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Introduction

Police brutality—including the incidents that mobilized collective outrage and action across the world during the summer of 2020—has negatively impacted the psychological health of Black youth for generations. Police harassment is a persistent form of racial discrimination that Black youth frequently navigate (Brunson, 2007), and particularly as a consequence of vicarious trauma via social media, it has been associated with depressive and anxious sequelae (e.g., Tynes et al., 2019). While Black youth are faced with policing experiences *in vivo* and *in vitro*, many studies of the psychological impact of policing are contained within traditional retrospective surveys, which limits our understanding of youth's in-the-moment perceptions and desired concurrent actions. To expand the efforts to assess and redress youth's experiences with police encounters, this manuscript details the development of an after-school program that supports adolescents in the creation of a series of video game and virtual reality (VR) narratives. A participatory design method was utilized to co-create the perception of policing experiences with Detroit high school students enrolled in a computer science course, allowing them to actualize their experiences “on screen” and work towards redressing these experiences through co-construction and virtual activism.

The Psychological Impact of Racism on Adolescents

Racism—defined as a socially structured action based on race that is unfair or unjustified and harms individuals and groups (National Institute of Health, 2021)—has very broad-reaching outcomes for Black youth's mental health and wellness (Gee & Ford, 2011; Jones & Neblett Jr., 2019; Pachter & Coll, 2009). Black youth experience racial discrimination, or the behavioral expression of racism, at a rate significantly higher than that of any other racial group in the United States (Pachter & Coll, 2009). Over 90 percent of Black youth as young as eight years

of age report facing or witnessing racial discrimination across varying ecological contexts. These include virtual spaces like mass and social media (Tynes et al., 2019), and academic environments racial discrimination decrease in academic performance and interest (Neblett et al., 2006). As a result, experiences of racial discrimination contribute, contributing to “perceptions of powerlessness, inequality, and injustice” (Sanders-Phillips et al., 2009), and more severe psychological problems such as depression and anxiety (Clark et al., 1999; Tynes et al., 2008). These problems are exacerbated following exposure to instances of police brutality (Hawkins, 2021), so much so that the American Medical Association (AMA) and a working group, Pediatricians Against Racism and Trauma (PART), have declared police brutality as a health issue with suggested polices for change (Ehrenfeld & Harris, 2020; Dreyer et al., 2020). Further, research found youth directly and/or indirectly exposed to police brutality such that youth can experience a constant fear of dying, a state of hyper-alertness, and a lack of adequate coping mechanisms (Hawkins, 2021).

Policing as a Unique Racial Stressor for Adolescents

Black adults and children are more likely to experience depressive (Bor et al., 2018), anxious (Sussex Publishers, n.d; Tynes et al., 2019), and traumatic symptoms (Sussex Publishers, n.d.; Tynes et al., 2019) in response to police presence or practices. Descriptive studies indicate that depression and post-traumatic stress disorder are highest among Black Americans living in communities where high rates of police brutality against them have occurred (Bor et al., 2018). This distress is not unwarranted: Black Americans are nearly three times more likely than white Americans to be killed by the police, and the victims are unarmed in nearly half the cases (Edwards et al., 2019). Furthermore, Black youth are six times more likely to be killed by police relative to their white peers (Badolato et al., 2020). In youth undergoing the developmental period of adolescence, in which youth learn to interpret, appraise, and respond to race and racism in their society (Helms, 2003), this blatant disparity has clear connections to a sense of self and wellness and to the formation of beliefs about law enforcement (Outland, 2021). In the past decade alone, Black youth killed by police, including Ma’Khia Bryant, Tamir Rice, Aiyana Stanley Jones, Michael Brown, and Laquan McDonald—to name but a few—are often depicted in dehumanizing ways after their death, creating a feedback loop for youth seeking to understand how they are perceived by authority figures and society writ large (Smith Lee & Robinson, 2019).

Although the history of policing in the United States is rife with racial terror since its inception (Chaney & Robertson, 2013), the more contemporary practice of recounting the horror via recording, particularly at the hands of everyday citizens, is relatively new. Vicarious effects of this injustice for Black people include increased perceptions of systemic awareness and victimization, a lower degree of trust in social institutions, and activation of prior traumas (Bor et al., 2018). For adolescents, the greatest negative mental health impact of police brutality exposure occurs one to two months after the event (Tynes et al., 2019). The increased frequency, severity, and delay of impact for Black youth suggests that they may uniquely need an avenue to process and cope with vicarious experiences of police brutality over time, especially as they may continue to re-experience the visual imagery without an outlet for their emotions (Staggers-Hakim, 2016).

Coping with Racial Stress

Racial discrimination differentially impacts the way that Black youth cope with racial stress (Franklin-Jackson & Carter, 2007), contributing to disproportionate avoidant coping strategies (e.g., keeping emotions inside) and “maladaptive” coping behaviors (e.g., outwardly expressing emotions that are counterproductive or harmful to oneself or others) (Scott & House, 2005). And, while approach-oriented coping (e.g., addressing a perpetrator) may yield more favorable outcomes than avoidant-oriented coping in some instances (Scott Jr. & House, 2005), it is not wholly possible for Black youth to deploy this coping strategy in every discriminatory racial encounter, particularly when they are faced with the fear or threat of death (Scott, 2003). Although the vast majority of stress research is embedded within a stress and coping framework, culturally and justice-centered approaches to coping, including healing and emancipation, are emerging as ways to radically challenge oppression in the lives of Black youth (Ginwright, 2018; Grills et al., 2016; Mosley et al., 2020). Having a virtual safe space to develop, practice, or imagine coping behaviors that Black youth would like to deploy may reduce the very real danger that may be present for them in their everyday lives (Jerdan et al., 2018; Villani et al., 2006).

Utilizing Virtual Reality Cope with Racial Stress

The best current estimate of how youth cope with racial discrimination is based on interview and self-report data (Gaylord-Harden & Cunningham, 2009). However, existing approaches lack realism and do not account for the ability to learn from experience. In contrast 87 traditional, retrospective assessments of discriminatory encounters, VR may usher in a new paradigm for exploring coping behaviors in real time and in response to the growing forms of racial discrimination experienced or witnessed in online settings (Lewis et al., 2015; Tynes et al., 2019; English et al., 2020). This practice also supports theories regarding racial coping for Black youth: managing a racial stressor, reappraising it as less threatening, and acting towards one's desired actions are hypothesized to be psychologically beneficial for youth (Anderson & Stevenson, 2019). VR can help to generalize skills that are learned through the simulating social interaction and communication scenarios to the real world (Kozlov & Johansen, 2010; Romei & Ruggieri, 2014). Additionally, digital technology and play can support positive identity formation in youth (Bers, 2012). In such a way, both the development of one's own narrative and the immersive experience of playing the game can support youth's self-efficacy, or coping beliefs, and agency, or coping behaviors, in addressing police encounters (Bandura, 2000; Rodríguez & Brown, 2009), particularly in concert with their developing racial identity throughout adolescence.

The aim of this study is to explore the co-creation of VR experiences for Black adolescents as a method of expressing personal narratives and practice racial coping in police encounters. The co-creation nature allows for Black adolescents' voices to be centered throughout the empirical process and provides direction as to how their innate coping processes can be enhanced and strengthened. Interactive systems such as games and VR enable players to modify their choices and behavior within the virtual environment, which consequently alters the direction and outcome of a narrative storyline. (Lewis et al., 2015). VR also facilitates experiences in which individuals can confront their preexisting conceptual beliefs through interpreted and enacted narrative (Cogburn et al., 2018). As such, interactive tools have great potential to help users gain confidence and practice in identity-related phenomena like discriminatory police encounters. Further, the ability to personalize stimuli in a VR platform helps to address heterogeneity in youth experiences, allowing programs to be flexibly adapted to each individual (Bell et al., 2020). This pilot sought to foster a safe and supportive environment for advancing Black adolescents' psychological wellness while reducing the detrimental consequences of personal or vicarious police encounters.

The VR & Games for Social Change Program

Pilot Overview

The primary aim of this project was to develop and pilot VR & Games for Social Change, a program comprising interactive workshops that provide Black youth with the opportunity to practice racial coping through the creation and use of VR games focused on police encounters. The research team established a partnership with a public school in Detroit, Michigan. Arising from the 1968 Safe Streets Act, STRESS (STop the Robberies, Enjoy Safe Streets) was created in 1971 with the aim of reducing crime. In practice, however, the unit exhibited unjustifiable discrepancies in treatment based on race: from arrest, to sentencing, to brutal or fatal altercations (see McCoy, 2021). More recent data suggests that Black youth and adolescents in Detroit are more vulnerable to firearm related injuries than their counterparts in other racial and ethnic groups (Borg et al., 2020). Additionally, pandemic-era research has documented that an increase in mental health issues and interpersonal tensions as well as a lack of community-centered mental health resources contributed to the rise of firearm violence and increased risk of entanglement with policing systems across the United States (De Biasi et al., 2022). Given this context, the specific school was selected because of its pedagogical focus in social justice as well as engineering principles for students in kindergarten through twelfth grade. After consultation with the school's principal, it was determined that ninth-grade students

enrolled in a computer science course whose participation would count towards course requirements would serve as the pilot cohort.

In March 2021, parents of the children in the class were notified of the opportunity to participate in the program, and four Black students (three girls and one boy, anonymized as Daisy, Shirley, Angela, and John) agreed to participate. The adolescents were all ninth graders between 13 and 15 years of age. While John and Shirley reported direct experiences with police-- namely microaggressions-- Daisy and Angela indicated they personally knew someone who experienced police brutality. All four adolescents were active in local sports teams, church groups, and other social networks. Additionally, all four adolescents had strong interests in video games and storytelling and regularly played a variety of video games as hobbies. Prior to the start of the program, all four students had minimal exposure to computer science or game theory concepts, outside the introductory course in which they were concurrently enrolled.

The adolescents attended one-and-a-half hour weekly workshops on Fridays after school over 11 weeks. Over the course of the program, youth learned fundamental design and prototyping techniques and applied these skills to create video game and VR systems that fit both their personal interests and told stories about their prior experiences with police. Due to restrictions on in-person interactions because of the COVID-19 pandemic, this program was delivered remotely using the Zoom video conferencing platform, with full IRB approval from the University of Michigan, parental consent, and assent obtained from the youth.

Program Development

The core curriculum was developed by two Black graduate students enrolled in information science and computer science doctoral programs at the University of Michigan and the Massachusetts Institute of Technology. The team supporting their efforts consisted of five graduate students who served as program facilitators, five undergraduate research assistants (RAs) who served as mentors to participating youth, and three principal investigators (PIs). Members of the research team had diverse social identities, identifying as Black, white, biracial, and Asian, various socioeconomic statuses, and different relationships with the city of Detroit (some were born and raised in the city, others grew up around the city, and some were not affiliated at all). The developers of the core curriculum initiated reflexivity sessions with the research team, during which the team members discussed their identities, relationships with the city of Detroit, and their positionalities within the research project. Collectively, there was acknowledgement that each team member had differing perspectives from the study participants—from racial identity to geographic location to socioeconomic status. Open discussions about these experiences allowed the research team to critically evaluate why they wanted to work with youth and participate in the project and what impact they hoped to have. It also allowed them to address biases and how these might influence existing power dynamics and how they could be curtailed in interactions.

The structure and content for VR & Games for Social Change utilized theoretical and practical approaches to formulate a co-constructed and youth-centered computational design strategy (Harrell, S.V. & Harrell, D.F, 2009; Goode & Margolis, 2011; MIT ICE Lab, 2017; Harrell et al., 2018). In particular, critical pedagogy theory (Freire, 1973), which emphasizes dialogue as “a pedagogical practice in which co-construction of meaning occurs when educators and students identify and engage hopeful vocabulary with the possibility of social empowerment” (Harrell et al., 2018, 2), and constructionism, which allows “student responses to drive lessons, shift instructional strategies, and alter content” (Kempf, 1996, 173), were adopted. Additionally, we drew from community-engaged research (Wright et al., 2020), which recognizes that youth are experts of their own lived experiences. It also empowers them to decide how they want to respond to discriminatory encounters (Lowrie & Tyrrell-Smith, 2017), allows the research team to facilitate trust with youth, and provides a more equitable and sustainable approach to responding to youth needs. Last, we drew on prefigurative design approaches, which prioritize civic goals and community approaches to design (Asad, 2019).

General Session Overview

Each session followed a general structure, including 1) Feelings Check-in (5 minutes): RAs conducted “temperature checks” with youth to gain insight into their mental and emotional states; 2) Curriculum Delivery (30

minutes): Facilitators delivered a 30-minute lesson on computing topics to the whole group, with the first lesson providing a brief introduction to serious games and VR technology; 3) Breakout Rooms (45 minutes): Youth were divided into Zoom breakout rooms with their assigned teams of two graduate students and two RAs. For the first session, teams used this time to learn more about one another and to talk about prior interactions with police in greater detail; 4) Wrapping Up (5 minutes): All groups convened in the main Zoom room to address any questions and discuss plans for the next session; 5) Program Facilitators and Research Assistants Debrief: Immediately following each workshop, program facilitators and RAs met to share observations concerning participants' comprehension of the content and to discuss ideas for best meeting each student's learning needs moving forward; 6) Follow-up with Youth: After each workshop, RAs also followed up with youth using Slack, a web-based communication app in which different conversations can be organized into different "channels." For example, program facilitators and RAs created a channel called #well-being-check-in to allow students to express how they felt on a given day. The primary purpose of these communications was to provide words of encouragement affirming students' contributions and learning achievements, additional online learning resources for students to explore and reminders for the next week's workshop.

Session 1

Table 1 provides an overview of the workshops included in the curriculum. During the first session, research assistants conducted remote 30-minute one-on-one semi-structured interviews with youth during the scheduled class. The purpose of these interviews was to assess their gaming skillsets, coping behaviors in response to racial discrimination and police encounters, and their existing social support systems related to coping with racial stress. Sample questions included "What are your thoughts on the instances of police brutality that have captured national headlines since summer 2020 and in the several years prior?" and "How do you feel during conversations about race or racism with your family?" These questions were developed over several brainstorming sessions among the research team members. This qualitative inquiry helped the research team understand the students' prior experiences with police brutality, orientation to virtual reality narrative building, and general fears and excitements about participating in the program. The research team discussed these findings to understand how they could create a holistic learning environment for the students throughout the course of the program.

Table 1

Content Curriculum Focus and Hands-On Activities for Weekly Workshops.

Session	Topic	Content Focus and Learning Activities
1	Program Introduction	1) Pre-assessment: Research assistants (RAs) conducted semi-structured interviews with participating Black youth, 2) Facilitators discussed program expectations with youth as a group, 3) Serious games and virtual reality (VR) were defined, (4) Zoom breakout rooms were used to facilitate introductions between participants and their RAs and begin discussing the topic of prior interactions with police
2	Video Games and VR for Social Impact	1) As a group, participants played through an existing interactive narrative video game system called Passage Home, 2) Participants were taught about the fundamental computational building blocks of video games and VR, 3) Participants were taught about the purpose of building prototypes to explore ideas, 4) Breakout rooms were used to allow participants to brainstorm think about existing computational media works (e.g., games, movies, television shows) related to racism from which they could draw inspiration for storytelling and game-making
3	Storyboarding and Paper Prototyping	1) Participants were provided with additional examples of VR experiences that focus on social issues, 2) Participants were taught about the brainstorming and design process for building videogames and VR, 3) Participants explored the concept of physical prototyping through Play-Doh, 4) Breakout rooms were used to support participants and to begin to develop storyboards related to police interactions
4	Digital Prototyping Part 1	1) Participants were taught about fundamental concepts related to creating user experience designs through digital prototypes (e.g., virtual environments, movement, selection, manipulation, avatars), 2) Breakout rooms were used to assess participants' project goals, to determine their needs for RA support to achieve them, and to begin drafting an end-to-end specification of the system prototype they intended to build with these resources

Session	Topic	Content Focus and Learning Activities
5	Digital Prototyping Part 2	1) Two tools for building digital video game and VR prototypes (CoSpaces and Mozilla Hubs) were demoed to participants as resources for their projects, 2) Breakout rooms were used to assess participants' project goals and their needs for RA support to achieve them
6-9	Project Development	Entire workshop was focused on supporting participants in project design and development
10	Final Project Presentations	1) PIs attended workshop and provided brief introductions about their backgrounds and the work of their respective labs to expose participants to future educational and disciplinary pathways related to the program focus, 2) Each student presented their project, with a description of their goals, design process, demos, and takeaways from the program, 3) Peer and program facilitator feedback was provided to each student, with emphasis on their project's strengths
11	Program Closing and Celebration	1) Program facilitators provided a summary of the overall content and milestones of the intervention, highlighting participants' achievements, 2) Participants and RAs shared about their personal reflections from participating in the program, 3) The remainder of the workshop was spent socializing and enjoying music and refreshments supplied by the program to the participants

Session 2

During the lesson, facilitators led youth through an interactive narrative video game and VR system called Passage Home to expose them to a relevant example of how games can be used as tools for telling stories about discriminatory racial encounters (Olson, 2019; Olson & Harrell, 2019). Passage Home simulates a discriminatory encounter between a high-achieving African American high school student and her English teacher, who projects the belief that Black students are incapable of producing high-quality work. Players take on the first-person perspective of the high school student and are asked to select different thought, dialogue, and body language options to indicate how they are appraising and would like to respond to the discriminatory encounter. Youth played Passage Home collaboratively in a group gameplay session led by a facilitator.

Sessions 3-5: Digital Photography

The following three weeks involved instruction centered on supporting Black youth in transforming their ideas from storyboard to physical prototype to digital prototype. RAs were equipped with discussion topics and questions to help participants explore the safe translation of their experiences into projects. Supplies included sticky notes, Play-Doh, graph paper, and plastic head-mounted displays that enabled mobile phones to support simple VR applications (Nebeling, 2019).

Sessions 6-9: Program Development

Youth began to apply the content learned from prior weeks to create their own video games. During their time in the breakout rooms, the project teams worked collaboratively on their projects. RAs were responsible for supporting student empowerment and leadership rather than being sources of authority—empowering students to apply new concepts in the context of their own experiences creates a more conducive learning environment, as opposed to a more didactic approach (Marshall & Harron, 2018). In mentoring the youth in this capacity, the facilitating team encouraged them to consider the larger impact or messaging of their games. Given the remote delivery of the program, our team decided to leverage CoSpaces, a 2D design platform with 3D virtual capabilities, to support the development of students' designs. CoSpaces is an interactive, narrative system that allows users to drag and drop assets into a predesigned interface to create their VR systems.

Session 10: Final Presentations

A final project showcase was held during the penultimate week of the program. Guest judges and youths' family and friends were formally invited to attend a virtual presentation of the students' projects. Students presented their project concepts, narratives, and prototypes with the audience and shared thoughts, feelings, and lessons learned

from having participated in the pilot. RAs and graduate student facilitators also provided words of affirmation and praise for students' successes based on their direct engagement and observations during the prior nine weeks.

Session 11: Program and Closing and Celebration

The first part of the final session was dedicated to completing semi-structured interviews with youth to solicit their input on the program. Sample questions included “What was it like building a videogame or VR experience about dealing with police? How did you deal with those feelings?” and “What was it like when we discussed racial discrimination during the program?” After these interviews were completed, a small, informal celebration was held via Zoom. Time and space for celebration and connection was intentionally prioritized to preserve the meaningful and mutually beneficial partnerships that were cultivated between youth and researchers during the program. Participants and the project team celebrated the workshop completion by eating snacks, playing party games, and verbally expressing gratitude related to individuals' program experiences.

Factors Influencing Program Design, Content, and Implementation

Standpoint epistemology “maintains that all knowledge is situated without forgoing the possibility of discerning among more and less objective claims: accounts of the world obtained from the situations of the oppressed may be said to be more objective than those obtained from the situations of the privileged” (Pohlhaus, 2002, 285). Applying this theory in practice, RAs were prompted to author 500-word positionality statements reflecting on who they were as a researchers and their connections to the student population as part of their initial onboarding. This prompt asked them to reflect on their experiences as high school students and how such experiences could inform their participation and work with students in the program. To support the training process, each RA was also asked to research, document, and present on a particular area or competency central to program delivery (e.g., historical and contemporary issues of policing in Detroit, trauma-informed approaches to working with and discussing racism with adolescents). This exercise encouraged a reflective process in which they were asked to consider their own lived experiences and relationships to these topics and issues, rather than acting as passive recipients of static training content and materials.

The program content, facilitation, and research were designed according to the situated response model. This is a model in which researchers' processes and methods are “specific to the culture, the problem, and the dynamics of the particular context” (Hermes, 1998, 166). By principle, this model instructs researchers to “be in the community as a member first and a researcher second” (Hermes, 1998, 166). The program was continuously adapted and modified based on feedback from stakeholders, including school leaders, graduate students, and RAs. Weekly memos were also sent out to the entire program leadership team, including school leaders and PIs, to ensure that this process of responsive adaptation was documented and that there was a continued channel for feedback.

Relatedly, the program utilized what Held (2006) calls an “ethics of care” through weekly “temperature checks,” which functioned as a tool for fostering connection by placing value on emotions and interdependent care. During most weeks of the program, students used emojis such as a thumbs up, a smiley face wearing sunglasses, a heart, or a grinning face to describe their emotions. During weeks six and seven of the program, however, all student responses featured new emotions: neutral, speechless, sad, and confused. During this time, Daunte Wright and Ma'Khia Bryant were fatally shot by police (The New York Times, 2021; Bogel-Burroughs 2021). The program placed value on emotional processing through dialogue with students and program staff, rather than content scheduled for the day. During this discussion, one student emotionally shared that the news of Bryant's death “hurt her heart,” remarking on her observation that “she was only one year older than me.” These events brought the program together through emotional processing and grounded the importance of the project with participants.

Youth Perspectives on the Pilot Program

During the first and last weeks of the program, RAs conducted semi-structured interviews to assess students' skill with VR game design, racial coping, and ability to engage in conversations about racism with their support networks. We treated the participants' experiences as real and true to them, while acknowledging the influence that the program environment may have had on how they recounted those experiences. Methodologically, we employed

thematic analysis to interpret our qualitative data. The authorship team first engaged in deep reading and open coding of the transcripts, keeping epistemological perspectives and individual positionalities in mind. We then applied template analytical methods to identify key themes from the qualitative interviews. First, open codes were discussed among team members and interview passages were organized into clusters based on relationships and emerging themes. Second, the themes and corresponding passages were presented to the participants as a means of member checking (Brooks et al., 2015). The three primary themes were: gaming and injustice, racial coping, and support systems.

VR and Game Use to Address Injustice

All four students believed that video games were good tools to teach about social injustice after completing the program. Daisy, a high school student in Detroit, signed up for the program following a teacher's recommendation. Daisy had some personal VR experience because her brother had a VR headset. When asked about personal experiences with racial discrimination and/or police, Daisy expressed never having any personal experiences with racial discrimination. Daisy's friends described their experiences with racial discrimination to her, including police altercations. Daisy's video game depicted a young Black woman experiencing racial discrimination at a convenience store (see fig. 1). She mentioned that "it [the video game] explains everything, but it lets you experience it so that you can see the problem for yourself." John, a high school student in Detroit, signed up for the program because he likes video games and wants to become a game designer. John had no specific experiences with VR before starting the program, but he considers himself skillful in drawing. Similarly, when asked about his personal experiences with racial discrimination and/or police, John could not recall a time when he was discriminated against because of his race. John created a video game about a young man who experiences police brutality while being pulled over (see fig. 2). He expressed that players of such games should be "mindful that this can really happen." Daisy's and John's responses reflect how digital play can factor into identity formation and exploration for youth, allowing them to make sense of themselves and the world they experience (Bers, 2012). They also highlight how video games can make the experiences of racism visible through realistic portrayals, and can allow participants to react to those experiences (Cogburn et al., 2018).

Figure 1 A Still Image of Daisy's Video Game Narrative



Figure 2 A Still Image of John's Videogame Narrative

Collective Action as a Means for Increased Racial Coping

At the start of the program, while discussing police brutality, a general theme of helplessness was observed among the four students regarding police brutality and racial discrimination writ large. When introducing topics of police brutality and the disproportionate impact it has on Black Americans, the researchers engaged the students in interactive discussions. Students expressed helplessness in different ways, indicating that they do not know how to talk about these issues with their friends and families and that they do not know how to prevent such situations for themselves. They discussed how they did not feel well equipped to cope with media narratives on police brutality as a result. After participating in the program, each student mentioned an action or idea they learned about to help cope with feeling helpless. Angela, a high school student in Detroit, became interested in the program from playing VR games at a local arcade. In contrast to the other participants, Angela recalled personal experiences with racial discrimination and police altercations. In fourth grade, she experienced unfair treatment from a white teacher, which brought up feelings of anger and unfairness. Also, Angela initially mentioned that hearing about her friend's interaction with the police made her self-conscious of her own racial identity. She stated,

I was scared. Because it's like, anytime of day, I can't go outside. It's like if you have a hoodie on, somebody just gonna think you're going to go rob a place or kill somebody. And they can kill or hurt you if they think that. And it's just really sad that that's what's going on in today's society...Like it's hard to be Black in today's society.

Angela depicted these feelings in the video game she created about a girl experiencing police brutality upon pulled over (see fig. 3) and said that creating her own video game and participating in the program allowed her to better appraise and describe her own feelings regarding police brutality. This also opened avenues for healthy communication and dialogue with trusted friends and family members as a means to cope and to realize that “we

have to use our voices for change for anything to happen.” Angela went on to say, “I used to think that sometimes us and other races were sometimes equal but now I don’t think that anymore...but for it to get better we will have to work together and use our voice so it can get better, and we can get better.” For Angela, creating and playing video games inspired collective action as a means to cope with racial stress and trauma.

Figure 3 A Still Image of Angela’s Video Game Narrative

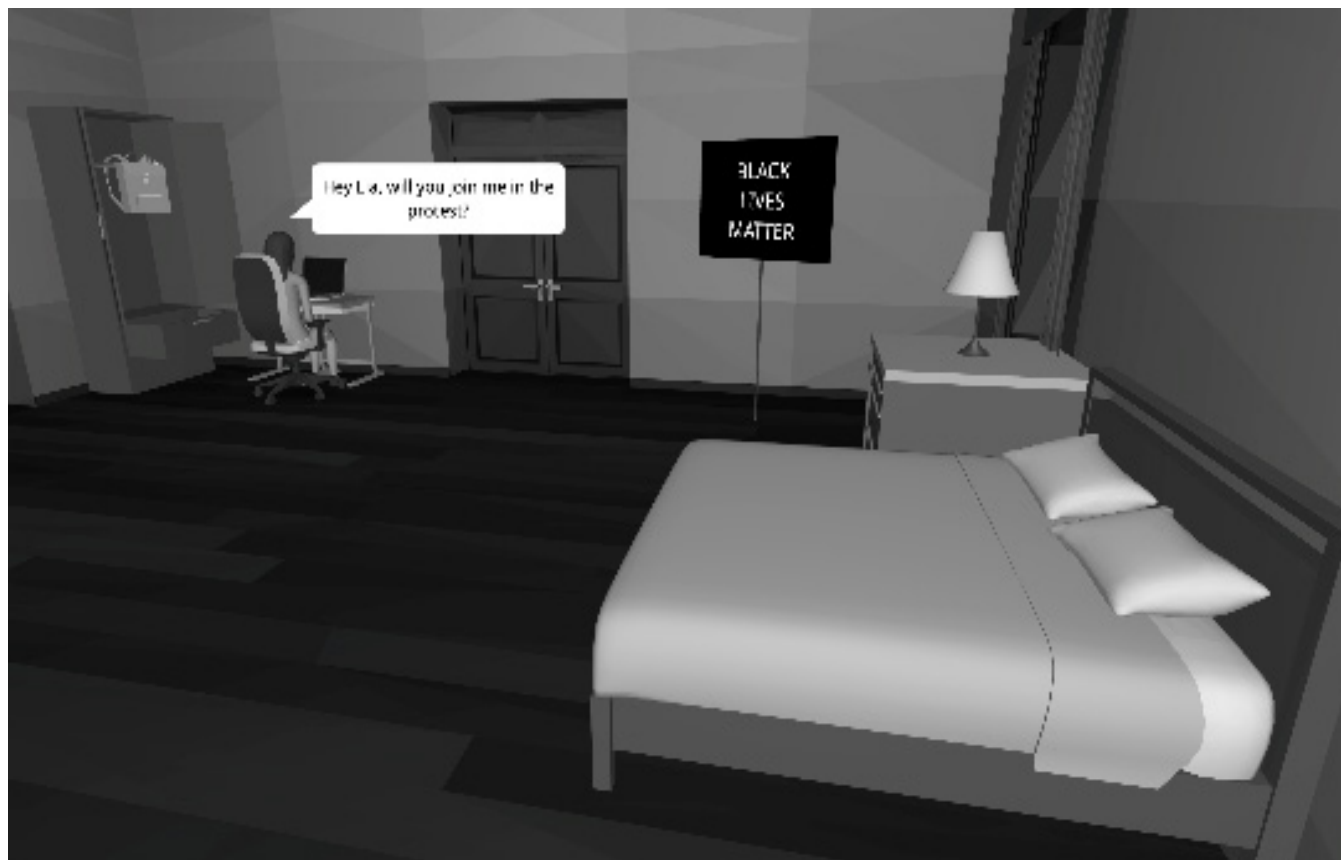


Shirley, a high school student in Detroit, came into the program with enthusiasm about games and specifically, games for social justice. Shirley had experience with the coding language C++, which made her feel prepared to participate in the program. Shirley articulated a familial experience with racial discrimination and police brutality specifically, her uncle, who was beaten by police until he became disabled. Shirley had similar insights to Angela. She initially expressed feeling helpless and acknowledged the persistence of racism as a stressor, noting that:

It’s like, I can’t really do anything to help because like, no matter what anybody does, there’s nothing you can do. And right now, I have a little brother. And so when he grows up, I actually have to worry about stuff like that [police brutality]. And it’s just very crazy that you have to worry about things like this.

At the end of the program, Shirley mentioned that “standing up for your rights and your voice makes a difference not only for you but for every Black person.” Shirley’s video game reflected a young girl using her voice at a Black Lives Matter protest and inspiring others to join her in her cause. (see fig. 4).

In addition to feeling supported by their families and communities, participants remarked how the emotional disclosures made by their peers impacted their relational experience. Angela mentioned that in 2020, conversations about race and racism with her family “happened a lot...especially during a protest time with George Floyd. Or whenever I feel like I’m being discriminated.” At the end of the program, Angela noted that making space for discussions about racial discrimination reaffirmed her belief that “we have to use our voices for some slight of change, or for anything to happen.” Daisy shared that she “really enjoyed hearing other people’s perspectives and emotions towards these different situations because it helped me also look at these situations in a different way and get a different take on it.”

Figure 4 A Still Image of Shirley's Video Game Narrative

Expanding Youth Support Systems

Given the sensitive topic of and participatory approach to the program, support was also provided by the close collaboration between program stakeholders, including students, school leaders, graduate students, RAs, and PIs. An ethic of care was leveraged to steer our programming, collaborations, and student engagement from the inception of our project. Both graduate team leads had extensive prior experience in developing and facilitating program with people in the students' age group, and industry VR gaming experience. RAs were undergraduates recruited because they met specific needs of the program. For example, RAs had prior experience and expertise with design, VR, curriculum facilitation, and diversity and inclusion programming. Each RA was assigned a role based on their skillset. These roles included, assistant, communications and storytelling assistant and student social well-being assistant. The team had weekly meetings to discuss student progress and needs and well-being and took a non-hierarchical approach to program delivery and facilitation as much as possible.

As indicated above, Daunte Wright and Ma'Khia Bryant were fatally shot by police in their communities. Our social well-being RA facilitated a processing discussion with poetry and music to acknowledge current events and the subsequent impact on the program's students. The technical RA facilitated technical support towards VR development and any technical questions the team and students had throughout the program. Lastly, the communications and storytelling RA facilitated outward communication to participants and their institutions each week for transparency and to cultivate our community during non-programming days. Also, this RA supported students in designing their VR narrative experience. The added obstacle of a remote program created opportunity for intentional organizational and project delivery grounded in care ethics. For example, we leveraged Slack as a communication tool between our students and team, creating channels for discovery, pop culture, funny memes, high-school- age opportunities, and discussions used well after the program finished. Additionally, the graduate leads provided letters of recommendation to students for programs that would expand their skillsets, keeping in mind that centering participant well-being included recognizing participants' potential and advocating on their behalf. Our approach to an ethics of care meant consistent and transparent

communication about team members' capacities to design roles, schedules, and programming that centered our participants' safety, abilities, and well-being.

Recommendations for and Challenges to Future Implementation

With respect to developing programs focused on policing, several recommendations are provided. Although the implementation of this program occurred in a less-than-desired remote setting, the enrolled youth were very active and made strides with their product and personal agency. For subsequent iterations, we would encourage working with youth in-person whenever it is safe to do so. We would also encourage a flexible approach to the program, allowing it to fluctuate in length depending on the external environment faced by youth. Our sample was limited because of the pandemic; however, we recommend at least 12 participants for saturation in qualitative analysis (Guest et al., 2006) or 20 for a one-group pilot for quantitative analysis (Sauro & Lewis, 2016).

Additionally, teams should prioritize an ethic of care as much as (if not more than) they prioritize the technical content itself. Fostering a restorative 466 environment and trust between stakeholders was essential to the program's relational cohesiveness. Police killings of Black youth and adults occurred multiple times during the 11-week program, and, given the widespread and insidious nature of police brutality in the United States, it is recommended to anticipate the need for space and time to discuss these issues within the program context. Additionally, maintaining small groups and individualized support allows practitioners to adapt to differences in students' progress, needs, and interests. Although increased agency was evident in the resolution of some narratives, such as inviting a friend to a protest within Shirley's narrative, Black youth may benefit from support developing coping strategies for race-related stressors in particular (Diemer et al., 2021; Hope et al., 2020), as racial stress and coping processes have been demonstrated to be unique for Black families (Anderson et al., 2020).

Finally, understanding the local and historical context of policing at the implementation site (e.g., focus groups, stakeholder interviews, empirical and historical research) should be an important consideration when working with youth. In light of the extensive history and presence of police harm in Detroit, implementing a community-focused, empowerment-centered that addressed local as well as national events allowed youth and their support systems to process lingering stressors and trauma (McCoy, 2021).

Challenges to this work are also important to consider. With the retelling of any narrative, retraumatizing may occur. In our transdisciplinary team, clinical supervisors were apprised weekly of youth wellness and could intervene personally or suggest a referral if distress was observed. Without intervention, youth experience heightened 488 distress from viewing this content on television or social media (Tynes et al., 2019); thus, providing an outlet for retelling and recasting youth's experience was of great importance. Also, the small sample size in one urban area limits our ability to discuss the generalizability of our work to other programs and locations. While local and historical variations are important to recall, the experience of stress from policing has been demonstrated with nationally representative samples (Bor et al., 2018). Therefore, other youth experiencing racial stress from policing may seek and benefit from a program like this when offered to them. Finally, the development of games about racial discrimination may be taxing on youth participants but provides unique opportunities for youth to feel empowered and control their own narratives.

Future Directions

Building off on the lessons learned from this proof-of-concept study, the research team is presently working on adapting the pilot program to fit a hybrid school schedule. Participant feedback as well as teacher and administration insights are supporting this adaptation process. After adapting the virtual program to suit a hybrid school structure, we will recruit a larger sample of students to participate in a pilot trial of the program. Through a pilot trial, we hope to further refine the programmatic components with additional data and qualitative feedback and optimize the program for a fully powered randomized controlled trial.

Conclusions

Black youth experience and perceive racism as a social stressor at increasing rates given multiple and more accessible viewing and correspondence platforms, racial uprisings and unrest due to police violence, and emboldened in-person actions. Thus, Black adolescents face a paradox: the same technology that can be a source of fighting against the devaluation of Black lives also makes them aware of fatal police force. Although VR & Games for Social Change cannot prevent Black youth from discrimination exposure, it can fortify the strengths Black adolescents have to resist and create their own “endings.” Supporting them through youth-focused programming is a crucial step toward challenging discrimination as a precipitant of inequality, as evidenced by the positive feedback students had for the school-based program. Incorporating youth-focused programming in school settings ensures institutional accountability and commitment to Black youths’ well-being, in addition to highlighting policies and practices at local and state levels. It is our hope that youth will have the skills to both depict and redirect their feelings and actions related to injustice to preserve their quality of life and protect their humanity to combat racism effectively.

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