to circle every emotion they had felt during play. The research team then collected the papers for analysis. For the V9 playtests, the researchers demonstrated how to place an event on the emotion map in a way that corresponded to a feeling. Participants were then given the nine event tokens. They were asked to place each token on a



spot on the map that corresponded to their feelings at that point in the game. When participants indicated they were done placing tokens, the researchers photographed the map. If participants did not place any tokens, they were asked a second time if they wanted to complete the measure. If not, the researchers photographed an empty map.

After collecting emotion data players participated in a focus group interview. Participants were told that their feedback would be helpful in aiding the game designers working on the game to iterate the game and make it better. They were asked what they liked most about the game, what they would wish to change about the game, and for any other additional feedback they'd like to share.

During all phases of the playtest, an additional researcher seated in the play space took field notes using the notes template during play, captured feedback during the focus group interview, and made additional observational notes as described in measure development.

It is important to note that our data represents diverse playtests. Some participants played the game only once, while some played multiple times over several weeks; playtests occurred in a range of physical locations from a formal lab setting to a cafeteria in a science center; and players played multiple versions. Given this diversity of data, it would be inappropriate to perform formal statistical analyses. Instead, we demonstrate that much can still be learned about curiosity and game design from diverse aggregate data.

### 3.4 Designing for Comfort with Failure

#### 3.4.1 Exploring Comfort with Failure Through Design and Data

In order to explore the concept of comfort with failure, we first needed to operationalize failure within the design of *Outbreak*. Based on our rules design and observation of playtests, we identified three types of failure in the game. First, players could fail to find an antidote in a particular room, which we refer to as “room loss” (V5, V8, V9). Second, players could lose resources such as teammates (V5, V8) or gear (V5, V8, V9), which we refer to as “resource

loss.” Finally, players can lose the game, either by reaching the end of a countdown to midnight (V5) or by reaching the end of the game board (V8, V9) without finding enough antidotes, which we refer to as “game loss.” Room and resource loss occur repeatedly throughout the game. However, game loss can occur only once and reflects players’ overall performance.

During lab-based playtests of V5 (L1, L2) and V8 (Y1a, Y1b), we studied players’ emotional and social reactions to the design decisions we made around room loss, resource loss, and game loss. Because we did not want to interrupt players between rooms, these playtests relied primarily on observation to understand room and resource loss, which occurred during play. At the end of the game, we collected self-report data on player emotional experience, which reflected their overall experience in the game.

To connect the data more directly to specific types of failure, we collected observational and valence-arousal map data from four playtests of V9 across two separate sessions at the YMCA site. During the first session, we observed two games involving eight students (Y2a, Y2b). A week later, we observed two games involving ten students, seven of whom had participated in the previous session (Y3a, Y3b). All students had previously playtested different games designed by our group in prior sessions. However, because none of the students had played *Outbreak* prior to Y2, we were able to explore how uncertainty and failure were experienced both as first-time players and on a repeated encounter with the game.

### 3.4.2 Patterns from the Data

In our earliest playtests of *Outbreak* with participants from the lab playtests, we observed that failure was a salient concept to the students. Individual player’s emotional responses to the threat of failure such as observable anxiety behaviors (e.g., facial expressions, wincing) and vocalized fear over losing often spread to the group, and how the group responded to that - either by amplifying it or dissipating it often had a profound impact on a group norm around failure moving forward in the game.

### *Failure and Affect*

We observed two factors that influenced players' affective relationship to failure. First, we observed that narrative and aesthetic elements had a much stronger effect on players' emotional reactions to failure than we expected. Second, we observed that repeated play changed players' feelings about failure.

Early in the playtest process, we discovered that players felt attached to the resources in the game, and that they were often more willing to accept room loss (e.g. failure to collect antidotes) than resource loss. For example, in group L2, players asked questions such as "Will we lose the scanner if we send it in?" Although the game's rules prohibit answering the question explicitly, the players decided that their scanner was at risk and chose not to send it into the room. Players correctly identified this decision as one that required weighing a guaranteed failure against the possibility of failure - only by chancing the loss of their scanner could they avoid the guaranteed loss of the room. We observed players experiencing anxiety around this decision, which could affect their willingness to take the risk.

To reduce the level of player anxiety about the risk of failure, we explored the role of narrative and aesthetic factors. Could we change the level of player anxiety using affective manipulations alone? Examining differences between player affective experiences in L1 and L2 suggested that we could. Players in group L1 were visibly distressed during play. Although they claimed in post-game interviews that they enjoyed the game, their Feelings Wheel data corroborated their distress. Of the 37 total emotions circled by four players, 24 were negative; 17 of those fell into the "scared" category, and all four players chose "anxious" to describe their feelings (Table 2). On the other hand, the four players in group L2 circled 49 total emotions, of which 44 were positive. All four players circled "aware" and "confident" to describe their experiences, and no negative emotion was circled by all four players. Our observations confirmed these differences. Players were concerned over the well-being of the game characters and their use of resources; they were sometimes anxious, but never visibly upset.

Group L1				Group L2			
Negative Emotions	24	Positive Emotions	13	Negative Emotions	5	Positive Emotions	44
Scared	17	Joyful	9	Scared	4	Joyful	19
Anxious 4				Anxious 3		Aware 4	
Scared 3				...		Joyful 3	
...						...	
Sad	6	Powerful	4	Mad	1	Powerful	15
						Confident 4	
						Faithful 3	
						...	
Mad	1	Peaceful	0	Sad	0	Peaceful	10
						Peaceful 3	
						...	

**Table 3.2:** Aggregate counts from the lab study groups (L1, L2) Feelings Wheel data. Counts for the two overall categories, positive and negative, are shown, as well as each of the six sub-categories. When three or more participants all circled the same emotion, that emotion is displayed with count data.

What could account for such an extreme difference between L1 and L2, given that the two sessions involved the same version of the game (V5)? During L1, we played a soundtrack of scary music in the background. Players repeatedly mentioned the music during gameplay, and they were visibly unnerved by it. The player response was sufficiently strong that we removed the music during L2 for the well-being of our players. Players in L2 still experienced anxiety, particularly when asked to weigh room loss against resource loss as noted above. However, they appeared to be more resilient to this anxiety, focused less on the negative impacts of their failure, and had more positive feelings at the end of the game.

Another narrative element that affected players' willingness to take risks was the theming of resources. In earlier versions of the game (V5, V8), game resource cards included both scientific tools such as a cloaking device or first aid kit, and scientist characters such as Barbel the anxious ice researcher or Karolina the dependable virologist. Including scientist characters gave us the opportunity to introduce scientist role models who matched our target playtest groups, such as scientists who were female, black, Hispanic, or all three. At the same time, making characters a collective resource, we hoped to create psychological distance between the players and the fate of their characters, who would serve to heighten the drama of the game. Unfortunately, this psychological distancing did not succeed. We observed that the highest levels of anxiety were

associated with negative outcomes for characters. The idea that player choice could result in characters going into a coma was too frightening for our audience. In V9 we removed characters as a separate resource type and saw a reduction in player stress; conversely, if the game were being redesigned for older students, reintroducing threats to scientist characters could increase the level of tension.

Over and above the impact of narrative and aesthetic game elements, we observed that repeated play changed players' affective reactions to in-game failure. As noted earlier, we were able to test the same version of the game (V9) across two different playtest sessions (Y2 and Y3). During these sessions, we collected valence-arousal map data about specific game events, including times when the players failed to complete a room ("When we lost a room" in Table 3). After the second session, players reported affective *dampening*, or a trend toward neutral valence in their emotional reactions, for all game events with one exception - the event involving failure (see Table 3). Players reported feeling more positive about failure events after their second play session, with a decrease in negatively-coded and neutral-coded emotions and a 26.7% increase in positive affect (see Table 3). In other words, playing *Outbreak* a second time reduced emotional responses (i.e., both the high negative and high positive valence) of most game events, but made failure a better experience.

	Proportion of Valence/Arousal Responses in Positive/Neutral/Negative Valence								
	Positive Valence			Neutral Valence			Negative Valence		
	Y2	Y3	Shift	Y2	Y3	Shift	Y2	Y3	Shift
When we found an antidote	0.714	0.7	(-)	0.143	0.3	(+)	0.143	0	(-)
When I got a new person or item	1	0.7	(-)	0	0.1	(+)	0	0.2	(+)
The first round of asking questions to the robot	0.857	0.6	(-)	0	0.3	(+)	0.143	0.1	(-)
The last round of asking questions to the robot	0.715	0.5	(-)	0.143	0.3	(+)	0.143	0.2	(+)
When the team didn't know who to send into the room	0.572	0.6	(-)	0.143	0.2	(+)	0.286	0.2	(-)
At the start of the game	0.857	0.5	(-)	0	0.3	(+)	0.143	0.2	(+)
At the end of the game	0.714	0.8	(+)	0	0.2	(+)	0.286	0	(-)
Deciding which room to go into	0.572	0.6	(+)	0.143	0.3	(+)	0.286	0.1	(-)
When we lost a room	0.333	0.6	(+)	0.167	0.1	(-)	0.501	0.3	(-)

**Table 3.3:** Proportion of game events eliciting positive, neutral, or negative (valence) responses on the valence-arousal map measure across two repeated play sessions (Y2 and Y3).

Our prior work in this area emphasized the role of *uncertainty*, as instantiated in game design decisions, in provoking and supporting curiosity (To et al., 2016a). However, this research suggests that *aesthetic* and *contextual* decisions can change players' affect and hence their willingness to take risks. The same game, deployed in different ways (with or without a scary soundtrack, played once or repeatedly), can produce different affective experiences of failure.

### *Social Factors*

Theories of curiosity suggest that social norms about uncertainty and failure will affect people's experiences of curiosity and their likelihood of expressing curiosity. In our playtests, we were able to deploy our game in two different social settings with different social norms: a Science Center and a local YMCA. We observed that social differences between the groups affected how players engaged emotionally and socially with the game. SC players were highly concerned with failure in ways that paralleled the students in our lab studies L1 and L2. We observed anxiety when they were at risk of losing resources. However, these emotions shaped not only their play decisions, but also their social activity during question-asking and discussion. During the question-asking phase of the game, these students spent most of their time thinking silently, presumably about the "right" questions to ask. As a result, they asked very few questions and received little information. With the little information they had, they would debate back and forth endlessly during the discussion phase and would require light prompting to make a decision to move forward. Their concerns over failure were so immense that it prevented them from failing with grace, and from learning. By comparing these students to the players from the YMCA, we can see that this behavior is not purely driven by game design decisions. YMCA students were not overtly concerned about failure or losing resources, particularly by comparison to the SC and lab groups. They tended toward lightweight, short discussion rounds and rapid decision-making, and would forge ahead quickly through many rooms. While both of these behaviors, reflecting and experimenting, are valid curiosity-relevant strategies, we ideally hope to foster both. Games designed for curiosity therefore require designs that are mindful of the social space they exist in. We want to design social spaces that can evoke the curiosity behavior that is most relevant to the goals of a particular curiosity game.

We note that even though social spaces can be designed to support different types of curiosity-relevant norms, differences in emotional response may be amplified by individual player factors. Because *Outbreak* is a cooperative game, players who are working together may experience “emotional contagion,” or being affected in their emotional response by the individual emotional response of other players (Barsade 2002). We observed this behavior in group L1, where one player had a particularly strong emotional response to the scary music. While all players found it unnerving, their response was amplified by seeing the fear displayed by this particular player.

### 3.4.3 Design Lessons

*Helping players manage the aversiveness of potential failure can help prevent it from stifling curiosity.* In *Outbreak*, we ask players to embrace risk and uncertainty in order to avoid certain failure. We observed that when players were particularly afraid of risk, they chose certain failure rather than the possibility of failure. Fear of failure also sometimes thwarted strategies to reduce the chances of failure, such as when students became so involved in asking the “right” question that they did not ask enough questions to gather information. Understanding that in some circumstances, risk can be more intimidating than the certainty of failure can be used to help design for curiosity in other types of games.

*Affective responses to failure can be modified by aesthetic game design decisions.* We found that aesthetic design decisions such as narrative and contextual factors had a strong impact on players’ affective experience of failure. Scary music, named characters who were at risk, and first-time play all increased the anxiety level in play. Conversely, table talk, generic items, and repeated play all made failure a more positive experience. Finding the right level of difficulty for a game is often conceptualized as requiring game-mechanical balance; our findings suggest that aesthetics can also be used to balance gameplay when it comes to the perceived risk of failure.

*Group norms influence the affective experience of failure and the strategies available to manage it.* Players’ social norms and the setting in which they are playing affect how willing they are to

tolerate failure, to take risks, and to express ignorance in front of a group. For example, our SC and YMCA groups had very different rates of asking questions, even when using the same set of rules. These social norms can be affected by emotion contagion, in which a single player's strong experiences spread to other players. In other types of multiplayer games, designing for players who have outsized or outlier emotions can be a productive way of shifting the norms of the group.

### 3.5 Designing for Questions

#### 3.5.1 Exploring Question Asking Through Data and Design

To explore this topic, we relied on observational data, valence-arousal map data, and question data from playtests for three different versions of the game in our on-site playtest settings as well as our lab setting.

In every version of the game, each round of gameplay involves the previously described *question-asking phase* where investigators ask questions of the robot player. The question-asking phase is always limited by a timer. Question-asking mechanics varied between versions in two ways. First, in V5 and V8 players could ask an unlimited number of questions during the question-asking phase. In V9 we introduced battery tokens, which constrained both question number and question form. Immediately before each question round, players drew three tokens from a bag. Each token is small rectangular battery with a question template (e.g., “How many \_\_\_\_\_?”, “\_\_\_\_\_ need a \_\_\_\_\_?”) (see Figure 4). In order to ask a question, players turn in a token to the robot player and ask a question matching the template. As discussed below, the robot player needed to use their judgment about how tightly to require the question match the form. Second, we varied how rooms were displayed to invite curiosity. In V5, the rooms were displayed on a board in a map-style layout. In V8 and V9, the rooms were individual cards drawn from a deck. Cards featured a title and some clue words (e.g., the “Big Office” and “Full of broken \_\_\_\_\_ and a \_\_\_\_\_”). (see Figure 2A).





**Figure 3.4:** Battery questions with question templates used in the question-asking phase of *Outbreak* (version nine)

We also use our coded question data to examine the effects of failure on players' question development within a single gameplay session. Questions are coded as either occurring in the first round, or after a round in which they either failed or succeeded at overcoming a chosen room's challenge. We use this information to explore the relationship between prior failures or successes in the game and players' decisions to build on, revise, or discard their hypotheses.

### 3.5.2 Patterns from the Data

From observational data we see that players had highly varying relationships with questions, specifically regarding their level of comfort. In our early playtests with V5 and V8 in the lab and in the field, players were permitted to ask as many questions as possible within the given time limit. While some players took advantage of this and asked questions in a rapid-fire fashion, we saw some players that asked very few or no questions. These players instead seemed to be deep in thought or too nervous or uncomfortable to ask any questions aloud. In an attempt to ensure that every player had the opportunity and motivation to ask questions, in V9 and beyond we distributed battery tokens so that each player was allotted a particular number of questions they could ask. This limited the questions that the more comfortable students could ask and incentivized the less comfortable students to ask questions.

In V9 of the game, we also implemented the question templates. By asking players to fit their questions to the template, we hoped to support players who were overwhelmed by the task of coming up with a question as well as diversify the questions being asked by players. During

game play, we did not strictly enforce that players fit their questions to the template - partly so that students would not feel increased self-consciousness or discomfort with question-asking and partly because it is logistically difficult for the robot player to check the templates while attempting to answer questions within the timed round. In our analysis of the question data, we examine how closely players matched the given templates when asking questions. In our analysis, only about half of the questions asked perfectly matched the template given. Twelve of the 159 questions across the six game plays used no discernable template at all (i.e., the questions could not be retrofit into any of the existing templates).

The battery tokens are randomly distributed on each round, but we recorded an uneven distribution of usage of the battery token templates across game plays. Of all of the 20 question templates, by far question template Q1, “*Is there a \_\_\_\_\_?*,” was the most frequently used, with 25 uses over the four plays of V9. By comparison, the next most frequent template, Q4, “*\_\_\_\_\_ need \_\_\_\_\_?*,” had 19 uses across those game plays. By contrast, Q20 “*When \_\_\_\_\_ a \_\_\_\_\_?*”, Q19 “*\_\_\_\_\_ the most \_\_\_\_\_?*”, Q7 “*How much \_\_\_\_\_?*”, and Q6 “*Does the room \_\_\_\_\_?*” all had two or fewer uses.

We observed an increase in average number of questions asked from V8 with 24 questions per game to V9 with 33 questions per game. This may be taken as an indication that students’ comfort with questions may have increased. However, we must also note that because these data come from repeated game play (albeit with different versions of the game), this pattern may simply have resulted from students’ increased level of comfort and familiarity with the game as a whole.

Finally, we observed differences in question-asking behavior and question content when a question-asking round immediately follows a prior failed round versus a prior succeeded round. Removing all first rounds of question asking, we compared post-success and post-failure questions. In post-success rounds of question asking, questions coded as “building off” were three times more frequent than in post-failure rounds. Similarly, questions coded as “characteristic,” where players ask about a feature of something they have previously discovered, were three times more likely in post-success rounds than in post-failure rounds. Finally, we

observed that questions coded as “discovery” were twice as likely in post-failure rounds. These question-asking patterns indicate that when players succeed, they are more comfortable building specific hypotheses and learning more about these hypotheses. In post-failure rounds we see more exploratory behavior, with players prioritizing the pursuit of greater breadth rather than greater depth of information.

### 3.5.3 Design Lessons

*Questions can serve multiple simultaneous roles in supporting and expressing curiosity.* Questions are a common tool for reducing knowledge gaps, which is why we centered them as a mechanic for *Outbreak*. However, questions also carry with them implicit hypotheses about the gap the players perceive. Even when players cannot articulate their hypotheses explicitly, they voice them in their questions. Because questions are spoken publicly, they help the group perform collective knowledge assessment; players know what other players are uncertain about, and what they think is worth asking. Finally, because answers are also given publicly, questions help players *help each other* reduce information gaps, not just reduce them for themselves. Even in games where questions are not core to the mechanic, creating moments where question-asking is both encouraged and visibly rewarded can create safe social environments to express curiosity.

*Empowering quieter players supports the entire group’s efforts to express curiosity.* Designs that enforce that all players participate support the entire group in expressing curiosity, without impairing the performance of individuals. As we saw in *Outbreak*, when we switched from a free-form question-asking phase to a structured one where each individual player was given battery tokens, we witnessed an increase in the average total number of questions the entire group asked. There was both an increase in fluency and better distribution of question-asking amongst players. In other games that require creative participation, enforced participation might temper the influence of an “alpha player” and help the entire group.

*Flexibility in enforcing rules fosters curiosity.* When players are trying to reduce a knowledge gap, they are sensitive to their ability to effectively use the tools available to them, including

questions. Rejecting attempts to close the knowledge gap for minor rules violations was counterproductive. As we observed in *Outbreak*, the question templates on battery tokens were used loosely. Players typically asked questions that were a close, but not an exact, match. While the robot player rejected questions that had nothing to do with the proffered template, accepting the close-but-not-quite questions helped support player enthusiasm for and fluency with questions. By not formalizing the degree of acceptable deviance into rules, but rather leaving it up to the player's judgment, robot players can implicitly respond to group social norms.

### 3.6. Summary

This work explores how game design decisions using uncertainty influence two critical elements of curiosity: the affective experience of failure and question-asking as a method for closing information gaps. In this chapter, I present a design model of curiosity that articulates the relationship between uncertainty and curiosity, and defines the role of failure and question-asking within that relationship. We explored ways to instantiate failure and question-asking within a cooperative board game, playtested repeatedly with players in our target demographic (i.e., middle-school aged students who are underrepresented in STEM), and investigated the impact of game design decisions on their affective experiences of failure and their ability to use questions to close information gaps. We found that affect had a significant experience on players' in-game decisions around risk and failure, as well as on their willingness to express ignorance and take risks socially; players' affective experiences were in some ways more responsive to aesthetic, narrative, and contextual factors than to changes in mechanics. Conversely, changes in game mechanics changed how groups managed their question-asking process, and served to empower quieter players without silencing bolder ones - but flexibility in enforcing the rules and mechanics of the game was key. Designing for curiosity involves a balancing act; when designers can create motivating moments of uncertainty, give players opportunities to face that uncertainty, and equip them with the right tools to resolve that

uncertainty they can create positive cycles not only of curiosity but of rich engagement with their games.

This work demonstrates that we can design with uncertainty in mind and provide tools within the design to empower people to reduce their uncertainty. In the STEM context, vulnerable and underrepresented groups may especially benefit from increased feelings of competence addressing and reducing their uncertainty. In the next chapter I explore a much broader context for uncertainty that nonetheless has serious and everyday consequences for people from vulnerable populations - those who experience racism.

## Chapter 4: “They Just Don't Get It”: Seeking Social Support for Racist Experiences

In this chapter I present findings from interviews with people who have experienced racism centered on social support seeking and receiving following racist experiences. This work is currently under review and was done in collaboration with Sarah Hemaida, Komal Dewan, Claire Chen, Janie Xue, Xiaoyan Song, Jocelyn Gao, Kyra Low, Lindsey Shi, Kelly Yang, Clarissa Xu, Jessica Hammer, and Geoff Kaufman.

Over 35% of Americans belong to racial minority groups. Racism targeting these individuals results in a range of harmful physical, psychological, and practical consequences. Online and offline social support are crucial to coping with and mitigating those consequences. However, little is known about the barriers to seeking such support or what makes support effective. Additionally, there are documented risks to discussing racism online. Our work seeks to empower the targets of racism to connect and cope using social technologies. As a first step towards improving the current state, we conducted interviews with targets of racism. In this paper, we report stories of ‘everyday’ racism shared by our participants. Participants describe that uncertainty, both about the nature and consequences of the experience of racism, motivates support-seeking. Reducing uncertainty through collective meaning-making helps targets cope. Using these findings as our foundation, we outline design insights for addressing uncertainty and supporting productive conversations about racism, and share a set of design concepts that reflect these insights.

### 4.1. Introduction and Motivation

*“So I appreciate her for trying to help me, but I was like... yeah she just don't really get it.” -P02*

Racism continues to be a devastating social problem experienced on a persistent basis by much of the United States population. In recent decades, more “overt” or “old-fashioned” forms of

racism such as hate speech or racist violence have steadily declined, but have by no means disappeared. Instead, individuals from racial minority groups, which currently make up more than 35% of the U.S. population, continue to face forms of “modern” racism (Perry et al., 2015 ) that are embedded in many social contexts and interactions (e.g., subtle racism, implicit bias, institutional racism, etc. (Dovidio et al., 2004; Swim et al., 1995). Experiences with racism, overt or subtle, profoundly affect both the physical and mental well-being of individuals from racial minority groups (Essed, 1991). For example, amongst a host of other destructive outcomes, these experiences can cause overwhelming cognitive load and anxiety (Croizet et al., 2004), impair belonging and advancement in professional and academic environments (Woodcock et al., 2012; Beasley & Fischer 2012), and contribute to long-term damage to heart health (Calvin et al., 2003). We take lead from the paper “Does Technology Have Race?” (Hankerson et al., 2016) which calls on HCI researchers to acknowledge the racial bias and inequality often built into our technology, and asserts that there is a moral and ethical imperative for HCI to address bias and push for inclusive design.

In the CARE (Coping After Racist Experiences) project, we aim to understand the complexities and nuances involved in seeking support for experiences with racism. Our goal is to identify how the design of CSCW tools and methods might help support coping and processing. Modern forms of racism are often subtle, and in some situations may even be unintended by their perpetrators. Thus, those experiences usually entail some degree of uncertainty for targets of racism (whom we also refer to throughout as “participants” and “support-seekers”) to grapple with while coping and processing the event (Sue, 2010).

To provide one illustrative example, a microaggression that black women frequently experience is a request from another person to touch their hair. This request implies, among other things, that black women's hair is foreign and exotic and objectifies and “others” the targets of the request (Sue et al., 2008). In these experiences, the target of racism may feel uncertain whether or not the person who made the request is a racist person or whether they were genuinely curious and unaware of the negative impact of the request. Whether or not the slight was intended, the target may also feel uncertain how to respond both in the moment and in the future. Pushing back

and saying no poses risks (e.g., further harassment, harm to professional relationships and opportunities, etc.) but an acquiescence may incorrectly signal approval of the request and invite future microaggressive behavior. Additionally, while this solo experience is certainly unpleasant on its own, the persistent accumulation of microaggressions that harm wellbeing in the long-term (Deitch et al., 2003).

The ambiguous and uncertain nature of experiences like these poses inherent challenges for both targets of racism as well as potential supporters. For example, a close friend of the target who has never had the experience of having their hair objectified may desire to offer social support, but lack the understanding of why the experience is so stressful. While a target's question-asking might help with coping by reducing their uncertainty (To et al., 2018), a supporter's questions about the experience can easily exacerbate the target's stress. This introduction of the supporter's uncertainty can be experienced as a "microinvalidation" of the target's subjective experience (Sue, 2010).

Because social support is a crucial tool in mitigating the negative consequences of racism, it is important to understand how targets of modern racism communicate those experiences and how the act of collective meaning-making can go well or go awry. The vast majority of research on modern racism has focused on understanding its psychological underpinnings and its impact on targets' well-being and identity. There is still much to learn about the unique communicative and social dynamics involved in sharing personal experiences with racism. What factors affect targets' choice to communicate those experiences in the first place? How do targets decide with whom and through what medium to communicate and seek support? How do targets and supporters navigate the inherent uncertainty and ambiguity of experiences with modern racism?

Prior work in HCI, and within CSCW in particular, has revealed that social platforms, both private and public, are frequently used to cope with and navigate the disclosure of unpleasant and even traumatic personal experiences. Social support and coping have been studied through lenses of gender identity (e.g., Haimson et al., 2015), queer identity (e.g., Carrasco & Kerne, 2018), and through perspectives on mental and physical health (e.g., Adams et al., 2014). However, experiences with racism and racial identity have been historically understudied



(Hankerson et al., 2016) and people of color have been historically erased from computing histories (Nelsen, 2017). In fact, the lack of research focus on the unique experiences of racial minorities has been a specific point of critique within HCI and CSCW (Hankerson et al., 2016). As of a 2016 review, an ACM digital library search for the term 'racism' only returned six results (Hankerson et al., 2016). While we find it encouraging that as of today (April 2019) that number has doubled, we as a field have still only scratched the surface.

This work seeks to begin filling this gap by investigating the socio-technological context of support-seeking and support-providing for experiences with racism. As a first step towards identifying entry points where communication technologies and social platforms might promote meaningful and productive communication, we conducted a qualitative study that explored people's experiences of racism, their approach to coping with it, as well as the extent and the means by which computing platforms served to create a space for these conversations to occur. We focus on two questions:

*RQ1. After experiencing racism, what social support-seeking behaviors do targets engage in?*

*RQ2. What opportunities and barriers do current communication and social technologies provide in terms of social support related to racism?*

In the study, we conducted narrative episode interviews (i.e., a person-centric method that allows participants to freely share their experiences (Bates, 2004) followed by semi-structured interviews. We used these methods in order to empower participants in sharing their stories of experiencing racism and in guiding our discussion of their practices and processes following racist experiences.

Our findings center on the motivation behind support-seeking and means by which support-seekers utilize and curate social systems. We found uncertainty was the biggest motivator for support-seeking behavior, which aligns with prior literature indicating that uncertainty presents the biggest burden to cognition in experiences of modern racism. We discuss how targets use social processes to reduce that uncertainty as a form of coping with and

processing racist experiences. Finally, we see that targets of racism are reticent to violate their existing communication habits and practices when seeking social support. Instead, they often engage in a cyclical process of finding and curating trusted communities and individuals with whom to share their experiences in the future. We use these findings to inform design insights for creating socio-technological systems to promote positive and productive communication around experiences of racism. Our approach to promoting digital wellbeing online focuses on empowering marginalized people by amplifying and supporting their existing best practices in coping with racist trauma (To et al., 2019). We present sample design concepts using a range of technologies, from crowdsourcing to wearables, that illustrate how these insights can be embedded in design.

It is important to recognize that while the present study focuses largely on subtle, 'everyday' forms of prejudice, racism can and does continue to take the form of extreme, overt acts of violence and trauma. Racism also exists in large-scale systemic and institutional injustice. These forms of racism likely have vastly different social support needs (e.g., community organizing such as activism, campaigning, and protest (Hyers, 2007), group and individual therapy (Laszloffy & Hardy 2000, etc.). We do not discuss or focus on these coping mechanisms in this paper as it falls beyond our scope. However, we acknowledge that for many marginalized peoples, there are many important and differing components to the overall process of coping with racism.

In addition, we note that this work is personal to members of our research team. A number of the authors belong to racial minority and/or other oppressed groups and thus have a deep connection to the subject matter of the research. We experience prejudice and discrimination along several intersecting facets of identity. This work ultimately seeks to empower people from marginalized groups by amplifying and supporting their existing useful practices at scale. We have a vested interest in adding to the growing body of anti-racist HCI research and design work.

## 4.2 Methods

To answer our first research question, we conducted narrative episode interviews with 14 people who self-identified as having experienced racism. We used methods that are person-centric and gave as much agency to our participants as possible in sharing their stories. To answer our second research question, we conducted semi-structured interviews about their relationships with various communication and social technologies. Below we detail our recruitment and study procedures, as well as ethical considerations in planning and performing this research work.

### 4.2.1 Recruitment

Participants were recruited via flyers, social media posts, and advertisements in large-scale group chats aimed towards race-related discussions (e.g., a group chat for young professionals of color in a mid-sized U.S. city). Recruitment materials specified that the study would involve sharing personal experiences with racism in interpersonal interactions, and that eligible participants were required to be 18 years or older and capable of completing all study measures (interviews and survey) in English. Participants were compensated (\$15 cash or Amazon gift card) for taking part in the study.

A total of 28 individuals responded to the recruitment ads by signing up through an e-form, the link for which was provided in the ads. The respondents were then invited via email to sign up for an hour-long Skype or in-person interview with the researchers.

### 4.2.2 Participants

Fourteen individuals signed up for interviews and became the study participants (Table 1). Our sample included 9 Black or African American participants, 4 Asian or Asian American participants, and 1 Hispanic or Latino participant (listed by self-identified racial identity in Table 1). Their age ranged between 18 and 45 (average = 29). This sample was highly educated, with 7

participants having earned a Master's Degree, 1 participant having earned a Professional or Doctoral Degree, 5 participants having earned a Bachelor's Degree or Some College, and 1 participant currently in pursuit of a Bachelor's Degree. The respondents were primary residents of Pittsburgh, PA - a mid-sized U.S. city, where the researchers' institute is located. Three of these interviews were conducted online while the rest were conducted in person.

ID	Racial-Ethnic Group	Age	Gender	Highest Degree	MEIM EI	MEIM OGO	MEIM Overall	Interview Location <sup>1</sup>
P02	Black	26	Male	Master's Degree	4.20	4.43	4.33	In-Person
P05	Black/African-American	30	Female	Master's Degree	4.20	4.57	4.42	In-Person
P09	African American	28	Female	Master's Degree	3.60	4.14	3.92	Online
P10	Black	32	Female	Bachelor's Degree	4.40	4.14	4.25	In-Person
P11	Black	18	Female	High School/GED	5.00	5.00	5.00	In-Person
P12	Black/African-American/Afro-Caribbean	22	Female	Bachelor's Degree	4.80	5.00	4.92	In-Person
P14	African American	25	Female	Professional or Doctoral Degree	4.80	5.00	4.92	In-Person
P15	Black Hispanic	38	Female	Bachelor's Degree	4.40	4.86	4.67	Online
P17	Latino	27	Male	Master's Degree	4.40	5.00	4.75	In-Person
P20	Chinese	30	Male	Master's Degree	4.20	4.00	4.08	In-Person
P21	Korean	33	Female	Bachelor's Degree	3.40	3.71	3.58	In-Person
P22	Asian American	22	Female	Some College	4.40	4.43	4.42	In-Person
P23	Black	32	Female	Master's Degree	3.80	4.43	4.17	In-Person
P24	Korean	45	Male	Master's Degree	4.60	4.86	4.75	Online

<sup>1</sup> Due to circumstances of some participants, interviews were conducted either online or in-person.

**Table 4.1:** Participant Demographic Data and Results of Multigroup Ethnic Identity Measure (MEIM) including measure of ethnic identity (EI), other-group orientation (OGO), and overall score.

#### 4.2.3 Study Procedure

The study consisted of an hour-long, audio-recorded, semi-structured interview about the participant's experience(s) with interpersonal racism, followed by a survey questionnaire on ethnic-racial identity and usage of social media and communication technologies.

We acknowledged that discussing personal stories of experienced racism could be challenging for participants as it involves a highly vulnerable self-disclosure and a recollection of bad memories and resurfacing trauma. We addressed the problem in several ways. First, a semi-structured interview was used to give participants some control over the conversation. This was important given the sensitivity of the topic discussed. Second, the researcher directly acknowledged the risks with potential participants throughout the research process. Third, the interviewer disclosed her personal relationships to the topic at hand. More details on how we addressed the sensitive nature of the current research have been discussed elsewhere (To et al., 2019).

Upon arrival, the participants were briefly introduced to the study and the researchers, and indicated consent by signing a consent form. The interviews began with a short introduction of the participant about their profession/education, their interests, and their racial/ethnic identity. Participants were asked about the role ethnicity plays in their life, how often they discuss race with others, and in what context.

Next, participants were asked to communicate one or more narrative episodes about an experience with interpersonal racism. The participants were asked to describe the incident that they had experienced, preferably within the past 5 years, giving an anonymized description of the setting, time, aggressor(s), etc. Participants were asked how they responded to the incident, who if anyone they talked to about the incident, how they chose who to talk to, and how they reached out. They were asked what the impact of this support-seeking interaction as well as the long-term impact of the original incident (e.g., did the incident change their perception of race?). They also answered questions about their general usage of social media and communication tools.

Following the interview, participants completed surveys consisting of three sections: 1) demographic information, 2) racial-ethnic identity, and 3) social media and communication technology usage. The racial-ethnic identity was measured with the Multigroup Ethnic Identity Measure (MEIM), a 12-item instrument widely used in ethnic identity literature to assess affiliation with one's ethnic group, and one additional question to understand the ethnic salience for participants (Phinney, 1992; Ponterotto et al., 2003). Participants respond to a series of statements on a 5-point Likert (1 - Strongly Disagree, 2 - Disagree, 3 - Neither Agree Nor Disagree, 4 - Agree, 5 - Strongly Agree) where higher scores are associated with stronger affiliation to racial-ethnic identity. The MEIM provides a perspective on how individuals' feelings towards their racial-ethnic identity interplay with their experiences with racism and their post-incident social support-seeking strategies. Results are reported in Table 1. The last part of the survey included five questions on types of social media and communication tools participants use, the frequency with which they use them, and where they feel comfortable discussing ethnicity/race-related issues. These questions were investigated to inform our next step of designing digital tools that amplify social support for targets of racism at online environment. Results replicate what is found in the interview data and are not reported separately in this paper.

After the completion of the questionnaire, participants were thanked by the researchers and received \$15 cash or Amazon gift card as compensation for their time.

#### 4.2.4 Reflexive Statement on Researchers

All researchers conducting the interview studies identified as women of color, entailing some personal stakes in this research topic for the researchers. Data analysis was conducted by a different subset of researchers who share the same characteristics with the interviewers (women of color). Not only does this mean the researchers personally identified with the research, but it also means that the researchers had their own experiences and opinions about racism and racialized aggression.

While this may seem to pose a risk of subjectivity and bias in the study, it was also conducive to the study since participants feel more comfortable discussing these issues with someone who “gets it.” To help signal this directly to participants, during the session the interviewer (first author) discussed experiences with participants as a peer while acknowledging they have unique experiences our team members likely do not have. The interviewer took particular care to avoid responses that could be experienced as micro-invalidations by stating at least twice during the interview (once before the narrative episode and once before the semi-structured interview) that questions were not meant to invalidate the participant's lived experiences, but instead meant to clarify so that the interviewer avoided over-interpreting what the participant said. The interviewer also regularly affirmed the participants' personal stories. Our biases along with the limited demographic of participants gives us a somewhat limited perspective. In order to address this, we turned to existing literature on this topic to inform our study design and procedures.

### 4.3 Analysis

We utilized a grounded theory approach to qualitatively code transcripts of our interview data with several rounds each of open, axial, and selective coding (Creswell & Poth, 2017). The first author developed a list of preliminary open codes based on prior research. From literature reviews on racism, social support, uncertainty, and other related topics, these preliminary open codes reflected existing knowledge closely related to our area of interest. Afterwards, the first author and an additional researcher read through the interview transcripts to develop more open codes through salient and consistent categories.

The open codes were considered to reach saturation when the researchers felt that they sufficiently covered each category of information described in the interviews. Once the first author and researcher felt that they had reached saturation with the open codes, the first author and researcher iteratively reviewed the codes to develop a comprehensive open codebook. The review process included checking existing codes for overlap, refining language and specificity in existing codes, and adequately defining each code (samples in Table 4.2). Using the final

codebook with contained 27 open codes, researchers performed several rounds of coding to informally test for inter-rater reliability. All data was coded using the open codes in this way, providing quotations with one or more open codes to be used for axial coding.

Open Code	Open Code Definition
"event-receiving"	Interviewee describes an event of racism where they are the direct or indirect target of the racism, could be in an individual or group context.
"racism-evidence"	Discusses how the target knew the event was racially motivated / how the target interprets the event (in the moment or afterwards).
"social-support-public"	Target actively seeks out some kind of support by sharing their story on a public platform (e.g., mass group text, Twitter, Facebook) where it is unlikely that you personally know everyone who sees the story.
"target-event-ambiguity"	Target expresses some level of uncertainty about the racial motivation of the event
"listener-event-certainty"	Listener expresses certainty about the racial motivation of the event - could be certainly racist or certainly not racist.
"listener-advice"	Listener offers some kind of action the target might take following the event - could be a more direct response to the aggressor or might be more abstract or personal just so the target can cope further or might be advice towards other ways to reduce uncertainty about the event, etc

**Table 4.2:** Sample open codes with definitions.

Open coding produced 684 quotations with one or more associated codes labeled with participant ID. Six researchers new to the project began the process of axial coding by gaining a general sense of the quotations associated with each code. Using the codes as a starting point for finding commonalities between quotations, we explored relationships between quotations that shared codes and classified identifiable relationships under an axial code (samples in Table 4.3).



<b>Axial Code</b>	<b>Sample Associated Quotations with Open Codes</b>
The target feels comfortable in the presence of and sharing with those with shared minority status.	"Yeah I just forgot to share because that stuff would happen all the time and if there's a black person in the room like we have a whole conversation with just a look. No one else would get it... they don't have to explain it to you." -P02, (social-support-public); "Yes she there when it happened and I talked to... to actually talk to the other... I'll talk to the other people of color in my cohort... they were the only other people that I spoke to about it" -P05 (social-support-private)
Targets use the racial composition of their environment to help determine if experience was racist.	"Before this even had taken place it didn't take anything for me to notice that me and my cousin were the only two people of color in this side of the audience... especially as close as we were" -P05, (racism-evidence).
Target seeks some sense of belonging or identity.	"I'm black and everyone in the chat's black so it's like... you know stuff like that comes up... if we see something that happens we'll talk about it sometimes" -P02, (ethnic-racial-identity, social-support-public) "I did that on purpose. I wanted to be like... not the only representative of a race or a continent wherever I was gonna be. Yeah but it also almost reinforced like... yeah you still not feel super Asian yet either because here are Asians from Asia or people are like Asian American... like you know in our society or sororities or fraternities... and like I don't feel like I belonged there either so that was fun." -P21 (ethnic-racial-identity)
Target compares their experience with others to confirm whether an aggression occurred.	"Or like oh this one's important. I remember sophomore year of high school I had a teacher and it was a public speaking class. Like it was the first time I had done a speech and the first comment he had was, wow you're so articulate. So there's like a big one... like he didn't expect me to be. I was like... like I literally said... I was like did you not expect me to be? And he was like, no that's not what I meant. And I was like would you send that to a white person in the classroom? And he was like, no. And I was like, okay so that's what you meant." -P11, (target-asks-question, target-event-certainty, event-receiving) "I looked at my friend and I was like... I was like was that just me or whatever? And he was like, no. He was like, let's get out of here. I was like, yeah. So we left" -P09 (target-asks-question, event-receiving, listener-event-certainty)

**Table 4.3:** Sample axial codes with sample associated quotations.

Finally, when axial coding was complete, the first author performed selective coding. During this process, relationships were drawn between axial codes to make meaning from the data. The results of selective coding are presented in the discussion.

## 4.4 Findings and Discussion

*“Yeah it's like... that's the situation where it's like so aggressive that people like me on the periphery and get it... like we have no choice but to get involved.” -P24*

Participants described a range of experiences with racism and often described experiences with high degrees of uncertainty in the most detail. We interleave our findings with interpretation and discussion below.

### 4.4.1 Experiencing Racism

In order to provide the necessary context to understand social support and coping, we provide brief summaries of experiences our participants shared with us. While our analysis focuses more on the coping process, in this section, we do discuss important common themes across how participants describe these experiences. *We caution that these stories may be triggering and upsetting to our readers.*

#### *Representative Story Samples*

In story one, P05 describes an initially ambiguous experience being unjustifiably removed from the VIP section of a concert venue by security. In story two, P11 describes six of the most common microaggressions she experiences and explains why she chooses not to respond to them, through support-seeking or otherwise. In story three, P17 describes experiencing directed hate speech on a public bus.

*Story 1.* P05 describes an experience with racism where the event itself was initially ambiguous. P05 sought out multiple people in attempting to resolve that uncertainty including an ally that experienced the racist event with her, the perpetrators, and close trusted family members and friends. P05 responded particularly negatively when the perpetrator was unable and unwilling to provide a straightforward justification for the experience and when friends introduced additional uncertainty which she perceived as invalidating.

Part way through a concert in Las Vegas, security tapped the P05 and her cousin on the shoulder and asked them to leave. During and after being escorted out, P05 and her cousin repeatedly asked security and hotel management for specific reasons for their removal and for photo or video documentation or at least a refund, but management continued to say, “we didn't look at the video, but security told us you were a problem.” No refund was issued, but they were told they were welcome to come back to a future show.

P05 later called her father - as she was considering legal action on basis of discrimination and was interested in filing a civil suit. P05 also told her close friends who she texts daily about this incident. She received mixed responses - but largely the “bad” responses came from people who she was not as close with who had known she was going to Vegas. When they asked how the concert was, she described the situation as well as its racial motivation, to which at least two responded “did you guys do something?” P05 was very frustrated by this because she felt that *“sometimes a lot of people can't see that oh wow this actually does happen to people for no reason, it's unprovoked.”* Others commented, “that sucks” and “I can't believe that happened to you guys” and “I hope you guys can work something out.” P05 was encouraged by these comments and seemed happier overall with the friends who responded in this way.

While P05's cousin posted about the event on Facebook, P05 did not. She thinks she commented on his post, but definitely did not engage in any conversation. However, were it to come up, P05 is willing to tell others who might attend that same venue about her experience to deter them. *“I'm not going to necessarily go on a social media tirade against you, but if I can convince or let other people that I personally know about my experience with this hotel... hopefully they will feel the same way and not want to support organizations and business that treat people the way that they treated me.”* She will also no longer patronize their hotel, mall, or concert venue in the future.

*Story 2.* Every one of our participants described common microaggressions they experience. P11, a current undergraduate student, described six common microaggressions she faces in rapid succession: 1) “wow, I wish I was as dark as you”, 2) “oh, you're so articulate”, 3) “you're just playing the race card”, 4) being told her mother or father's accent is “weird” (they are from

Nigeria), 5) “*can I touch your hair?*” and 6) being called an Oreo in middle school (a derogatory term that implies you are “white” on the inside). Over the course of her interview, P11 described additional microaggressions, but what stood out here is that she was able to so quickly list these experiences. She described a few of her philosophies and responses to dealing with microaggressions.

First, she described that it was something we all have to deal with. “*It's just like we all deal with microaggressions. No, it's really terrible that we all deal with microaggressions but like you kind of just have to like shrug your shoulders and keep going. Yeah, it's just gross.*” She also describes them as frequent and common, necessitating that she move on from the experience quickly. “*I don't really experience [overt racism] much anymore other than like little microaggressions and I'm just like oh you're a dumbass and I get over it because I kinda have to which is terrible.*” Finally, she describes that one motivator for moving on is that confrontation typically ends up being pointless at best and backfiring at worst. “*Like most of the time white people don't even know that they're saying microaggressions and if you tell them they'll get like really offended and it's very annoying.*”

P11's experiences with and attitude towards microaggressions are shared by the majority of our participants. They feel that microaggressions happen all the time and that they are not worth responding to. It is worth noting that this distancing attitude is yet another coping mechanism. However, we know that microaggressions have cumulative negative impacts on those who experience them.

*Story 3.* P17 was a recently graduated grad student who recalled a blatantly racist incident he experienced on the bus. He described his experience as being incredibly hostile in a way that necessitated multiple forms of social support.

P17 regularly commuted to school by bus and on the day of the incident, gave up a seat on the bus to an older woman that just got on. As the bus was crowded, he stood in front of her to hold onto the pole right by the seat. After taking his seat, the woman kept kicking P17's foot, so he asked her if his leg placement was bothering her, and the woman responded that she wanted him to move. P17 said that he could move his leg, but he would still be close to her as a result of the

crowded bus, and she replied by saying that he was not entitled to this space. P17 replied that everyone is entitled to that space if they have a bus pass. The woman launched into an agitated rant about how blacks beg for everything and that they feel entitled to everything they have, but if they are given welfare or education, they still complain. This sharp turn in the conversation shocked and upset him.

This interaction captured the attention of many bus riders close to P17 and the woman. Multiple riders began arguing with the woman, calling out her racism and hate. P17 remembered as he was getting off the bus that the driver, who was an African-American man, said that he was glad P17 handled the situation like he did. A Latinx woman who recorded the incident sent the video to P17 and told him she was going to send it to a local news station.

Despite that immediate support, P17 described struggling to process and cope with the event. *“I don't know what happened to it but it was an interesting experience because up until that point though I had dealt with you know the regular run-of-the-mill kind of microaggression being one of four minority students in my whole graduating class. It was never anything so blatant and kind of disgusting that made me really reflect you know it really bothered me...so much so like I called my father afterward and I was crying. The reason I was crying wasn't because I was sad I was so angry because I felt like I should have been able to defend myself and I felt put in the position where if I defended myself it was only going to react negatively upon me...I felt helpless because I had no response other than just take it.”*

#### 4.4.2 Summary of Stories

In total our 14 participants shared 52 stories with us about their experiences of racism. We count ‘stories’ as experiences with either precise incidents or perpetrators identified. For example, saying “my high school math teacher said he was surprised I was so articulate” is a story, but “people make comments about how good my English is” is not a story.

We found that participants had varying definitions of what it means to describe 'their experience with racism.' We coded the stories by target and found that of the 52 stories, the participant was the direct and solo target of the racist experience in 18 of them. In 12 of the shared stories, the participant described experiencing the racism with someone else (e.g., story 1 where P05 was with her cousin the entire time). In six of the stories, there was no direct target of racism. In other words, something racist happened in the vicinity of the participant (e.g., seeing a Confederate flag flying while driving through a new neighborhood, being an Asian person and overhearing someone say something racist about Black people). While the participant was not 'directly targeted' it was still their personal experience with racism, and often coped with it similarly as they did with experiences where they were directly targeted. Finally and most surprising, the final six stories describe situations in which another person, known or unknown to the participant, was directly targeted by racism. For example, P12 described her brother's experiences being harassed by the police and P15 described her son's experiences being followed by security guards while walking through a mall. Even in these 'indirect' experiences of racism, racial minority group members feel the oppressive nature of the racism and often need to engage in some form of processing and coping.

Experiences with racism were often described as embodied by participants - their emotions were felt physically. One physical characteristic that participants noted during their racist experiences was a feeling that their body was heating up from embarrassment or outrage. Additionally, participants noted having weird feelings that people were looking at them and of wanting to get out of the situation. These embodied feelings also left participants feeling rejected due to a barrier preventing them from belonging.

Another common detail described by our participants is the role of non-verbal support during their experiences with racism. Participants often clearly remember when another person of a similar racial background or other marker of allyship shares meaningful eye contact during the experience. Participants describe those allies in the moment as ``getting it" (discussed as an important theme later in this paper). Very often, the participant does not discuss the incident further with these in-the-moment supporters.

Finally, childhood memories were a prevalent part of our participants' storytelling. Of our 14 participants, 10 told us about some incident that happened during childhood. Often these stories stood out in how participants framed their experiences. For most participants, they described how, at the time, they didn't understand that they were being treated differently because of their race. These first brushes with racism are often very clear and cleanly narrativized by the participant - there is a beginning, middle, and end that the participant describes linearly and concisely. This differs from the other stories which are often told more cyclically with participants calling back to a prior story several times throughout the interview to add additional detail.

#### 4.4.3 Communicating About Racist Experiences

We further break down the core aspects of communicating about experiences of racism into three sub-themes: 1) deciding whether support is needed, 2) meaning-making to reduce uncertainty, and 3) coping and support mechanisms. In this section we refer to our interviewees as targets of racism and the people they share their stories with as supporters.

##### *Uncertainty Motivates Support-Seeking*

In our dataset, we observed that two main sources of uncertainty are the major motivators for communicating about experiences of racism. The first source of uncertainty motivating support-seeking is uncertainty about the consequence of the event. These consequences may take different forms; the common thread is how seriously they are perceived to affect the target. In the most overt case, racism may present a threat to the safety of the target, including the threat of physical violence or harassment. Another form of threat may be to the target's future. When racism occurs in professional or academic contexts, the target may feel that their future opportunities are either already limited or may become limited depending on how they react to the situation. Finally, the threat may be to the target's sense of social belongingness. The climate of a professional, academic, or public space may become hostile or chilly (Barajas & Pierce, 2001; Crawford & MacLeod, 1990), negatively impacting long term engagement with entire

topics of study and/or communities and snowballing to create long-term impacts to career and professional success. In the case of feeling these serious threats, targets seek social support primarily for emotional support as the experience is often traumatic and secondarily for advice.

The second uncertainty motivator for communication is uncertainty about the event itself. In situations that were initially ambiguously racist, participants often describe a constant inner dialogue assessing the occurrence. They might, for example, ask themselves: was that racist? Am I overreacting? Was that a slip of the tongue or is that person racist? Should I leave? These inner conversations can be summarized as a desire for a “sanity check” through which targets reaffirm their experiential reality (Sue et al., 2008). Targets of racism also face uncertainty about what to do when deciding if an experience was racist. Should they engage in some follow-up action or confront the aggressor? Should they avoid (if possible) this person or space in the future? What can they do to better protect themselves in the future? In these situations, targets may seek empathy, advice, and connection with others with shared experience.

Finally, participants described that not all experiences of racism require social support. In instances where the target has certainty - whether it is about the experience itself or what next actions, if any, to take, there is no need to communicate about the experience. While these experiences may come up in conversation during the social norm communication described above, in these situations of certainty, the target does not actively seek support related to the experience. For some, it may feel necessary to downplay the impact of frequent experiences such as microaggressions as a type of coping in and of itself. If every experience of racism merited a specific action from the target, their life would be overwhelmed with constant reaction to racism. Ultimately, this is not feasible.

Microaggressions are most often downplayed by targets of racism. In addition to the sense that reacting every time would be overwhelming - targets of microaggressions also downplay microaggressions either by labeling them as “not that bad” or by using humor and sarcasm.

*Meaning-Making is Coping through Uncertainty Reduction*



An important part of the coping process in dealing with racism is understanding the underlying motivation and purpose behind the interaction. We know from the previous section that uncertainty around the event motivates support-seeking. In this section we describe both the social and individual processes of meaning-making as a form of coping. In social processes targets look for trusted allies to evaluate their experiences with them. In individual processes, targets often relate their individual experiences to a larger context.

When selecting a potential listener or supporter, the top priority for a target is that the supporter gets it. This concept of “getting it” or “not getting it” was core to every participant's conception of communicating about racism. Getting it usually implies that the supporter has a high degree of empathy for the target, either because they shared similar lived experiences or because they have in some way demonstrated that they are a legitimate ally (i.e., a person who has already said or done something in front of me that proves that they will legitimize and understand my lived experiences). For example, P21 describes, *“I found that I can only really speak openly about these experiences with people who I feel like are gonna get it and who have also been accused of not being Asian enough or like taking on traits that are not like stereotypically Asian and like you know I don't know betraying the race or whatever the hell like the subtext is you know?”* It's important to note that this does *not* mean that the supporter always labels the event as racist. Getting it is a precursor to support. The support-seeker is not looking for someone who will always say yes that was racist, but is instead looking for someone who has a shared frame of reference who can help resolve their uncertainty.

Supporters can do a number of things to help a target resolve uncertainty. First is the sanity check - supporters can just clearly state yes or not that an event was racist or racially motivated. This kind of uncertainty resolution is typically a short interaction and quickly and easily bolsters a target's feeling of validation. Supporters also might help run through different or parallel scenarios with the target, either in theory or in practice. For example, a supporter might return to a store where a friend was followed by a security guard to see if it happens to them. Whether or not the supporter has the same racial identity as the target, both can gain useful information from doing this kind of test.

Second, supporters with certainty might provide additional context or background information, explain why a particular incident might be racist, and engage in a back and forth meaning-making process with the target. For example, P10 described experiencing frequent slights and exclusions from her Indian cohort members. After several experiences with these microaggressions, she reached out to a Pakistani childhood friend asking, "Is it just me? Is my intuition off?" Her friend responded that she was correct in thinking that her cohort members very likely had culturally ingrained racial prejudice towards her, but insisted that she not take it personally and try to ignore their ignorance in future.

Finally, a trusted supporter might bring in a non-threatening level of uncertainty and work with the target to resolve their mutual uncertainty. For example, P15 described that she and a number of her co-workers were uncertain whether or not their more senior co-worker had said something racist over lunch. They spent the next week going to each other re-hashing past statements that had been red flags in retrospect and ultimately came to the collective conclusion that he himself was not overtly racist, but was "a product of another time" and thus they could forgive but not forget his indiscretion.

Whether or not it is a result of or independent of social support, an important process a target might go through in coping is the abstraction of the racist experience to its larger context. When our interviewees discussed their experiences, they often focus the agent of racism on institutions and physical locations rather than individuals. For example, when P23 (who identifies with her Christian religious faith) discussed a racist experience in a Catholic church with an elderly woman, she described how that experiences altered her willingness to enter Catholic churches in the future. *"But I guess it affects the churches that I go to even now. I try not to go to Catholic church, but okay like if I go to a church, a Catholic Church, and there's no black people in the church I automatically think there is another church for me... I'll stay for today, today I'm already in church right? Right, so I stay and if there's no black people and the people that they don't seem friendly at all yeah I won't come back again. I used to think maybe they're just in a bad mood but now I just don't come back again... However if I go there and everybody minds their business and there are some black people there I'm more inclined to visit their church*

*again because again I'm like okay maybe everyone is just in a bad mood today.*” We can gather a few things from this story.

First, extrapolation to the larger context and distancing might be a useful and productive part of coping - rather than being about me as an individual, my racist experience was evidence that some larger system is flawed. Second, connecting to a larger context might help me make predictions about the future. I can avoid experiencing racism in the future if I can understand why it happened when it did. Finally, we might imagine that time is a key factor in this contextualization process. Our participants are often describing experiences years after they occurred and their bias in feeling comfortable discussing these experiences might mean that they are quite far in the coping and healing process. It might be that contextualization is not an inherent part of processing, but a signal that a target of racism has coped ‘well’ with the experience.

### *Response and Coping Mechanisms*

Our final set of findings focus on the particular mechanisms targets employ to respond to and cope with racism. We discuss the role of communication technology and social media platforms in the inclusion as the exclusion of particular people in the social coping process.

First, and most important to understanding how we can build successful technological interventions, is that the mode of social support communication is incidental. That is to say, support-seekers communicate with potential supporters in line with their already established social norms. If a person speaks on the phone with their parents, they will use a phone call to tell them about their racist experience. They might call specifically to communicate about their experience or they might describe the experience during, for example, a regular weekly phone call with their family. Targets do not usually alter their communication norms when seeking support for racist experiences.

The only time a target might change modes is when the communication is overly burdensome. For example, when P20 was sharing an experience with a friend over GChat (an online instant messaging service), he realized there was too much context and background to explain. He halted

the conversation and told his friend that he would “*tell them about it next time they saw them in person.*” The physical and possibly mental/emotional burden of typing the story in pieces was overwhelming and necessitated a change of platform.

Targets also proactively join or curate communities where they feel comfortable discussing their experiences with racism. In these situations, getting it is usually a given and therefore targets can openly share experiences with either individuals in the group or the group at large without the burden of feeling evaluated on a case by case basis. In our interviews, these communities fall into two main categories: 1) professional/institutional organizations and 2) pseudo-anonymous online communities. While the core purpose of these communities may not be social support for racism, it is an expected and acceptable community norm that people self-disclose experiences with racism and often the community will collectively engage in meaning-making with the target. In these situations, even when a supporter introduces uncertainty, the target engages more positively with that uncertainty. When these conversations happen with the entire group, there may not be consensus, but the target can use the multiplicity of opinions and perspectives to come to their own conclusions as an individual as to the nature of their racist experience.

The social support processes for targets are often cyclical. People who are deemed to be poor supporters (e.g., through introducing uncertainty, invalidating the support-seeker, etc.) are excluded from future communication about racism. These relationships are often tainted in the future with the target always knowing that even if they are close with the purported supporter, they will never really understand or empathize with an important aspect of their lived experiences. This can cause distance that may be visible or invisible to the supporter. Supporters who demonstrate allyship build trust and understanding with the target that gives more leeway in the future to introduce uncertainty during the meaning-making process and may be more readily called upon when future support is needed.

## 4.5 Designing for Coping After Racist Experiences

*“My family they just listen now. I think over time they have learned about the gulf in the context that we that we each have. They didn't get it but now they see. So they recognize that there are lots of things about race relations in [country] where I'm from that just don't translate to the American context.” -P20*

We have described the core aspects of communicating about experiences of racism. Targets of racism have particular and sometimes unique needs when it comes to social support. In the long term, we seek to understand how our findings can be translated into the design of interventions or new systems to help facilitate effective communication, support-seeking (and -giving), and coping. Based on an ideation and analysis process, we present preliminary design insights for researchers and designers who seek to empower targets of racism when communicating their experiences.

### 4.5.1 Design Methods

As the first stage of translating our findings into design insights, we created and analyzed potential design probes. Our work frames design probes as “embodied questions that are co-creative, empathetic, and shared context between the researcher and a participant” (Wallace et al., 2013). However, cultural design probes incorporate a large number of influences that may be difficult to trace (Gaver et al., 2004). We describe our process here to be transparent and to attempt to surface and articulate those influences in order to help us see and unpack our own assumptions about racism.

To generate our insights, we used a process of ideation and reflection. First, team members were tasked to individually construct a mind map from the preliminary findings, which outlined general themes and approaches. Next, the team met to integrate the individual mind maps into a single concept map that reflected our shared understanding of the design space. This concept map was used as a starting point for ideation, with each team member tasked to develop 15 ideas.

Meanwhile, five selective codes were chosen to reflect the main topics of the study findings. These selective codes were used to refine and organize the ideas generated by the team. Ideas were generated, iterated, and sorted until the team had produced 20 ideas per selective code. Next, the team collectively built an affinity map that highlighted common themes among the design concepts. After consulting with design experts, the team agreed on three of these themes to share in this work.

#### 4.5.2 Design Insights

We present three sample insights for how our research can be used to better design for coping after racist experiences. While these insights are not exhaustive, they provide a launching point for the development of cultural design probes - artifacts that stakeholders can react to and that help create a shared context between researcher and participant. As part of this work, we illustrate each of our insights with sample design ideas. We do not assert that these sample designs are the best solutions for empowering the targets of racism. Rather, we use them to illustrate how a researcher or designer might incorporate our insights into their work. The design and evaluation of possible interventions will be explored in future work.

##### *To Encourage Social Sharing, Create Spaces for People Who Get It*

Participants repeatedly describe needing to know whether people "get it" or "don't get it." In some cases, individual personal history with a person helps a target know that they are safe to share a story with. In other cases, the context of the interaction lets a target know that people in the space or community will understand the nuances, complexities, and uncertainties that are embedded in experiences with racism.

As described in the discussion, targets of racism have techniques for communicating with people who "get it" and for managing people who "don't get it." The risky situation is mistaking someone who doesn't get it for someone who does. Self-disclosure of racist experiences creates vulnerability, and prior literature shows that self-disclosure also involves risks such as

harassment or negative impacts to real-life relationships. In other words, the costs of getting it wrong about who "gets it" are potentially quite high.

One approach to reducing the risks of self-disclosure is through *environmental signaling*. Cheryan and colleagues describe ambient belonging as people's sensitivity to the physical design of their environment and their reliance on salient cues to determine whether or not they are welcome (Cheryan et al., 2009). We can adapt this technique to support individuals who have recently experienced a racist event. For example, customized virtual reality (VR) spaces can signal the presence of people who "get it." Just as the example of neutral decorations such as nature posters and phone books encouraged more interest and engagement for women in computer science (compared to the masculine-stereotypical decoration of *Star Trek* posters and video games), a space decorated with "Black Lives Matter" signs can signal to Black targets of racism that they are in a space where racial self-disclosure is acceptable, and to potential supporters that only people who "get it" are welcome. The customizability of the virtual space allows *specificity* in signaling, rather than assuming all marginalized identities are equivalent. For example, the "Black Lives Matter" signs could be swapped out with pride flags to signal LGBTQ support. The space could be adorned with multiple signs, increasing customizability for people experiencing marginalization along multiple axes simultaneously.

Another approach to curating online communities and spaces might be increasing the cost for people to send incorrect signals about whether or not they get it. Research on moderation of online communities indicates that proactive moderation tools (e.g., ones that prevent certain types of content) can be effective at discouraging spamming or otherwise negative community behaviors (Seering et al., 2017). We might imagine tools that automatically recognize when community members invalidate each others experiences. Rather than banning members from the community, we might also imagine preventing that user from posting or interacting with the group for increasing lengths of time so they have the chance to learn community norms and behaviors while protecting other users from harassment or invalidations.

*Support Uncertainty as a Natural Part of Coping and Processing*

A recurring theme that arises from the stories of "everyday" racism is the uncertainty that targets face about the nature of the experience of racism and about its consequences, which in turn motivates support-seeking. Our participants often imply uncertainty through their actions in asking questions and seeking validating support, but rarely acknowledge it directly. We hypothesize that targets of racism who are less resilient to and less comfortable speaking about racism may have an even harder time acknowledging uncertainty. We therefore believe that it is critical to support acknowledging, addressing, and resolving uncertainty as a natural part of the process. In designing for coping, we first want to emphasize that uncertainty is acceptable and common and second, offer suggestions and support for reducing uncertainty.

In signalling and normalizing uncertainty, we might for example, design an artificial intelligence (AI) chatbot (also known as a conversational agent) could ask questions and push people to think about and reflect on their experience. The conversations between the target and the AI chatbot could be based on emotional language - machine learning can be employed to figure out what the target is indicating and feeling, and the AI chatbot provides an appropriate response. The conversational agent might even recognize varying degrees of uncertainty and directly tell the target, "it seems like you're not sure why this happened... that's totally normal." Or instead it might suggest other venues of social support. "The last time you experienced something similar, talking to your brother helped, do you want to text him to talk about it?"

An alternate strategy involves crowdsourcing and curating an online collection of other people's experiences of racism (much like microaggressions.com). Targets of racism might benefit from "lurking" and reading stories or could choose to engage more deeply with the material by sharing their own experiences. The collection could be interactive and highlight the emotions associated with different stories with an emphasis on how uncertainty pervades experiences with racism on a variety of levels (e.g., the experience, the perpetrator, the response of supporters, etc.). Storytellers might be encouraged to share coping mechanisms that helped them reduce uncertainty and model productive support-seeking behaviors.

*Prioritize Synchronous, Low-Burden Communication*



We observed that the targets of racism recognize that communicating about racist experiences can be lengthy and complex. While they prioritize *who* they talk to over using a particular medium, they strongly prefer synchronous and low-effort forms of communication. We hypothesize that the importance of synchronous communication is partly because communicating the experience of racism is stressful and in itself requires ongoing support. Receiving repeated feedback during the process of telling the story also helps the target assess in real-time whether the supporter in fact "gets it," and reduces the risk and effort expended in case they do not. Additionally, our data suggests that the targets of racism value *timely* support, so that they do not have to carry the burden of uncertainty about whether an experience was racist while they are seeking coping options. Designers can therefore work to make communication about racism more timely and support alignment between the target and the supporter. The context-heavy nature of racism provides additional burdens to communication. In some cases, support-seekers had to halt communication and instead asked to wait to speak on the phone or in person with supporters to avoid the burden of literally typing the entirety of what had occurred through text message or online messaging services.

One strategy to reduce the burden of explaining what happened is through community-sourced, location-based reporting (e.g., *Protibadi* - a mobile and web app designed to empower women in reporting sexual harassment in Bangladesh (Ahmed et al., 2014)). A community-sourced map tracking experiences of racism could lower the barrier for sharing and seeking support through a low-effort input interface. For example, a support-seeker could simply input their location and select a type of racist experience (e.g., workplace microaggression, hate speech, etc.) and optionally include additional details. Then, witnesses nearby using the app could upload their own information about the experience to the app, which in turn could be shared with a group of trusted supporters. This can help the target communicate what happened without having to repeatedly explain all the details each time they seek support. The map might also serve as a reminder for both the supporters and support-seeker to discuss the experience later when they can engage in more synchronous communication.

Another strategy is to make communication about racism more timely using *wearable* technology. Wearable technology has the ability to immediately track physiological data that can be linked to emotional states (Liu et al., 2017). A target could, for example, wear a smartwatch that tracked and provided feedback when physiological data signalled moments of high distress and ask wearers, "did that seem racist?" (or perhaps an even less obvious icon with a simple yes or no to avoid a perpetrator viewing the text). Tapping yes could automatically send a notification to a pre-generated list of trusted people. The wearable could be unobtrusive enough that it could be tapped during the racist encounter itself, and by communicating with a list of trusted people lower the burden of reaching out to a large group individually. Supporters could even tap in that they are available for support, signalling to others that the situation is, at least temporarily, handled. Both of these things would make social support more timely.

### *Managing Risks Arising from Design*

In proposing these design concepts, it is important to incorporate a critical design approach. We must evaluate the "potentially hidden agendas and values" of these designs and address the additional risks they might pose (Bardzell & Bardzell, 2013). Here we briefly examine some potential ways these risks might manifest within our proposed design solutions.

First, in designing customizable VR spaces for discussing racist experiences, we suggested using social cues (such as banners) to indicate to users who could potentially be trusted to "get it" and who cannot. However, in executing this idea, one risk is that the cue itself does not necessarily represent an accurate gauge of understanding and support, particularly without a way of vetting or validating the intentions or the level of understanding possessed by the users who are "marked" by those cues. For example, these cues may be adopted and displayed by well-meaning allies who, at best, are under-prepared for supporting people dealing with trauma and, at worst, are performing empathy and allyship in shallow and invalidating ways (e.g., 'slacktivism' or engaging in trivial online activism for the main purpose of social participation (Rotman et al., 2011)), causing additional burden to those who enter the space.

A conversational agent such as the proposed AI chatbot might incorporate training that well prepares it to address the unique challenges of supporting someone experiencing racism.

However, targets may struggle to develop a comfortable rapport discussing racism with a conversational agent, particularly around emotionally complex and nuanced experiences with racism. In many situations, an understanding of shared or at least similar experiences help targets feel comfortable trusting a supporter in helping them make meaning of an experience. Given the conversational limits of current chatbot technology, such a system would need to be designed with these potential constraints in mind.

Finally, any autonomous system that "senses" or detects when a user is in need of support must take into account the importance of maintaining a user's agency. In the wearable technology example, the automatic detection of the device means that users will persistently and immediately be notified of their own discomfort. There may be situations where it is more psychologically protective to delay processing and coping with an experience, so the system would ideally give some level of control to the user to be able to control or disregard notifications from the system that indicate immediate recognition and/or prompt reflection.

For any of these systems, we could begin proposing a series of solutions to mitigate our highlighted risks, but that falls far beyond the scope of this paper. We seek to illustrate the need to engage in iterative stages of critical design when designing and prototyping interventions for coping after racist experiences as well as the need to anticipate the potential for any idea to unintentionally exacerbate, rather than support, coping processes. As described in our future work, we will undertake this challenge in an upcoming research through design study.

#### 4.6 Limitations and Future Work

*“It's just after a while going back [and forth saying] well then they shouldn't do this, they shouldn't do that, it's like alright, you don't get it.” -P12 \newline*

We acknowledge that our sample and data have limitations. First, our sample has relative homogeneity. Our participants are primarily well-educated residents of the same mid-sized U.S. city. We know that experiences with racism may have negative impacts to success in academic

and professional contexts. Given that our sample are college-educated, they are more likely to have already succeeded in overcoming some of those negative impacts. Second, by virtue of responding to our recruitment text, our participants may be biased towards being more comfortable speaking about their experiences of racism. This might mean that they have already processed and narrativized their experiences, or may already be more resilient to racism. Third, all of our participants scored high on the MEIM measure for racial-ethnic identity (Table 1). This means that our participants consider their racial identity to be important and valuable to their sense of self. The social support needs and behaviors of others who experience racism may differ, but it is our hope that knowledge about and design incorporating our participants' practices and tendencies may actually more useful to those who are less resilient to racism.

In our analysis we acknowledge two additional limitations. First, the researchers' personal experiences have an impact on how we read, understand, and analyze our participants' stories. As we have reflected on previously, we believe that this strengthens our ability to provide a space where our participants can engage in vulnerable self-disclosure. We attempt to limit bias through the use of grounded theory methods and inclusion of multiple non-overlapping teams to analyze the data (e.g., researchers who were in the room with participants were not the same as researchers performing axial coding). Second, our analysis focuses almost solely on racial identity. As the "Intersectional HCI" paper (Schlesinger et al., 2017) calls for, future work in this area must be approached from an intersectional lens that accounts more for the unique experiences within intersections of race with other experiences of gender, sexuality, religion/culture, class, citizenship, etc.

As a next step, we will iteratively prototype cultural design probes that draw on our findings, such as the ones described above. Using these artifacts, we will engage in co-design activities with people who have experienced racism to understand how particular interventions can support coping. We will then evaluate the effectiveness of the most promising interventions that emerge from this process. In recruiting for this next study we hope to address the limitations of our current study by broadening to an audience that may be less resilient and less practiced at productively coping with racism.

More broadly, we envision several lines of future work stemming from our findings. For example, many support-seekers described friends who *wanted* to support their coping process, but who were unable to follow through and successfully support them in practice. Typically, the friend was unable to resolve their own uncertainty, and therefore increased rather than decreased the uncertainty of the target. While our current approach focuses on the target of racism and how they communicate, our work could also lead to "helping the helpers." For example, we might design ways for well-intentioned supporters to manage their uncertainty about racism outside the collaborative coping process with a target of racism, or to help them prioritize the needs of the target above their own needs.

Additionally, we could study the longitudinal processes of recognizing people who "get it." For example, what triggers a targeted person to evaluate whether someone in their environment might "get it?" Under what circumstances might they reach out to someone who they have never sought support from before? What happens after someone is removed from a social support network because they didn't get it? Understanding the dynamics of support and allyship in order to promote learning healthy support and allyship practices could vastly increase and improve the available resources in a person's social network.

Finally, although the current study focused primarily on social processes used to recover from racist experiences, our participants also informed us about other strategies they used. Most notably, participants described processes by which they reclaimed their identity. Some participants deepened their connection with their racial identity, for example by engaging with existing cultural practices related to their race. Others deprioritized their race and prioritized other aspects of their identity, while still others used "code-switching" techniques (Debose, 1992) to make their racial identity more and less salient depending on context.

While a full study of this strategy is beyond the scope of this paper, it emphasizes that we can approach these questions from an intersectional perspective. Individuals have many different identities; many individuals experience marginalizations even within marginalized communities, and the experiences of those who experience multiple marginalizations are more than the sum of their parts (Crenshaw, 1990). For example, does "getting it" transfer across different axes of

marginalization? Does racial identity always become the most salient when experiencing racism and how does this factor into support-seeking behavior when looking for people who “get it.” Could increasing the salience of other more privileged identity buffer the impact of experiencing racism or could that create additional burden and blame on the target? Future research in this area must examine the unique needs and considerations when designing for coping after racism for people at the intersection of multiple axes of privileged and marginalized identities.

## 4.7 Conclusion

*“I mean, you get it, right?” -P23*

Seeking social support following racist experiences can be a challenge for targets of racism. In both online and offline contexts, there is a substantial risk of emotional, psychological, and practical consequences. Additionally, the ambiguous nature of experiences of modern racism complicate coping and provide additional barriers to support-seeking.

In this work, we explore the complexities and nuances involved in seeking support following experiences with racism. We find that uncertainty surrounding the experience as well as its consequences is a primary motivator for support-seeking behavior. Once a target has shared with a potential supporter, supporters and targets work together to make meaning of the event through uncertainty reduction. This is typically only possible when a supporter first validates the subjective experience of the target, either in-the-moment or through previous interactions with the target. When potential supporters introduce additional uncertainty during the meaning-making process, it hampers the coping of the target. Targets engage in a number of practices to ensure that they have ready access to potential supporters, such as cultivating relevant relationships before a racist experience occurs. From these findings, we demonstrate design opportunities for researchers and designers who wish to create solutions that facilitate coping through support-seeking following racist experiences.

This work has implications beyond the context of Western racial minority groups. Prejudice and discrimination are experienced along a wide range of facets of identity. For example, previous work on microaggressions explores gender, racial-ethnic identity, and sexual orientation. Our work examines how people from racially marginalized groups successfully cope with experiences of racist oppression in an effort to uncover opportunities and challenges in amplifying and supporting those practices at scale, but we believe that this approach can be extended to other marginalized populations as well.

We envision a future where sociotechnical systems promote the safety and empowerment of people from marginalized groups in fighting against their experiences with prejudice and marginalization by sharing, communicating, and supporting each other. This work is intended to provide a foundation for other members of the CSCW community to respond to this challenge and contribute to a growing body of theoretical, empirical, and technical work that helps bring that future closer to reality.

## Chapter 5: Proposed Work - Awareness of Uncertainty

People deal with experiences of racism on a wide spectrum on a near daily basis in the United States. In chapter 4, I described findings showing that overwhelming uncertainty motivates social support-seeking behavior following racist experiences. A long-term goal of this research is to build tools and interventions that can help people in reducing their uncertainty through social or other means. The subject of my proposed work is the necessary next step in understanding how people experience the uncertainty that comes with racist experiences before intervening in that space.

Uncertainty as a motivator aligns with previous literature that indicates that targets of discrimination such as microaggressions desire validation of their lived experiences (Sue, 2010). Other prior work indicates that experiences linger longer on the mind when they are ambiguous. For example, following ambiguously negative experiences, people were shown to have disliked the ambiguous event more and for longer compared to an overtly negative experience (Gilbert et al., 2004). Finally, we also know that overwhelming uncertainty - negative emotions surrounding uncertainty - can be incapacitating. When people feel that they lack the ability to resolve or reduce their uncertainty, they may feel defeated and stymied.

While we understand that the emotional experience of uncertainty is a critical component of motivating coping through social means, we know little about a person's awareness of their uncertainty. Are people correctly attributing anxiety to uncertainty? What is the impact of becoming newly aware of uncertainty? When it comes to experiences with racism, what is an acceptable level of uncertainty? How aware are people of their own uncertainty in the moment as well as following a racist experience? And how does awareness of uncertainty impact the decision to actively seek support or engage in other coping mechanisms? We focus on the following research questions:

RQ1. Are people aware that they are uncertain when it comes to racism?

RQ1.1 Do they recognize the specific source of their uncertainty?



RQ1.2 What do they think if they don't think it's uncertainty?

RQ1.3 What happens when you increase someone's awareness of their uncertainty about a particular experience of racism?

RQ2. What kinds of design can promote and empower uncertainty reduction forms of coping following racism?

To test RQ1, we will conduct a vignette study as described by Freedman et al., 2018 to allow participants to make iterative decisions. We will use Twine, an interactive narrative program, to write vignettes about racial microaggressions. Participants will read the story and at different points throughout the narrative be allowed to make choices about what the main character does, says, or thinks. Some choices may be solely narrative choices (e.g., what food does Mei eat for breakfast), while others will be specifically targeted at measuring the participant's uncertainty surrounding the experiences in the story (e.g., how does Mei feel after that experience?). Some choices will be embedded directly within the story, while others will ask for reflection on the narrative. A sample excerpt of what vignette text might look like is included in Table 1. Given that racism and racial microaggressions follow different patterns and norms for people from different racial/ethnic identities, I will write several vignettes and will ask participants to self-identify their racial/ethnic identity to match vignettes to participants with similar backgrounds.

*During her second week, Mei's supervisor, Professor Holmes, invites her and the other new research assistants Roger, Miguel, and Ava out to lunch with the lab so he can check-in with everyone and get to know them. Everyone around the table eventually starts talking about their hometowns.*

*Holmes asks, "Mei, where are you from?"*

*"I'm from the Bay Area out in California."*

*"Oh no, but where were you born?" he asks, smiling.*

*"Oh, umm, I think San Jose" she laughs nervously.*

*[Choice 1] Remain silent.*

*[Choice 2] Ask where the professor is from.*

*[Choice 3] Change the subject.*

*[Question 1] What emotion do you think Mei is feeling the most in this moment?*

*Joy, Anger, Anxiety, Fear, Disgust, Apathy, Confusion*

**Table 5.1.** An excerpt of a vignette. The participant selects one of three choices for Mei's response to being asked where she was born.

Following the interactive vignette, participants will be asked an additional series of questions about the experience, focused on both their own interpretation of events in the vignette, as well as their perspective on how the main character interpreted the events. The post-vignette survey will target the following questions:

1. Do participants feel uncertain about the experiences of the character?
2. Do participants feel that the main character is uncertain about their experience?
3. If participants demonstrate uncertainty (either for themselves or the character), do they also demonstrate awareness of that uncertainty? (e.g., are feelings of anxiety, stress, etc. attributed to feelings of uncertainty about the experience?)
4. If participants demonstrate uncertainty, are they more or less likely to endorse support-seeking behaviors?
5. How much does the participant see themselves in the character? (e.g., have they had similar experiences?)

The second half of the study will use participatory design activities in order to answer RQ2 - how can we design to empower support-seeking and/or uncertainty reduction forms of coping. The first goal of the sessions will be to understand how stakeholders who are the targets of racism envision technology as useful tools in their coping process. The second goal is to co-design tools with stakeholders.

First we will utilize the immediately preceding experiences with the vignettes to provide some grounding and priming for the design portion of the session. We will ask participants to reflect on the experiences in the vignettes as well as their own experiences with racism and racist microaggressions. We will then present three design probe artifacts. These artifacts will all be aimed at promoting social support seeking following racist experiences (e.g., lowering the barrier to seeking support, surfacing uncertainty after an experience, providing safe digital spaces to seek support, etc.). They may take the form of digital systems online (e.g., website forum) or more physical digital artifacts (e.g., wearable technology). Reflecting on both sets of experiences we will ask participants first how the character might use the artifact. Second we will ask them how they might use the artifact.

The first part of my proposed work involves the iterative design of these artifacts. While the ideas and designs have not been finalized, I have included a sample description of an artifact in Table 5.2 to provide some context for the work.

*"A target could, for example, wear a smartwatch that tracked and provided feedback when physiological data signalled moments of high distress and ask wearers, "did that seem racist?" (or perhaps an even less obvious icon with a simple yes or no to avoid a perpetrator viewing the text). Tapping yes could automatically send a notification to a pre-generated list of trusted people. The wearable could be unobtrusive enough that it could be tapped during the racist encounter itself, and by communicating with a list of trusted people lower the burden of reaching out to a large group individually. Supporters could even tap in that they are available for support, signalling to others that the situation is, at least temporarily, handled. Both of these things would make social support more timely." (To et al., under review)*

**Table 5.2.** A description of a wearable device that the target of a racial microaggression can use to seek social support.

While some levels of uncertainty are ‘acceptable’ and can be lived with, we know that overwhelming uncertainty can stifle action and breed anxiety, burdens to cognitive load, and a number of other emotional and psychological impacts. It is also likely that every individual has personally and contextually different tolerances for uncertainty. This work aims to reach people

who feel overwhelming uncertainty following racist experiences in order to empower their uncertainty reduction processes.

This work will generate several contributions. First, we will be adapting interactive vignettes as described in Freedman et al., 2018 to study racial microaggressions. This methodological contribution may be of use to other researchers who wish to study perceptions of and experiences of racism. Second, this work will contribute an understanding of the impact of uncertainty awareness. While it is known that uncertainty is a motivator for support-seeking and coping with racism, it is not yet known whether interventions to support coping should directly confront people with their uncertainty or how to direct that conversation in design. Finally, this work will present several prototyped design probes for encouraging uncertainty reduction and coping with racism, co-designed with stakeholders who experience racism.

## Chapter 6: Timeline of Proposed Work

I anticipate completing initial design work by the end of Summer 2019 and will run my final study in Fall 2019. Writing will begin concurrently in Fall 2019, with a goal of defending my thesis by the end of Spring 2020. A more detailed list of activities is below in Table 6.1,

Semester	Research Activities
Summer 2019	<ul style="list-style-type: none"> <li>- Iteratively design and prototype three design probes</li> <li>- Iteratively write and test four racial microaggression vignettes</li> <li>- Complete materials for vignette and participatory design final study</li> <li>- Run pilot tests of final study</li> </ul>
Fall 2019	<ul style="list-style-type: none"> <li>- Run final vignette and participatory design study</li> <li>- Begin preliminary analysis of study</li> <li>- Begin dissertation writing</li> </ul>
Spring 2020	<ul style="list-style-type: none"> <li>- Finish study analysis and write paper</li> <li>- Complete dissertation and defend</li> </ul>

**Table 6.1** Detailed list of research activities for each semester of the 2019-2020 academic year.

## Chapter 7: Glossary & References

### 7.1 Glossary of Terms

To be completed as a part of my final dissertation work.

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