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Exploring, understanding, then designing: twitter users' sharing behavior for minor safety incidents

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ABSTRACT

EXPLORING, UNDERSTANDING, THEN DESIGNING: TWITTER USERS' SHARING BEHAVIOR FOR MINOR SAFETY INCIDENTS

by
Mashael Yousef Almoqbel

Social media has become an integral part of human lives. Social media users resort to these platforms for various reasons. Users of these platforms spend a lot of time creating, reading, and sharing content, therefore, providing a wealth of available information for everyone to use. The research community has taken advantage of this and produced many publications that allow us to better understand human behavior. An important subject that is sometimes discussed and shared on social media is public safety. In the past, Twitter users have used the platform to share incidents, share information about incidents, victims and perpetrators, and used it to provide help in distressed locations after an attack or after a natural disaster. Public safety officials also used Twitter to disseminate information to maintain and improve safety and seek information from the crowds.

The previous focus of the research is mainly on significant public safety incidents; but, incidents with less severity matter too. The focus of this dissertation is on minor incidents and the aim is to understand what motivates social media users to share those incidents to maintain and increase public safety through design suggestions. This dissertation is comprised of three completed studies.

The first study attempts to understand motivations to share public safety incidents on social media under the collective action theory lens. Collective action theory assumes that rational people will not participate in a public good unless there is a special incentive or an external motivation for them. In this study, public safety is considered as the public good. This study tests people's willingness to share incidents on social media if: the victim is someone they know, if the location of

the incident is close, and if there is some coercion to influence users willingness to share. General support is found for the hypotheses and collective action theory. In the second study, the focus is on internal motivations that stem from being prosocial. An established scale that measures six different traits of prosocial behavior is used. It is hypothesizes that prosocial behavior is positively related to decisions to share incidents on social media. The study also tests other mediating variables, namely: following news outlets on Twitter, following public safety officials on social media, frequency of tweeting/retweeting. Partial support for prosocial tendencies effect on decisions to share is found. The study also discoveres that the three mediating variables (number of public safety official accounts followed, news exposure on social media, and tweet/retweet frequency) fully mediates the relationship and that they have a significant positive effect on decisions to share.

The third and final study complements the previous two and helps conclude the previous findings. A 2X2X2 online experiment design is conducted. The three manipulations are the availability of location information, platform authority availability, and availability of sender authority. The study hypothesizes that the three interventions will produce a significant positive relationship with decisions to share on Twitter. It is found that location information has no effect on sharing minor incidents on Twitter, however, participants are more likely to use a fictitious button that increases local exposure to minor public safety tweets. It is also found that the authority of the sender has a significant effect on decisions to share. On the other hand, platform authority does not show an effect on decisions to share public safety incidents on Twitter.

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EXPLORING, UNDERSTANDING, THEN DESIGNING: TWITTER USERS' SHARING BEHAVIOR FOR MINOR SAFETY INCIDENTS

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إلى أمي الحبيبة،
أتذكر عندما كنت اعود من المدرسة وأنت بملابس العمل تعلميني كتابة الحروف وتساعديني بحل الواجب. اتذكر مساعدتك لي في جميع مراحل التعليم حتى الجامعة. لم تنسيني من دعائك وتشجيعك لي. كنت ولا زلت الداعم الأول لي. حبيبتي أمي لولا الله ثم أنت لم احصل على درجة الدكتوراه.. أنت الدكتورة يا أمي ولست أنا.
أحبك كثير

والدي العزيز،
كنت تناديني دكتوره منذ صغري. وطول فترة دراستي الدكتوراه أيضا تناديني الدكتورة. الحمدلله على البلاغ والتمام. شكرا لدعمك لي وتشجيعك ووجودك في حياتنا.

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CHAPTER 1

INTRODUCTION

1.1 Background and Motivation

Public safety is a basic human need that researchers dedicate considerable effort to study, understand, and find ways to maintain and improve. Social media has demonstrated its value in crises circumstances and prior literature documented its large impact [81], [111]. Social media has been used to relieve victims of natural disasters [65], and aid in human-made crises [38].

In this dissertation, the primary motivation to pursue this line of research is that, although there is considerable research dedicated to public safety improvement, law enforcement is still trying to seek intelligence and to gather more information from the public about local events [20]. Therefore, signifying a need that still needs to be fulfilled by researchers. Moreover, it is essential to understand what motivates social media (in our case Twitter) users to share public safety incidents on the platform.

However, the previous efforts focused on incidents of large severity such as wildfires, bombings, and terrorist attacks[4], [88], [96]. In this research, we focus on incidents of minor severity that have low impact and a low number of people affected. Examples of minor incidents include pickpocketing, low value stolen items, suspicious persons, unsafe road conditions such as floods, etc.

In sum, this research is based on three main motivations:

1. Fulfill a need by law enforcement to harness the power of the crowd on social media.

2. Social media users have demonstrated their ability to contribute to public safety in cases of large incidents.

3. Fill a gap in research regarding motivations to share minor public safety incidents on Twitter.

1.2 Hypotheses

To understand and explore motivations to share incidents on Twitter, we generated several hypotheses that are based on prior literature findings. The proposed hypotheses are studied in two separate studies, and the last study is intended to explore further hypotheses built on the findings of the two prior studies. Those hypotheses shape the intent of this research and aim to serve as guides towards more understanding of our investigation. Below we list the hypotheses we explore in this dissertation.

Study one hypotheses:

- H1. Perceived physical location closeness of an incident is positively related to likeliness to share that safety incident on Twitter.
- H2. Perceived psychological location closeness of an incident (connectedness and importance) is positively related to likeliness to share public safety incidents on Twitter.
- H3. Perceived relationship (interpersonal) closeness will have a higher positive relation with likeliness to share public safety incidents on Twitter.
- H4. If incident location and relationship to victim are not perceived as close, Twitter users will only participate in public safety on Twitter if there is an incentive other than the public good, such as coercion.

Study two hypotheses:

- H5. The prosocial tendencies measure (PTM) is positively related to decisions to share information on minor public safety situations
- H5.1 Showing public tendencies, is positively related to decisions to share.
- H5.2 Showing emotional tendencies, is positively related to decisions to share.
- H5.3 Showing dire tendencies, is positively related to decisions to share.
- H5.4 Showing anonymous tendencies, is negatively related to decisions to share.
- H5.5 Showing altruism tendencies, is positively related to decisions to share.

- H5.6 Showing compliant tendencies, is positively related to decisions to share.

- H6 General patterns of Twitter use will mediate the relationship between PTM and sharing minor public safety incidents on Twitter.

- H6.1 Following public safety government officials on social media is positively related to sharing minor public safety incidents on Twitter and mediates the relationship between prosocial tendencies and the likelihood to share incidents on social media.

- H6.2 Higher news exposure on Twitter is positively related to sharing minor public safety incidents on Twitter and mediates the relationship between prosocial tendencies and the likelihood to share incidents on social media.

- H6.3 Higher general engagement with Twitter (through retweeting) will be positively related to sharing minor public safety incidents on Twitter and mediates the relationship between prosocial tendencies and the likelihood to share incidents on social media.

  Study three hypotheses:

- H7. Twitter users who are exposed to location information will be more likely to share incidents on Twitter than people who are not exposed to location information.

- H7.1. When Twitter users decide to share minor incidents on Twitter, they will more likely share using the 'Shield button', which allows for increased local exposure, than the regular Twitter retweet button.

- H8. Twitter users who are exposed to minor public safety incidents shared by officials on Twitter will be more likely to share those incidents than people who are exposed to minor public safety incidents shared by normal users on Twitter.

- H9. Twitter users who are exposed to platform authority will be more likely to share incidents on Twitter than people who are not exposed to platform authority.

1.3 Approach

In this dissertation, we follow a multi-staged research agenda where we design the next study based on the results of the prior one. We use Twitter as a platform to study because of the large number of available research in public safety that is conducted

on Twitter, and which we base our hypotheses upon. Also, a large percentage of Americans (the study's population) use Twitter for many reasons, and we would like to harness their power to improve public safety. We do not use other platforms such as Nextdoor because they are usually private, and it would be challenging to contact users who are part of a specific neighborhood unless we are part of that neighborhood. Also, any insight from such a small community would be very difficult to be generalized to other communities, even in the same platform. Therefore, we use Twitter as the primary platform for our study. However, in future work, we plan to conduct similar research on other platforms such as Facebook to see if findings would generalize to other popular platforms.

To understand Twitter users' motivations to share minor public safety incidents on the platform, we begin the first study by exploring external motivations to share incidents using an online survey. In the first study, we attempted to understand H1, H2, H3, and H4. We use the theory of collective action to explain the findings. Then, we designed the second study, which looked at internal motivations in the form of prosocial traits. The design of the study was also an online survey with an adult population. Based on prior research and the previous support from study one, we proposed hypotheses H5.1, H5.2, H5.3, H5.4, H5.5, H5.6, H6.1, H6.2, and H6.3. We learned that prosocial behavior and other proposed variables had a positive effect on decisions to share.

The previously run studies revealed an interesting insight into decisions to share incidents on Twitter. To further validate and test the findings, we conduct the last study to complement the previous studies and help conclude this thread of inquiry. For the last study, we conduct an online experiment study that tests four hypotheses: H7, H7.1, H8, and H9. We pre-test the study's material using qualitative and quantitative approaches by showing participants the treatment materials and

asking them to reflect on the realness and believability of the content to be used. Then, we conduct an online experiment with a convenience sample.

1.4 Relevant Publications

This dissertation includes literature from previously published research.

1. M. Almoqbel, M. Alraihan, D. Y. Wohn. Understanding decisions to share minor public safety incidents on Twitter through a collective action theory lens. *International Journal of Social Media and Online Communities (IJSMOC)*,2021

2. M. Almoqbel, X. Wang, S. R. Hiltz, Do I care enough? Using a prosocial tendencies measure to understand Twitter users sharing behavior for minor public safety incidents. *Proceedings of the 53rd Hawaii International Conference on System Sciences*, 2020.

1.5 Dissertation Overview

This dissertation includes three completed studies. In the first chapter, we briefly introduce the aim and background of this work and provide the main hypotheses that guide this research. Chapter 2 discusses the relevant literature review in this field and upon which the hypotheses are based. Chapter 3 includes the first study conducted along with details about its methodology, results, and discussion. The first study explores motivations to share, such as the location of the incident, relationship with the victim, and coercion on decisions to share incidents on Twitter. Chapter 4 includes the follow-up study, which focuses on prosocial behavior and its effect on decisions to share minor incidents on Twitter. Chapter 5 includes the final study, a 2x2x2 experiment that looks into three types of manipulations based on prior findings to see if they affect decisions to share incidents. In the Appendix, we include supporting materials.

CHAPTER 2

LITERATURE REVIEW

Currently, almost everyone in all age groups is using social media [103]. The reasons behind the increased use of social media vary depending on the user's personality, age, and other characteristics [40]. In this section, we explore social media's role in crisis relief and discuss motivations to share content on social media. A more detailed literature review will be presented in the following chapters to provide more context for the specific studies.

2.1 Social Media's Role in Large Incidents

The available literature is abundant with research in the field of public safety and social media. In particular, more significant incidents such as terrorist attacks, bombings, and wildfires received more substantial attention from researchers due to their significant and catastrophic impact. Much research related to utilizing social media's users' power to help in the fight against large scale emergencies is based on the idea that the "public are under-utilized crisis responders; they are often first on the scene, vastly outnumber the emergency first responders and are creative and resourceful" [6]. For example, research by Tutun and colleagues [102], demonstrates a model to understand and predict the behaviors and activities of suicide bombers through network analysis, due to the complexity of terrorism activities. Another work by Tsugawa and Kito [101], focuses on predicting relationships among users on Twitter using the "retweet" function. Their approach is particularly helpful for detecting terrorist groups because terrorists often actively post, share, and retweet messages on social media to disseminate their ideas and attract potential followers online. The authors claim that the result of their analysis achieved higher performance than models based on the topology analysis alone [101].

Twitter, in particular, has been used to study cases of disasters e.g., [35] because its API allows drawing of a sample of public posts related to a topic and a region. Twitter members and emergency managers use it to get emergency updates [89], to receive information about disasters [53], and to know more about how their community is doing during those difficult times [10]. However, past research has focused on large scale disasters such as wildfires [98], bombings [97], floods [53], and terrorism [73]. We want to explore how social media is used in cases of minor public safety incidents that do not involve many people.

Due to the fact that our focus in this dissertation is on minor incidents, we do not intend to provide extensive literature review about large scale public safety incidents.

2.2 Social Media's Role in Crises Relief and After Crime Efforts

Social media users spend a lot of time reading and sharing content using their accounts, helping their societies, and improving the general welfare of the public through these acts. Social media and its users have proved their joint ability to help in cases of disasters. For example, in Haiti, a platform called Ushahidi was used to help relieve victims [65]. Another example is what happened in Mexico when residents helped with an oil spill by sharing pictures and locations of hurt animals on social media [65]. Social media also plays a significant role after disasters where it helps in bringing communities together, regaining coherence, and increasing urban resilience [14]. Social media was not only helpful during disasters, but also helpful in fighting crimes. For example, Facebook was used to help in the fight against crimes in South Africa [38]. Additionally, machine learning algorithms and classifiers used social media content that was generated from users to detect crimes and increase public safety [4], [63]. However, there is still research to be done in this area due to two main reasons. First, previous research has focused on victim reporting (which

involves reporting from the person who suffered from the attack), while overlooking witness crime reporting (which extends to any person who saw, heard, or generally witnessed an act of crime) [42], [64] . Reading posts online about public safety is part of witnessing a crime. Thus, research on increasing reporting through sharing on social media would help bridge the gap in the literature. Second, public safety organizations are still looking into leveraging social media to obtain information from the public [66]. Police departments share incident information on social media to seek information and collaboration from the public [20], [66], which requires the public to collaborate and share what they know through social media or other means. Thus, understanding motivations to share incidents on social media is vital to fulfill the need by public safety officials and to maintain overall public safety for communities.

2.3 Motivations for Sharing

Motivations to share on Twitter have been studied previously [1], [58], for example, through looking at 'intrinsic' and 'extrinsic' motivations [83]. Another study looked at data from an eastern (Korea) and a western (U.S.) country to understand motivations for sharing marketing information on Facebook [59]. In terms of public safety, prior research looked at three different motivations for reporting incidents on campus [41]. Moreover, research that looked at motivations to share disaster-related information on Twitter found that users share those tweets because they wish to provide current and updated information to their community, they desire to share what they believe as important information, they want to engage with their community, and they base their sharing decisions on their feelings about the tweet [71]. Thus, the general act of sharing on social media, whether reposting, retweeting, or typing the content, has been frequently investigated. Although decisions to share based on the level of crime severity ranging from high to low was investigated in prior work [41], to the best of

our knowledge, there is no previous research that looked into motivations to share information related to minor public safety incidents on social media.

Although much research describes the benefits of sharing incidents and public safety-related information on social media, the cons of sharing such information are yet to be explored. Flooding social media with public safety incidents might spark public fears, which is opposite to what we aim to accomplish through this investigation. Misinformation is a possible side effect of increased sharing of public safety related information, which could lead to unfavorable outcomes. A case in point is, although social media helped identify the criminals responsible for the Boston Marathon bombings, an innocent civilian was targeted and suspected for the attack [86]. Moreover, privacy issues should be considered when sharing incident information on public platforms such as Twitter. Although we believe the positive side of sharing incidents to identify suspects and increase awareness outweigh the possible side effects, we do acknowledge that the cons of sharing incidents on social media are not trivial and need to be considered when designing platforms to motivate and increase sharing.

2.4 Summary

Social media's profound role in responding to crises has been well researched. Social media shows its significant ability to positively help in the fight against crimes and in relieving victims. Motivations to share incidents of considerable severity have been studied. However, we found a gap in research concerning motivations to share minor incidents on social media. Therefore, we attempt to bridge this gap in research and explore motivations to share minor incidents on social media.

CHAPTER 3

PERCEIVED LOCATION AND RELATIONSHIP CLOSENESS, AND COERCION EFFECTS ON DECISIONS TO SHARE PUBLIC SAFETY INCIDENTS ON TWITTER THROUGH A COLLECTIVE ACTION THEORY LENS

3.1 Abstract

Social media feeds provide a lot of information that would be of great value to law enforcement to protect the public. Previous research dedicated considerable attention to sharing and communicating large-scale public safety incidents on social media. However, little to no research was found that focused on minor public safety incidents such as a suspicious person. According to collective action theory, rational people would not participate in a public good – even when everybody will benefit from it- unless there are external incentives and benefits other than the actual benefit from the public good. In this research, we use this theory to test public safety as our public good, and see if such incentives have an effect on people's decisions to share incidents on social media. In this research, we hypothesize a positive relationship between decisions to share and engage in public safety on social media and 1) incident location proximity, 2) relationship with the victim, and 3) coercion. Results show general support for the theory's assumptions.

3.2 Introduction

Social media users tend to use social media more often when there is a crisis. Some users tend to check online news outlets or official government accounts to have "live" updates about current emergencies. Twitter feeds contain abundant information about public safety issues that could play a large role in protecting the public. Some might share this news or inform others to ensure public safety. It was found that during disasters, the attention of Twitter users is focused on the crisis, which provides

a great opportunity for researchers and law enforcement to take advantage of [39]. Still, relatively less research has focused on minor public safety incidents and we know very little about the factors that affect users' intention to participate in the sharing of information related to these incidents.

This act of sharing is a form of collective action that is performed by crowds on social media. Attempting to understand this phenomenon under collective action theory would yield better understanding of motivations for such actions. Collective action theory posits that rational people will only participate in a public good if there is an incentive or if there is a form of coercion [74]. A public good is any general good that will benefit everyone, whether they participate in it or not. In this research, the public good that we assess is intentions to share public safety incidents on social media to improve overall public safety. Understanding motivations under this theory is vital due to the lack of studies that cover collective action in social media in the fields of human computer interaction (HCI) and computer-supported cooperative work (CSCW) [67].

One of the hypothesized incentives for sharing is perceived location closeness, which refers to the physical and/or psychological distance between the public safety incident and the user retweeting/sharing it. Researchers claim that Twitter users tend to retweet or tweet about an emergency event if it was close to their physical location [92]. Additionally, relationship closeness with the victim is another incentive. Social media users tend to communicate more with people they know or relate to during a crisis [82]. Yet, there is not enough literature covering perceived relationship closeness and its relation to social media users' likeliness to share. Lastly, according to the theory, coercion is assumed to be an outside impact like a government law or school rule that can affect one's likeliness to do something. Coercion is tested in this study with a hypothetical scenario of a rule or regulation by an authority to share public safety incidents. Coercion in the form of rules or regulations can be a significant

reason to influence Twitter users' likeliness to share. Also, in the literature, previous focus on public safety was on large scale incidents and disasters, while in this research we focus on minor incidents. This research will try to cover this gap.

3.3 Background

3.3.1 Collective action theory and motivations to share

Twitter users tweet and share information on Twitter for many reasons. The motivation behind the decisions to retweet have been previously discussed in the literature [1], [58]. Harnessing the power of crowds is invaluable, and in the case of public safety, a single person's participation by either reporting or sharing public safety incidents makes a difference. The more Twitter users who make the decision to share public safety incidents, the more everyone will benefit from increased safety. Such work requires collective action of social media users which is facilitated through modern social media such as Twitter [67].

Most of our decisions to participate in social media can be explained by theories of social behavior. Collective action theory is one of the first, if not the only theory that extensively explains and delineates the motivations and expectations of groups of people to conduct collective action. It was developed by Olson in 1971 [74] and explains how people participate in providing a public good. A public good is a common goal for a group of people whether small or large and requires the contribution of individuals. Every participant will benefit from the public good whether they participate or not, which allows for the possibility of free-riding. An example of a public good is protecting the environment. The more people make 'green' decisions, the more everyone on earth will benefit from a clean environment, regardless of who contributed to protecting the environment.

In this work, the public good we attempt to study is public safety. It is obvious that the more people report or share a public incident, the more public safety would be

enhanced for many people. By sharing a tweet about public safety, a range of benefits are expected such as helping to catch the criminal, avoid dangerous locations, or just raise public safety awareness. Interestingly, according to collective action theory, rational individuals will not contribute to the public good unless they are coerced or there is a special interest or gain other than the public good that everyone else would receive [74]. Collective action is a very controversial theory, albeit famous and based on empirical studies [75], [76]. Thereupon, we attempt to test the constructs of this theory by investigating its relation with motivations to share public safety content on Twitter. We use two external incentives or gains to study: incident location closeness to the social media user, and relationship to the victim. Coercion is also tested under collective action theory.

3.3.2 Perceived location closeness

As previously stated, collective action theory is a theory that assumes that individuals only do good when there is an incentive for them to do so. In this research, we assume that location closeness is considered as an incentive for Twitter users to share public safety incidents. Incidents occurring in closer locations might affect residents' quality of living in these locations and overall welfare. Location closeness refers to how geographically close the public safety incident or natural disaster is to the ones tweeting/retweeting about it.

Twitter users nowadays use the platform as a source of news and disaster updates [89], [93]. For instance, during the Thailand flood in 2011, citizens resorted to Twitter for real-time information and updates more than traditional media. Notably, those who are affected by or close to a disaster check Twitter for updates more than others [35], [91]. Researchers also proved that social media users check these platforms to get updates about their community during crises [10], [56].

Social media is not only used for updates during emergencies, researchers argue that users tend to post or share an incident if it was in their geographic area [92]. During a disaster like Hurricane Sandy, more tweets/retweets originated from the affected location, while fewer tweets were tweeted from places far from the disaster [53], [87]. Therefore, more retweets will be tweeted from locals living on the ground of the crisis or the emergency. For example, when Typhoon Haiyan hit the Philippines in 2013, Twitter users residing in the country showed more activity on Twitter (tweeting and retweeting) than those outside the country [91], [98]. Also, researchers argue that being physically in the Philippines made Twitter users more knowledgeable about the situation which made them tweet and retweet more about it than Filipinos living outside the country [98]. That said, information about the emergency incident or disaster is more useful from those living it or affected by it [93]. It is also proven that users in the same geographic area tend to retweet each other's tweets at high levels during a disaster [52]. On the other hand, users who were not affected by the fire and who did not live in the same area, did not tweet at high levels about the incident compared to those who were affected by it [9], [98].

Twitter users do not necessarily share their location on their Twitter profile. Researchers argue that someone's location on Twitter can be determined by users' shared content [19], [22]. For example, Lee et al. [57], conducted an experiment on 50 Twitter users and asked them why would they retweet a stranger's tweet. Participants came up with many reasons and one of the main reasons was "content relevance" -that the event occurred in their local area. Moreover, Twitter users can share their geo-location when they want to warn others about a disaster or a crisis. For instance, users affected were tweeting their locations during the wildfire disaster that happened in Oklahoma 2009 [111]. Researchers found that users posted their geo-locations so others in the same area can be informed on where the fire is spreading or reaching [98], [111].

Local government authorities were found to actively tweet, and reply on Twitter to spread relief and awareness to people in cities involved in riots [78]. Local government officials also benefitted from the use of Twitter during the Boston marathon bombing that occurred in 2013 [16], [97]. Public officials on Twitter were requesting citizens living in the area of Boston to help locate/identify the suspect by asking them to send videos, pictures, or tips [97]. They also used Twitter to reassure citizens of Boston that everything was under control, and to spread love, and condolences to those who were affected [97].

In regards to perceived location closeness, researchers proved that people tend to share public safety incidents when it is near their location, because it might affect them or the ones they love [42]. Researchers also concluded that any message spread locally is taken more seriously by locals only, unless it is meant to be distributed outside the local area by government officials [97].

A common theme to the previous literature is the focus on large disasters like bombings, terrorist attacks and wildfires. In this research, we would like to explore if the findings still hold true when the scale of the incident is less severe, and only involves minor incidents. We hypothesize:

- H1 Perceived physical location closeness of an incident is positively related to likeliness to share that safety incident on Twitter.

Psychological location closeness The literature demonstrated the effect of 'geographical' location closeness on tendencies to share public safety issues on social media. Yet, little research was found that addresses 'psychological and emotional' location closeness and its effect on likeliness to share public safety or emergency incidents.

As mentioned earlier, social media helps people connect with each other and helps them ensure that friends and/or family are safe when there is an emergency. In

addition, researchers state that social media is mostly used to reconnect people with each other [110]. For example, social media can help someone research an old friend who is physically distant to connect with him/her. On the other hand, researchers claim that social media users feel psychologically distant from others when there is an actual physical distance between them [48], [100]. Researchers also concluded that psychological distance between social media users means that there will be a decrease in communication and a difficulty in sharing information with others [37], [94].

According to the Construal level theory by Trope [100], "Transcending the self in the here and now entails mental construal, and the farther removed an object is from direct experience, the higher (more abstract) the level of construal of that object." Researchers who applied this theory outlined psychological distance into four dimensions: spatial distance, temporal distance, social distance, and hypotheticality [61], [94]. For example, researchers who studied the Tianjin port explosion that happened in 2012, found that there is a decrease in social media usage when there is spatial distance, temporal distance and social distance while there is an increase of social media usage when there is hypotheticality of an incident [27]. The Construal level theory was useful to different social psychology researchers who applied the theory to understand and define the effects of digital communication on people's communication in teams, persuasion, and social media [49], [62], [113]. Lim et al. [62], based the Construal level theory on social media use. In their research, they suggest ways to decrease psychological distance in social media "by appropriately manipulating inhabited space and isomorph effects" [62]. Lim et al., [62], identify the importance of psychological distance in "enhancing social experience" among social media users. Howbeit, they claim that psychological distance is not popular in "human computer interaction and in social media literature" [62]. This is also true in the case of research as there is very little literature discussing psychological or emotional location closeness and its effect on social media users' decisions to share

public safety incidents. Thus, we aim to understand this relationship through two main variables: reported location closeness, and location importance.

- H2 Perceived psychological location closeness of an incident (connectedness and importance) is positively related to likeliness to share public safety incidents on Twitter.

3.3.3 Perceived relationship closeness

Not only is it common for social media users to actively share news in response to a disaster [34], [82], users also become part of a network that connects them to news affecting them or their followers, friends, and family [10], [56], [82]. Researchers also concluded that there is a social need to connect and bond with others during an emergency and as a result, Twitter users tend to increase their use of Twitter (tweeting and retweeting) to fulfill that need [68].

On a similar note, studies show that people of the same group contribute more to public good than strangers do [24], [51]. Also, users who have close relatives living in the disaster area tweet their relatives' addresses so others can send help or help find them [89]. Additionally, researchers found that "social ties" increase user's motivation to share information online [47]. Though, there is a gap in research regarding relationship closeness to the victim and its relation to sharing and engaging in public safety incidents on social media. To fill this gap, we employed the relationship list from a Social Distance Scale by Emory S. Bogardus to investigate if sharing public safety incidents on Twitter is positively related to perceived relationship (interpersonal) closeness [11], [54]. In regard to collective action theory, we assume that relationship closeness is considered as a motive and an incentive that drives Twitter users to share or decide on sharing public safety incidents. We hypothesize:

- H3. Perceived relationship (interpersonal) closeness will have a higher positive relation with likeliness to share public safety incidents on Twitter.

3.3.4 Coercion

Coercion can include a government regulation or a job/school requirement. It is concluded that people tend to follow orders or regulations from higher authorities such as the government or the police due to perceived legitimacy [44], [104], [106]. So, we would like to question the effect of regulations concerning public safety on likeliness to share public safety incidents. Would Internet users (Twitter users in this study) share and engage in public safety issues on social media under coercion? In regards to public good involvement, people are motivated to actively be part of public good when they are rewarded by authorities [108]. Studying the possible effect of coercion is important because researchers proved that people tend to "conditionally contribute" to public good, meaning that participation in public goods positively increases with the increase of people doing it [51], [107]. To understand the link between coercion and likeliness to share minor incidents on social media, we propose the following hypothesis based on collective action theory:

- H4. If incident location and relationship to victim are not perceived as close, Twitter users will only participate in public safety on Twitter if there is an incentive other than the public good, such as coercion.

3.4 Methodology

3.4.1 Sample

In this study, we used a mix of snowball method (N=60), and Mechanical Turk (N=193) to recruit participants. A total of 285 responses were collected in a period of one week, of which, 253 were found usable in this study (the remaining responses were not complete, therefore, could not be used in the study). The respondents reported gender of female (50%), male (49.5%), and other (0.5%). Participants reported the following race groups: American Indian or Alaska Native (1.9%), Asian (37.5%), Black (5.1%), Native Hawaiian/Other Pacific Islander (0.5%), White (49.5%), and

Table 3.1 Sample Demographics

Variable	**Details**	***M***	***SD***
Age	(18-24) =2 (25-34) =3 (35-44) =4 (45-54) =5 (55-64) =6 (65+) =7	*3.39*	*0.85*
Total years of education	Range: 2-26	*15.05*	*3.9*
How often use Twitter	Range: 1-7	*5.63*	*1.33*
How often tweet/retweet	Range: 1-7	*4.40*	*1.80*
Number of followers	Range: 0 - 8500	*290*	*690.52*
How often read news on Twitter	Range: 1-7	*5.04*	*1.52*
News outlets followed	Range: 0 - 180	*12.46*	*22.51*
Retweet news outlets in-line with political views	Range: 1-7	*4.39*	*1.83*
Retweet news outlets *not* in-line with political views	Range: 1-7	*3.44*	*1.85*

Other (5.6%). We also asked questions related to general Twitter usage and used a Likert-type scale ranging from one to seven, using the following categories: less than once every three months, once or twice every two months, about once or twice a month, about once or twice a week, a few times per week, about once or twice a day, several times a day. The rest of the demographic questions were free-form. Table 3.1 presents demographic information with means and standard deviations.

3.4.2 Procedure

The study was conducted after receiving approval from New Jersey Institute of Technology IRB committee. We used an online questionnaire through Survey Monkey and recruited through Mechanical Turk and snowball method, starting with personal contacts such as friends and Ph.D. students. Then, the researcher asked the seed sample to forward the message to their personal contacts who might be willing to participate. Participants from MTurk were Twitter users and had high work acceptance rates (meaning that previous surveys and work they have done for

researchers was deemed by other researchers as acceptable). Participants were asked about basic Twitter usage behavior and news consumption on Twitter. The dataset was analyzed using SPSS.

3.4.3 Measures

The dependent variables in this study are participants' likeliness to share a public safety incident on Twitter. Participants were given hypothetical scenarios to answer if they would share an incident in that particular scenario. The first set of scenarios was concerned with locations. Participants were asked about their likeliness to share minor public safety incidents in nine locations. The locations varied in distance proximity to participants, and so, allowing the researchers to test location effects, if any. An example of a hypothetical scenario is: (If you read about a public safety incident on Twitter such as a robbery or a minor assault, how likely would you share this incident on Twitter if the incident happened in *location*). The location variables are: likeliness to share if incident location is home (M=4.75, SD=2.08), likeliness to share if incident location is neighborhood (M=4.54, SD=2.15), likeliness to share if incident location is a park you visit (M=4.30, SD=2.09), likeliness to share if incident location is work (M=4.61, SD=2.14), likeliness to share if incident location is school (M=4.13, SD=2.22), likeliness to share if incident location is city (M=4.24, SD=2.10), likeliness to share if incident location is state (M=3.87, SD=2.06), likeliness to share if incident location is inside country (M=3.60, SD=2.08), and likeliness to share if incident location is outside country (M=3.05, SD=1.97).

The second set of hypothetical scenarios asked participants whether they would share incidents if they have/do not have a relationship with the victim. Based on the Social Distance Scale by Emory S. Bogardus, a list of relationships was used in the survey to test the effect of relationship closeness on likeliness to share public safety

matters. An example of a hypothetical scenario is: Imagine that your "person in a relationship with" was the victim of a robbery.

The variables are: likeliness to share if victim is a romantic partner (M=5.00, SD=2.10), likeliness to share if victim is a friend (M=4.99, SD=2.09), likeliness to share if victim is a coworker (M=4.68, SD=2.02), likeliness to share if victim is a neighbor (M=4.52, SD=2.06), likeliness to share if victim is someone you barely know (M=3.48, SD=2.00), likeliness to share if victim is a stranger outside neighborhood (M=3.07, SD=1.93), likeliness to share if victim is a stranger outside country (M=2.76, SD=1.97).

The third scenario looked at whether coercion would increase participants' willingness to share. Coercion in this case is tested with a hypothetical rule that is imposed by an authority such as a government or a school. The questions looked like the following:

- *Assume that your job/school/government instate a requirement that you participate in providing public safety awareness and help increase public safety. Please answer the following questions:* Keeping the hypothetical regulation in mind, imagine that person was the victim of a robbery. How likely will you share this incident on Twitter to find the assaulter and/or raise awareness?

The dependent variables for coercion include: 'likeliness to share if victim is someone you barely know if there is a rule' (M=4.23, SD=1.95), 'likeliness to share if victim is a stranger outside neighborhood and if there is a rule' (M=4.01, SD=2.02), and 'likeliness to share if victim is a stranger outside country and if there is a rule' (M=3.61, SD=2.02). All dependent variables were tested using a 7-point Likert type scale ranging from 1=never to 7=very likely. It is worth mentioning that all participants saw the same scenarios and answered all questions.

3.4.4 Results

To answer our first set of hypotheses (H1 Perceived physical location closeness of an incident is positively related to likeliness to share that safety incident on Twitter, H2 Perceived psychological location closeness of an incident (connectedness and importance) is positively related to likeliness to share public safety incidents on Twitter), we ran linear regression models. For control variables, Twitter usage frequency was not found to have a relationship with likeliness to share. For example, regression models exploring what variables affect likeliness to share in home, neighborhood, work, park, and country found that Twitter usage frequency and retweeting/sharing frequency did not have an effect on likeliness to share. The remaining regression models looking at school, city, state, and outside country had weak positive relations between Twitter usage and likeliness to share in the said locations. News consumption on social media was not found to have a significant effect on likeliness to share. However, in two models (sharing an incident in a park and sharing an incident in a school), following news outlets had an inverse effect on likeliness to share. Sharing tweets from news outlets in-line with political views was found to positively influence likeliness to share incidents in relatively closer locations such as: home, neighborhood, park, work, school, city, and state. By contrast, sharing tweets from news outlets not in-line with political views was found to positively influence likeliness to share incidents in further locations such as: city, state, country, and outside country.

We ran nine regression models to compare the location closeness effect on likeliness to share minor public safety incidents. The first set of models (five models) are geographically closer to the participant, and thus, are grouped together in Table 3.2. The rest of the models (four models) that are geographically furthest from the participant are presented in Table 3.3.

The first model examines likeliness to share public safety incidents if they occur near the participants' home. The model was significant, explaining 24% of variance (adjusted R-squared= .20). F (10,205) =6.31, p<.001. The next model examines likeliness to share incidents when the location of a crime is their neighborhood. The model was significant, explaining 28% of variance (adjusted R-squared= .25). F (10,205) =8.10, p<.001. The third model looked at likeliness to share if the incident happened in a park they are familiar with. The model was significant, explaining 37% of variance (adjusted R-squared= .34). F (10,205) =12.10, p<.001. The fourth model looked at likeliness to share if location of an incident is their work. The model was significant, explaining 26% of variance (adjusted R-squared= .22). F (10,205) =7.14, p<.001. The fifth model examined likeliness to share if the incident occurred in the participants' school. The model was significant, explaining 49% of variance (adjusted R-squared= .46). F (10,205) =19.36, p<.001.

The models in Table 3.3, are testing locations further from participants. The first model examined likeliness to share if the crime occurred in their city. The model was significant explaining 42% of variance (adjusted R-squared= .40). F (10,205) =15.07, p<.001. The next model, tested likeliness to share if the incident location is their State. The model was significant explaining 44% of variance (adjusted R-squared= .41). F (10,205) =15.87, p<.001. The third model looked at likeliness to share if location of crime is inside their country. The model was significant, explaining 41% of variance (adjusted R-squared= .38). F (10,205) =14.36, p<.001. The last regression model looked at likeliness to share if an incident occurred outside participants' county. The model was significant, explaining 41% of variance (adjusted R-squared= .39). F (10,205) =14.44, p<.001.

To further test the difference between likeliness to share in each location, paired-samples t-test was conducted in SPSS to test location closeness of minor crimes to a participant, and their likeliness to share it on Twitter. The first pair 'Home

Table 3.2 Regression Models Testing the Relationship between Location and Likeliness to Share for Home, Neighborhood, Park, Work, and School

Variable	Model 1 Likeliness to share (Home)	Model 2 Likeliness to share (Neighborhood)	Model 3 Likeliness to share (Park)	Model 4 Likeliness to share (Work)	Model 5 Likeliness to share (School)
Gender	.08	.09	.06	.04	.11*
Education	-.02	-.08	-.07	-.03	-.02
Twitter use frequency	-.04	-.11	-.14	-.08	-.03
Tweet/retweet frequency	.05	.14	.09	.02	.16*
Read news on Twitter frequency	.06	.09	.10	.05	-.02
News outlets followed	-.10	-.11	-.16**	-.11	-.14**
Retweet from news outlet in-line with political views	.30**	.27**	.37***	.21*	.27***
Retweet from news outlet not in-line with political views	.04	.05	.00	.10	-.06
Location connectedness	-.01	.02	.07	.26**	.32***
Location importance	.21**	.21**	.23**	.08	.22**
R-squared	.24	.28	.37	.26	.49
Adjusted R-squared	.20	.25	.34	.22	.46

Table 3.3 Regression Models Testing the Relationship Between Location and Likeliness to Share for City, State, Country, and Outside Country

Variable	Model 1 Likeliness to share (City)	Model 2 Likeliness to share (State)	Model 3 Likeliness to share (Country)	Model 4 Likeliness share (Outsi Country)
Gender	.11*	.08	.14*	.04
Education	-.11*	-.07	-.08	-.10
Twitter use frequency	-.08	-.05	-.09	-.15*
Tweet/retweet frequency	.16*	.16*	.13	.13
Read news on Twitter frequency	.03	.07	.12	.12
News outlets followed	-.05	-.02	-.12*	-.04
Retweet from news outlet in-line with political views	.31***	.18*	.11	.02
Retweet from news outlet not in-line with political views	.17*	.22**	.27***	.23**
Location connectedness	.16*	.18*	.23**	.26**
Location importance	.07	.13	.08	.16
R-squared	.42	.44	.41	.41
Adjusted R-squared	.40	.41	.38	.39

vs. Neighborhood' had a Mean difference of 0.21, $p<.01$, $t\ (231) = 2.73$. In terms of difference directionality, the previous pair Home vs. Neighborhood meant that participants were more likely to share if the location was home, vs. neighborhood (the same applies to the remaining t-test comparisons). The second pair 'Neighborhood vs. Park' had a Mean difference of 0.25, $p<.05$, $t\ (231) = 2.52$. The third pair 'Park vs. Work' had a Mean difference of -0.31, $p<.01$, $t\ (231) = -3.05$. The fourth pair 'Work vs. School' had a Mean difference of 0.47, $p<.001$, $t\ (231) = 4.60$. The fifth pair 'School vs. City' had a low Mean difference of -0.11, $P>.1$, $t\ (231) =-1.05$. The sixth pair 'City vs. State' had a Mean difference of 0.37, $p<.001$, $t\ (231) =4.92$. The seventh pair 'State vs. Country' had a Mean difference of 0.27, $p<.001$, $t\ (231) = 3.64$. The last pair 'Country vs. Outside Country' had a Mean difference of 0.56, $p<.001$, $t\ (231) = 5.41$.

The results show a significant difference between means of likeliness to share based on location of incident. However, there was no significant difference between school and city regarding likeliness to share incidents.

Hypothesis two (Perceived relationship (interpersonal) closeness will have a higher positive relation with likeliness to share public safety incidents on Twitter), was tested using an established scale of relationship closeness by Bogardus [11]. Participants were asked about hypothetical situations, asking them how likely they will share a public safety incident if the victim was one out of seven predefined relationships [11], [54]. The hypothesis then was tested through comparing the means of likeliness to share based on relationship with the victim. Using SPSS, the authors used a paired-samples t-test to compare the sharing likeliness means. The test provides partial support for the hypothesis, providing that there was a significant difference between means of likeliness to share when the relationship of the victim is closer. One exception was the romantic partner and the friend, where the test was not able to find a significant difference between their means.

The first pair in the paired samples t-test was 'Romantic partner vs. Friend' which had a low Mean difference of 0.02, $P>.5$, $t(224)=0.2$. The second pair 'Friend vs. Coworker' had a Mean difference of 0.30, $p<.001$, $t\ (224) =3.75$. The third pair 'Coworker vs. Neighbor' had a Mean difference of 0.16, $p<.05$, $t\ (224) =2.27$. The fourth pair 'Neighbor vs. Someone barely know' had a Mean difference of 1.05, $p<.001$, $t\ (224) =8.45$. The fifth pair 'Someone barely know vs. Stranger outside neighborhood' had a Mean difference of 0.41, $p<.001$, $t\ (224) =5.18$. The last pair 'Stranger outside neighborhood vs. Stranger outside country' had a Mean difference of 0.31, $p<.001$, $t\ (224) =4.20$.

We also analyze hypothesis three (if incident location and relationship to victim are not perceived as close, Twitter users will only participate in public safety on Twitter if there is an incentive other than the public good, such as coercion).

According to collective action theory, people are not likely to participate in a public good if there is no incentive and/or coercion. To test for coercion, first, the authors wanted to eliminate any incentive for sharing, thus, only the furthest three relationships (Someone barely know, Stranger outside neighborhood, Stranger outside country) were used to test for coercion. Next, the authors asked participants about hypothetical scenarios involving these three hypothetical victims, where there is a rule from their government/school/or work that requires them to share a minor public incident on their social media account. The means from likeliness to share with the three victims with low relationship closeness (from H3), were compared with likeliness to share if there was a rule (i.e. coercion) from an authority. Hypothesis three was supported, with significant increases in likeliness to share if coercion existed. The first pair included 'Barely know vs. Coercion-Barely know' and had a Mean difference of -0.78, $p<.001$, $t\ (222) = -6.11$. The second pair 'Stranger outside neighbor vs. Coercion-Stranger outside neighbor' had a Mean difference of -0.95, $p<.001$, $t\ (222) = -7.48$. The last pair 'Stranger outside country vs. Coercion-Stranger outside country' had a Mean difference of -0.87, $p<.001$, $t\ (222) = -7.18$.

3.5 Discussion

Examining control variables in our models revealed interesting insights. General social media usage was found to have an effect on different behaviors [12]. Initially it was expected to see an effect of Twitter usage frequency on likeliness to share (since usage frequency is a form of Twitter usage), however, we found no such relation. One possible reason to explain this is the type of issue we are investigating. Public safety issues, even minor ones, are sensitive issues and usage frequency is not a strong enough indicator of possibility to share. It is interesting and reassuring to have that result because it also indicates that low Twitter usage does not affect likeliness to share incidents.

For news consumption on social media, we found no significant relationship between news consumption and likeliness to share minor incidents, which contradicts previous findings suggesting a positive relationship between following news outlets and sharing public safety incidents on social media [5]. The conflicting results might be due to the unrepresentative nature of the Mechanical Turk sample or the inherent bias of self-reported data. Further research is required to investigate the affect of news consumption -if any – on the decisions to share incidents on social media.

Sharing tweets from outlets in-line with one's views was found to positively predict likeliness to share minor public safety incidents in closer locations. People who are more trusting in outlets with similar political views, who exhibit more trust in like-minded sources, are more inclined to share incidents that occur in locations perceived as close to them. Sharing tweets from outlets not in-line with political views, on the other hand, positively predicts likeliness to share incidents further from home. People who are more open-minded, and who are open to other diverse opinions, showed more compassion for incidents in further places such as outside their country. We predict those people to be more altruistic, prosocial and caring about general safety for human beings, not just when they have an interest in the matter, which contradicts collective action theory.

H1 examined the effects of incident location and likeliness to share on social media. When looking at the mere geographic location proximity, we see partial support in the paired samples t-test. People are more likely to share minor public safety incidents if incidents are geographically closer to home. The finding is not surprising. It supports previous research looking at larger public safety issues and people's sharing behaviors depending on location proximity of the incident [87]. Thus, we conclude that incident location proximity has an effect on likeliness to share on social media regardless of the severity of the incident (large or small).

For H2 (Perceived psychological location closeness of an incident - connectedness and importance- is positively related to likeliness to share public safety incidents on Twitter), we used 'connectedness' which refers to how connected users feel to a certain location, and 'importance' which is how important users believe a certain location is to them. Both measures showed some effect on likeliness to share. Location importance played an important role in close locations such as home, neighborhood, park and school. Perceiving these locations as important, intuitively, and statistically, positively affects likeliness to share in those locations. To look at this from a practical perspective, reinforcing the importance of close locations, through tweets by local government officials, would increase people's tendency to share those incidents. Increasing the sense of importance is most valuable for close locations, where one can be closely impacted and benefited from raised awareness.

Feelings of connectedness towards a location was a positive predictor of sharing in further locations such as work, school, city, state, country, and outside country. Connectedness did not have an effect on closer locations such as home, neighborhood, and park, probably because their physical close distance and emotional feelings of importance are stronger predictors of sharing in those locations. It is also worth mentioning that those three close locations had the highest means for likeliness to share, compared to other locations.

Looking at connectedness, we believe the results found match our expectations. Sharing in further locations such as in a far state or in a different country and considering that we are only asking about minor safety incidents, would be surprising if we see a large number of people reporting sharing in those far locations with no clear reason. Therefore, reporting a sense of connectedness towards further locations, is a valid reason for caring enough to share minor incidents on social media in those locations. For example, connectedness could be seen as having a friend or a relative in the said location, or having worked, studied, or visited that location. Any of the said

possibilities would increase the psychological feeling of connectedness to a location, and thus, increase likeliness to share minor incidents. This is relevant because there are areas in the world where there are not a lot of people with the privilege of having an Internet connection. So, it is imperative for users in other fortunate areas to share public safety awareness, and care enough about further locations to share even minor incidents such as a suspicious person, or a lost phone. This should also be done using hashtags on Twitter to allow for more local users to be aware of the incident.

The previous findings suggest that not only geographic locations serve as incentives to participate in the public good of public safety; emotional feelings of location importance and connectedness also have an effect on likeliness to share. The results support collective action theory in the sense that having a personal gain (on top of the public good everyone receives, which is increased safety), increases the chances of participating in the public good.

Using the social distance scale, we can say that H3, the closer the relationship to the victim, the more likely a person would share that incident, is partially supported. Intuitively, people would care more about other people if they share a form of a relationship with them [51]. However, this is important because it supports collective action theory that people need an incentive to participate in the public good. Thus, harnessing the power of the crowd requires providing incentives for them. Showing personalized ads for social media users to draw a personal link between public safety and themselves, might increase their likeliness of engagement with the social media post. For example, reminding users that next time the victim could be a relative or a friend if the suspect is not found, might increase chances of sharing the post. Also, law enforcement could add hypothetical sentences to their ads when requesting information, such as, imagine it was your daughter who was involved in this situation. But, these recommendations need to be piloted and tested to see their effect on the long term.

Coercion hypothesis (H4) results are the most interesting. The statistics show that, when there is no special interest for users to share, they will significantly more likely share the incident if there is a form of coercion (measured in terms of a rule posed by an authority such as the government, school, or work). Having laws in place that clearly state that people need to be part of public safety and help improve it, is important. We deduce that having consequences for not reporting incidents would drastically improve the participation rates in social media. According to collective action theory, people would not pay their taxes if there were no strict rules from their governments to enforce this act that will result in a better life and service for everyone [74]. The same logic seems to apply here. Although we do not assume people would not help improve public safety out of an altruistic motive, but having a form of coercion seems to be working in this situation.

3.5.1 Limitations

As with any other study, this research carries limitations. The research is based on a survey and self-reported data is subject to errors. Our sample was comprised of snowball and MTurk users, although we found no difference between the samples, using a sample from one population is more representative. Finally, the results presented cannot be generalized to other social media platforms such as Instagram or Facebook.

3.5.2 Summary

In this research, we aimed to understand motivations to share and engage in minor public safety matters on social media. Using collective action theory, we assumed having special interests in an incident, would increase the likeliness for incident sharing on social media. Three motivations were tested: relationship to the victim, incident location proximity, and coercion. The hypotheses were supported, thus, supporting

collective action theory. Discussions for possible implications for the found results indicate possible practical solutions to improve participation.

CHAPTER 4

DO I CARE ENOUGH? USING A PROSOCIAL TENDENCIES MEASURE TO UNDERSTAND TWITTER USERS SHARING BEHAVIOR FOR MINOR PUBLIC SAFETY INCIDENTS

4.1 Abstract

Social media has been used to assist victims of crises, especially large-scale disasters. Research describes the importance of the crowd who are the first witnesses to any sort of crime or disaster. Among others, this research focuses on smaller scale public safety incidents such as suspicious activities, and minor robberies. We investigate whether prosocial tendencies affect Twitter users' decisions to share minor public safety incidents on Twitter. The scale used has six subscales including: public, anonymous, dire, emotional, compliant, and altruism. The data (N=363) was collected through Mechanical Turk using an online anonymous survey. Initial results showed a positive relationship between being prosocial and sharing public safety incidents on Twitter. However, once additional variables related to Twitter use were introduced (number of public safety official accounts followed, news exposure on social media, and tweet/retweet frequency), they fully mediated the relationship. Limitations and design implications are discussed.

4.2 Introduction

Social media prevalence is reshaping the world around us. The platforms are heavily used by users of different age groups to share news posts, funny jokes as well as personal and intimate details about their lives. In 2018, at least 73% of American adults used a form of social media [90].

Social media has been a great resource in fighting crimes and responding to natural disasters; it has been widely utilized by the public and emergency responders, and received considerable attention from research [81], [95], [111]. Social media has

been used to assist victims and reduce the severity of the aftermath of a public safety incident or natural disaster. For example, researchers have used topic modeling to understand people's perceptions on Twitter, right after a large public safety incident [26]. Researchers also [115] proposed a model using crowdsourcing to help in cases of public safety and to understand public attention during disasters.

The Pew Center reports that 24% of Americans used Twitter in 2018 [90]. Twitter in particular, received attention from researchers and has been used in public safety and disaster incidents. For example, researchers have used visual analytics of Twitter to help emergency responders in disasters [99], and to learn about terrorists and to help in the fight against them [50].

Though social media have demonstrated benefits in public safety situations, it is important to acknowledge that it is the humans using those platforms who decide whether or not to share relevant, accurate, and timely information when needed. Motivations to share posts, stories, information, or news articles on social media are relatively well studied in the literature. Research has studied the question of why people retweet [58]. In a more recent work [25], researchers developed a theory to understand motivations to voluntarily share content online in regard to different individual stages of motivations.

Many of our motivations related to social media use behavior are affected by psychological aspects of our personalities. For example, anonymity is thought to have an effect on decisions to share public safety incidents [41], although previous research was not able to find a direct influence of anonymity on reporting decisions [8]. Traits like altruism, for example, were found to highly affect people's tendency to share on social media [58]. The latter study also stated that the act of "retweeting" is a prosocial behavior. Thus, in this study we use a Prosocial Tendencies Measure (PTM) [18] to understand six different psychological traits and their effect on people's

tendency to share public safety tweets on Twitter. The scale includes subscales labelled altruism, compliant, emotional, public, anonymous, and dire.

Large scale disasters, terrorist bombings, and natural disasters have been well researched and well represented in the literature. However, through a thorough literature review done by the researchers, it was found that minor public safety incidents are lacking in research. Examples of minor public safety incidents include pick pocketing, low value stolen items, suspicious persons, unsafe road conditions such as floods, etc. In this research, we focus on small scale public safety incidents and try to understand how prosocial tendencies affect social media users in terms of sharing information related to such incidents. This would enhance the understanding of researchers and help bridge the gap found in the literature. Also, understanding users' motivations would help in designing social media to promote more involvement from users in cases of minor public safety incidents.

In the remainder of this research, a more detailed literature review includes description of the prosocial tendencies measure and hypotheses about its anticipated effects on sharing information about public safety issues on social media. Potential mediating variables are then introduced. Research methodology and analysis of results are followed by a discussion which presents a model for further testing, and includes design implications and limitations of the study.

4.3 Background

4.3.1 Prosocial tendencies measure

Prosocial behavior is defined as any voluntary act performed with the goal of benefiting another person [29]. It may be motivated by empathy, altruism, among others. Prosocial behavior does not refer to the same notion as altruism since the helping action (prosocial behavior) of one person could be beneficial for both the helper and the receiver. Although the term "prosocial behavior" is often associated

with developing desirable traits in children, the literature on the topic has grown since the late 1980s to include adult behaviors as well.

Existing measures of prosocial behavior can be classified into one of at least two categories, those that assess global (general) prosocial behavior or those that assess prosocial behavior in a specific situation. In this research, we apply the prosocial tendencies measure (PTM) which is a widely used general measurement for prosocial tendencies in recent years, and which assesses six types of prosocial behaviors: altruistic, compliant, emotional, dire, public, and anonymous. These six different types of prosocial tendencies partly share some common basis, but also can be opposed to each other. The measure was validated by correlations between the six PTM subscales and other variables for which the relationships were consistent with theory and with prior research [18]. Although all the subscales reflect a specific form of prosocial behavior, the goal of the questionnaire is to measure prosocial behavioral tendencies. That is, the measure was designed to assess the tendency of individuals to engage in specific forms of prosocial behaviors.

The six subscales included in the PTM are theoretically important forms of prosocial behaviors that cut across distinct motives and contexts of prosocial behaviors. The prosocial subscales are described as follows: first, altruism is defined as "a motivation to increase another person's welfare" [7]. Second, compliant prosocial behavior is defined as helping others in response to a verbal or nonverbal request [18], [30], and is expected to occur more frequently than spontaneous helping in the general population. Third, emotional prosocial behavior is conceptualized as helping others under emotionally evocative circumstances [18]. Fourth, public prosocial behavior is seen as a helping behavior conducted in front of an audience, motivated at least in part by a desire to gain the approval and respect of others and enhance one's self-esteem [18]. Fifth, anonymous prosocial behavior tendencies are defined as helping behaviors where the person receiving the help does not know who offered that help [18]. Finally,

dire prosocial behavior is defined as helping behavior occurring in crises or emergency situations, which do not always entail emotionally evocative cues [18].

Previous research found that social media platforms are an efficient medium to increase prosocial actions [31]. Researchers have considered decisions to share on social media as a "prosocial" act [58], hence, we explore the relationship between prosocial tendencies and decisions to share minor public safety incidents on social media.

Thus, we use the PTM (six subscales: altruistic, compliant, emotional, dire, public, and anonymous) to study how often people have shared minor public safety incident information in the past on Twitter.

Based on the aforementioned literature review, we proposed the following hypotheses:

- H5. The prosocial tendencies measure is positively related to decisions to share information on minor public safety situations:
- H5.1 Showing public tendencies, is positively related to decisions to share.
- H5.2 Showing emotional tendencies, is positively related to decisions to share.
- H5.3 Showing dire tendencies, is positively related to decisions to share.
- H5.4 Showing anonymous tendencies, is negatively related to decisions to share.
- H5.5 Showing altruism tendencies, is positively related to decisions to share.
- H5.6 Showing compliant tendencies, is positively related to decisions to share.

4.3.2 Mediating variables

In order for us to measure the relationship between prosocial tendencies and likeliness to share minor incidents on Twitter, a person must be a Twitter user, and it is more likely that the relationship will occur if the user engages in behaviors on Twitter that pre-dispose them to such sharing. Thus, we introduce several potential mediating

variables that measure relevant aspects of Twitter use, including frequency of reading news on Twitter, number of public safety government officials followed, and frequency of tweeting/retweeting (rather than just passively reading the Tweets of others).

News exposure and followership Following someone on social media entails exposure to whatever they post about. When a social media user decides to share a photo or a piece of information, everyone following them will see that update stream in their feed [21]. This is especially relevant in cases of public safety. Prior research found that updates (posting/sharing) on social media are affected by disasters such as earthquakes [60], and there is a temporal shift on Twitter when there is a public safety incident [115], thereby, providing an opportunity for shared tweets to reach larger audiences.

Moreover, social media such as Twitter is an important source of news compared to traditional media [55]. The authors found that a retweeted tweet is very likely to reach around one thousand users, regardless of the original tweet owner's number of followers. The latter quantified finding suggests the vast reach and effect of news posted on social media. News posts usually contain reported information about crimes, disasters and mishaps and exposure to this type of news might have an influence on users' tendency to share them. For example, people are affected by what they are exposed to, especially through the updated feed from the accounts they follow. Researchers found that 'repeated exposure' to messages on social media would increase the chances of sharing those messages [116]. In addition to the effect of news exposure on social media, public safety official accounts on Twitter share information about incidents and sometimes seek public safety information from the public [20]. Consequently, exposure to public safety related posts on social media, whether from following public safety official accounts or from reading crime related news, could have an influence on tendencies to share.

- H6 General patterns of Twitter use will mediate the relationship between PTM and sharing minor public safety incidents on Twitter.

- H6.1 Following public safety government officials on social media is positively related to sharing minor public safety incidents on Twitter and mediates the relationship between prosocial tendencies and the likelihood to share incidents on social media.

- H6.2 Higher news exposure on Twitter is positively related to sharing minor public safety incidents on Twitter and mediates the relationship between prosocial tendencies and the likelihood to share incidents on social media.

General engagement behaviors in Twitter Established social media usage habits have been found to influence users' decisions and behaviors. For example, previous research found that the time students spend on Facebook has an effect on students' engagement [46]. Also, more time spent on social media is associated with higher engagement in the form of sharing (retweeting) others' content and generating new content [84]. Sharing public safety incidents on social media is a form of positive civic engagement, thus, we predict a positive relationship between level of engagement with Twitter and likelihood to share minor public safety incidents on the same platform.

- H6.3 Higher general engagement with Twitter (through retweeting) will be positively related to sharing minor public safety incidents on Twitter and mediates the relationship between prosocial tendencies and the likelihood to share incidents on social media.

4.4 Methodology

4.4.1 Sample

In this research, we used Mechanical Turk to recruit U.S. participants and Survey Monkey to collect the data. Participants were 18 years and older and current Twitter users. A total of 363 responses were found usable for this study. In MTurk, we used features such as high approval rates for participants' work in order to ensure better

results. The overall time of the survey was also monitored. All participants submitted responses within reasonable times. Participants' ages ranged from 18 to 57, with the majority of participants (45%) reporting 18-27 years. The dataset included responses from female (44.1%) and male (54.8%) respondents. Around (0.3%) reported other and (0.6%) preferred not to report their gender. For ethnicity, participants reported: American Indian or Alaska Native (0.3%), Asian (4.1%), Black or African American (9.9%), Native Hawaiian or Other Pacific Islander (0.3%), White (79.9%), Mixed race (3.9%), and Other (1.7%).

4.4.2 Procedure

Participants in the study read and signed a consent form before attempting to complete the survey. They were offered $1.00 compensation for their participation in an online survey that required around six minutes to complete. The study was approved by the IRB from a U.S. research university and the study followed the guidelines from the IRB. The survey questionnaire included general demographic questions such as age, gender, ethnicity, education, and parents' education. Information pertaining to various aspects of Twitter usage frequency, including sharing about public safety incidents, was also requested from participants. Lastly, the survey included questions from the prosocial tendencies measure, which is an established scale available for general use. Data collection was done within one week during December 2018. The resulting data were cleaned and analyzed using SPSS.

4.4.3 Measures

In the data cleaning and preparation stage, the authors ran univariate and multivariate analysis and descriptive statistics to understand the boundaries of the data. We ran kurtosis tests and found three variables with abnormal ranges, meaning

they were not normally distributed. The variables are: number of followers on Twitter, number of public safety government officials followed, and number of public safety specialists followed. The three variables are expected to not have a normal distribution due to the nature of the questions. In order to adjust for the abnormality, we used fractional rank to bring down the kurtosis to a normal range of between 2 and -2 for all variables.

The study used Linear Regression models to test the direct relationship between the dependent and independent variables and to test for mediation. We introduce one control variable which is e ducation. Previous research found higher education was positively associated with more engagement in social media [84]. We would like to explore if education has any effect on the specific engagement of sharing minor safety incidents on Twitter.

We used a pre-existing and validated scale to measure prosocial tendencies. Thus, we conducted a partial confirmatory analysis in SPSS using Maximum Likelihood. For the rotation method we used Oblimin with Kaiser Normalization. The result of the factor analysis is five clean factors, instead of six, which is what was initially proposed in the actual scale. A total of six items were excluded from the factors because they did not have clear loadings. Two subscales loaded together, which are emotional and dire. Both subscales are very similar and they both are concerned with being compassionate and helpful during extreme situations, and so, having both subscales combined was deemed appropriate. (Contact authors for factor loadings). Measures for the mediating variables related to general Twitter use and education are shown in the results section below.

Table 4.1 Variables Frequencies

How often Tweet retweet			How often shared incidents	
Category	Total N	%	Total N	%
1 Never	44	12.1	67	44.3
2	40	11.0	38	25.2
3	96	26.4	25	16.6
4	126	34.7	12	7.9
5 very often	57	15.7	9	6.0
Total	363	100.0	151	100

4.4.4 Results

The dependent variable "how often have you shared minor public safety incidents in the past" (M=2.06, SD=1.21), was measured using a five-point Likert type scale, ranging from never to very often.

Most participants who answered the question had shared incidents but reported a relatively low frequency for sharing minor incidents on social media (See Table 3.1 for frequencies). The prosocial tendencies subscales used in the analysis were: public (M=2.30, SD=1.05), emotional/dire (M=3.50, SD=0.86), anonymous (M=3.48, SD=0.92), altruism (M=4.05, SD=1.07), and compliant (M=3.65, SD=0.99). Number of public safety government officials followed was also measured. Due to its skewness, we used fractional ranking to bring down the kurtosis to normal. The new measure ranged from 0.16 to 1.00 (M=0.50, SD=0.28). The General Twitter usage variable measured with a 5-point Likert type scale included: "How often tweet/retweet" (M=3.31, SD=1.22); See Table 3.1 for frequencies.

Another mediating variable used in the study was "How often do you read news on Twitter" (M=4.70, SD=1.85), which was measured using a 7-point Likert type scale ranging from "never" to "very often"; 57% answered five to seven on the scale. Education ranged from 1= (No formal educational credential) to 8= (Doctoral or professional degree) (M=4.06, SD=1.65); the modal category was "Some college".

Table 4.2 Correlations Table

	Public	Emotional/Dire	Anonymous	Altruism	Compliant	How often do you tweet or retweet?	How often do you read news on Twitter?	Education	Public safety officials followed
Shared minor public safety situations?	.135	.293**	.208*	-.036	-.222**	.417**	.423**	-.200*	.490**
Public	1	.199**	-.080	-.531**	.017	.070	.122*	-.025	.234**
Emotional/Dire		1	.411**	-.025	-.781**	.147**	.181**	-.016	.233**
Anonymous			1	.153**	-.421**	.081	.033	-.105*	.083
Altruism				1	-.182**	.023	-.069	.045	-.117*
Compliant					1	-.122*	-.152**	.037	.215**
How often do you tweet or retweet?						1	.437**	-.075	.232**
How often do you read news on Twitter?							1	-.079	.344**
Education								1	-.124*

**. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed).

For bivariate analysis, we ran Pearson's r correlations for the study variables, shown in Table 3.2.

As seen in Table 4.2, the emotional/dire, anonymous, and compliant subscales had significant correlations with likelihood to share minor safety incidents. Also, Twitter usage frequency, education, reading news on Twitter and public safety officials followed had significant correlations with the dependent variable. In order to further test our hypotheses, we used those variables in linear regression models using SPSS. We ran two sets of regression models. The first set of models used the prosocial tendencies measure (PTM) as a single factor. The second set of models looked at specific subscales and their effect, if any, on the dependent variable (likelihood to share incidents on social media).

In the first set of models (Table 4.3), the first model, using only the PTM variables, explained only 6% of variance (adjusted R-squared= .05) $F(1,150) = 8.75$,

Table 4.3 Regression Beta Coefficients for Combined Prosocial Tendencies Measure

Variable	Model 1 Beta's	Model 2 Beta's	Model 3 Beta's	Model 4 Beta's	Model 5 Beta's
Prosocial tendencies measure	.24*	.23*	.12	.10	.07
Education		-.18*	-.11	-.09	-
Public safety government officials followed			.44***	.34***	.34***
How often do you read news on Twitter?				.27*	.17*
How often do you tweet or retweet?					.26*
R-squared	.06	.09	.27	.32	.37
Adjusted R-squared	.05	.08	.25	.31	.35

p<.001. The second model included education and explained 9% of variance (adjusted R-squared= .08) F(2, 150)= 6.98. The third model introduced number of public safety officials followed and was significant, explaining 27% of variance (adjusted R-squared= .25) F(3, 146) = 17.28. The fourth model introduced frequency of reading news on Twitter and was significant, explaining 32% of variance (adjusted R-squared= .31) F(4, 146)= 16.99. The fifth model introduced overall frequency of tweeting or retweeting and deleted education (which had no longer been significant once other mediators were considered), and was significant, explaining 37% of variance (adjusted R-squared= .35) F(4,146)=20.81.

Thus, according to the models in Table 4.3, H5 (the prosocial tendencies measure is positively related to decisions to share) is initially supported, but its influence is fully mediated by several other variables measuring aspects of general Twitter use. The second set of models (Table 4.4) looked at separate prosocial subscales as possible independent variables, but otherwise followed the sequence described above. The first model explained 10% of variance (adjusted R-squared= .09) F(1,150)=14.01. In this and all subsequent models using the subscales for prosocial behavior, only the combined subscales for emotional and dire were significant. The second model in this series was significant, explaining 14% of variance (adjusted R-squared=.11) F(4,150)=5.16. The third model was significant, explaining 28% of variance (adjusted

Table 4.4 Regression Beta Coefficients, Separate Prosocial Measures

Variable	Model 1 Beta's	Model 2 Beta's	Model 3 Beta's	Model 4 Beta's	Model 5 Beta's
Emotional/Dire	.31***	.29*	.16	.15	.12
Education		-.18*	-.11	-.09	-
Anonymous		.07	.06	.07	.07
Compliant		.03	.02	.03	.02
Public safety government officials followed			.41***	.31***	.31***
How often do you read news on Twitter?				.27***	.18*
How often do you tweet or retweet?					.25*
R-squared	.10	.14	.28	.34	.39
Adjusted R-squared	.09	.11	.26	.31	.36

R-squared=.26) F(5,146)=11.05. The fourth model was significant, explaining 34% of variance (adjusted R-squared=.31) F(6,146)=12.11. The fifth model was significant, explaining 39% of variance (adjusted R-squared=.36) F(6,146)=14.60.

According to Table 4.4, H5.1 is not supported, H5.2 is partially supported, H5.3 is partially supported, H5.4 is not supported, H5.5 is not supported, and H5.6 is not supported. For the mediating variables, H6 (General patterns of Twitter use will mediate the relationship between PTM and sharing minor public safety incidents on Twitter) was supported. H6.1 was supported. H6.2 was supported. H6.3 was supported

4.5 Discussion

Exhibiting prosocial tendencies was initially found to affect likelihood to share minor public safety incidents on social media. Previous research found that decisions to share on social media are 'prosocial' [58], thus, the result confirms previous findings. What's new is that even though the issues to be shared are minor, participants were more likely to share if they exhibit prosocial behaviors. Yet, it is not known if the effect of prosocial tendencies is larger when the scale of the incident changes. Future

research in this area might provide more insight and understanding for the magnitude of prosocial tendencies effect on decisions to share public safety incidents, based on their scale.

The emotional and dire combined subscale was the only subscale found to influence decisions to share minor incidents. In previous research, emotional and dire subscales were sometimes used together in a single factor due to their similarity. Previous research found that "emotional words, whether positive or negative, are processed faster than neutral words" [112]. This is a positive finding because emotions during decision making are found to increase the performance of the decision making process [85], which may lead to making better decisions. In the case of public safety, whether small or large, the situation of losing a wallet or being startled by a suspicious person, may raise emotional perceptions of others. Thus, public safety incidents galvanize the need to sympathize with the situation and decide to share the incident to find the perpetrator or simply raise awareness.

Other subscales were not found to have an influence on decisions to share on social media, including public, anonymous, altruism, and compliant subscales. The nature of posting on social media could be perceived as a public act (when using a real identifier), or an anonymous act (when using a pseudonym). Accordingly, since we did not control for how posting on social media is perceived, we believe that could be the reason we were not able to see a clear effect on decisions to share. Altruism, on the other hand, was expected to have an influence on the dependent variable, yet, it didn't. One possible explanation for the result is the nature of the incident scale being minor. Yet, it is hard to say exactly if this had an effect or not, because the questionnaire used was concerned mainly with minor incidents and did not measure responses if the scale of the incident was large. The last subscale, compliant, was not found to have an effect on the dependent variable. Being compliant presumes a specific rule or law to follow and abide by. In this research, we did not present

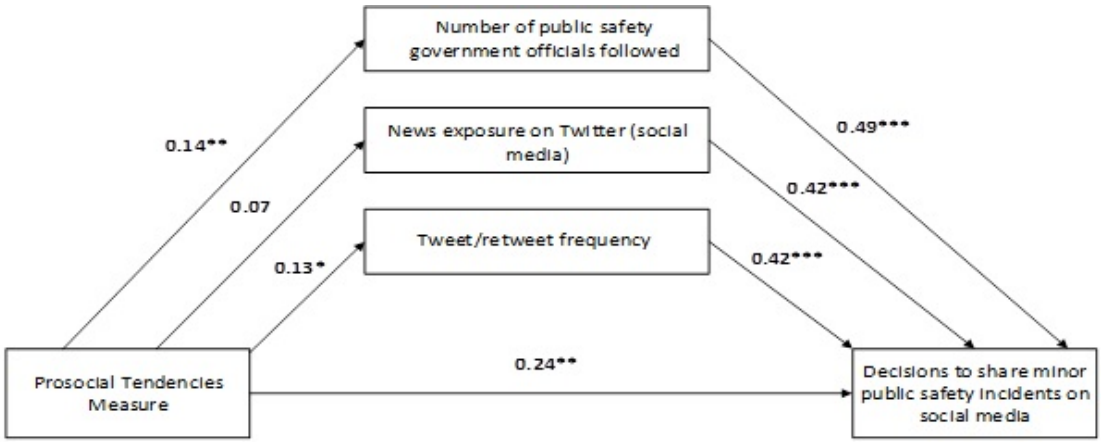

Figure 4.1 Conceptual Model for the Mediating Variables with Beta Coefficients.

hypothetical scenarios of regulations requiring individuals to participate. Also, since the scale of the incident is minor, compliant individuals might consider the situation as not alarming and judge that they are not expected to share this incident on social media.

Looking back at the two sets of models presented in Tables 4.3 and 4.4, we see that we initially included education as a variable in every model to see how it affected the results. Interestingly, we saw a significant effect of education on decisions to share, however, when other variables are introduced we see the effect washes out. Thus, we decided to remove education from model five in both sets of models. Below we present the conceptual model which emerged from our findings (Figure 4.1).

The three variables presented in the middle of Figure 4.1 were found to act as mediating variables for the relationship between prosocial tendencies and decisions to share. In model 3 (Table 4.3), when number of public safety government officials followed was introduced to the model, the effect of prosocial tendencies decreased. We deduce from this result that following those accounts on social media is related to prosocial tendencies and has a strong positive influence on the followers, which overshadows the effect of internal feelings of prosocial-ness. This is important

because it is easier to promote public safety accounts on social media to receive more followership than to actually change the psychological tendencies of social media users.

To further validate the results and the presented conceptual model, in our future research we aim to test it using a larger and more diverse sample and Structural Equation Modeling, which will provide more insight into the complexities of the relationships among the variables.

4.5.1 Design implications

Generally, although the three mediating variables presented in Figure 4.1 have a mediating effect on the prosocial tendencies relationship with decisions to share, number of public safety government officials followed was the most prominent variable with the strongest effect on decisions to share. In practice, as stated earlier, those accounts are already seeking the help of the crowd using social media [20]. It would be of great value to increase the popularity of those accounts by advertising them or having social media platforms such as Twitter promote local public safety accounts for their users to encourage them to follow those accounts. When using Twitter, one can see many promoted accounts by the platform which allows for more exposure for the advertised content. The Twitter platform is already involved in business related content promotion. Nevertheless, future research is recommended with controlling for public safety accounts followings to see if the same results persist.

Another interesting finding is the effect of news exposure on social media on decisions to share public safety incidents. Similar to the previous design suggestion, reliable and local news outlets might be suggested for Twitter users to follow. News on social media, as mentioned earlier, allows for more engagement with the content. Tools such as commenting, liking, and sharing might have an influence on the general users' engagement tendency on the platform. Though, the direct effect of news on social media use is not clear and, so, begs for more attention from researchers.

4.5.2 Limitations

There are several limitations of our study which should be mentioned. First, the sampling frame used, Mechanical Turk, consists of people who have volunteered to do "jobs" such as answering surveys for pay, are younger than the general population, and is thus not representative of all adults across the U.S. Because data were collected through a survey with only objective questions and just over 300 participants, it would be desirable to replicate the results involving more participants (a larger sample of Twitter users, and if possible, of users of other platforms too) and some open-ended questions asking people to discuss or describe incidents when they shared information about public safety situations, or decided not to.

4.5.3 Summary

To summarize, this research looked at motivations for sharing minor public safety incidents, using an adult sample (N=363) from Mechanical Turk volunteers in the U.S. Using the prosocial tendencies measure and a questionnaire, we found that showing emotional and dire tendencies affects the likelihood of a decision to share minor public safety incidents on social media. Regression models also revealed three mediating factors for prosocial tendencies: number of public safety officials followed, news exposure on social media, and tweet/retweet frequency.

Our main contribution is to add to the understanding of social media users' behaviors in terms of sharing minor safety incidents. We learned that being prosocial is not enough for one to be a volunteer contributor for minor incidents. Perhaps the low-scale severity of the incident affects how people perceive those threats to themselves and to their community. Interestingly, established, independent behaviors on social media such as frequency of sharing and others, showed a clear mediating effect on the relationship between prosocial tendencies and decisions to share minor incidents. This is particularly valuable because it is easier to influence such behaviors

through design changes that would change the mediating variables, rather than to try to change complex, psychological traits such as prosocial traits.

CHAPTER 5

TWITTER SHARING BEHAVIOR AND MINOR SAFETY INCIDENTS: A DESIGN EFFORT TO LEVERAGE THE POWER OF THE CROWD

5.1 Abstract

In this study, we test some of the findings in the prior two studies. We conduct a 2 x 2 x 2 repeated measures and between-subjects (mixed design) online experiment. We introduce three manipulations: availability of location information to share the tweet locally, availability of platform authority such as a new rule by Twitter embedded in their Terms of Service, and sender (tweeter) authority whether they are an official authority versus an average person. We first conduct usability testing for a design used to increase local exposure to public safety tweets. Then, we test the materials to be used in the experiment using qualitative and quantitative methods. After that, we conduct an online experiment with a Qualtrics sample of 246 participants. We found that location information in public safety tweets did not influence decisions to share incidents. However, when participants decided to share, they were more likely to share incidents locally and increase their exposure. Platform authority did not show a significant effect on decisions to share. Finally, the authority of the tweeter (original poster) significantly affected decisions to share incidents on social media.

5.2 Introduction

In this study, we base our hypotheses on prior literature as well as the theory of collective action. The theory of collective action [74] states that sane and rational individuals will not participate in a public good, unless they are forced to, or there is another incentive on top of the public good that everyone will benefit from. For example, Olson [74] states that people will not pay taxes if there are no rules, regulations, and sanctions from the government to enforce this requirement. Still,

everyone will benefit from tax money in terms of public services. Therefore, in this research, we intend to look at three main variables and study how they affect Twitter users' decisions to share minor public safety incidents: location information, platform authority, and sender (tweeter) authority.

In prior studies, through the use of survey instruments, we found that Twitter users are more likely to share minor incidents if they occur in a local location. We also found that Twitter users are more likely to share incidents if they were coerced to do so through a hypothetical rule or regulation.

For this study, we decided to conduct an experiment to confirm the findings from the prior studies that were primarily based on surveys. From surveys, we were able to find correlations; however, experiments help determine causality, which adds to our understanding in this field. Experiments allow the researcher to isolate the independent variables under study to examine the proposed hypotheses. Independent variables are manipulated, and the researcher measures witnessed changes in the dependent variable. Also, the availability of a control group provides a baseline for researchers to confidently attribute the witnessed change of the dependent variable to the manipulation of the independent variables.

5.3 Background

5.3.1 Decisions to share on social media

Social media users share content on those platforms for many reasons. For example, a study found that retweeting is a prosocial activity that carries underlying motives such as altruism and reciprocity [58]. The content of the tweets plays a major role in decisions to share those posts. A study found that the number of retweets a post receives does not alter users' intentions to share. Nonetheless, the actual content of the tweet matters [43], [80]. Research found that the emotional tone of a tweet increases its retweetabbility, or chance to be retweeted [80]. Another similar

study conducted on Twitter to understand why users retweet or share content on the platform revealed that users retweet to disseminate and amplify information, inform followers of something, and approve information in those posts, among other reasons [13].

In terms of sharing public safety incidents, previous research found that incident severity and location affect people's decisions to report incidents [41]. Another relevant research that looked at motivations to share disaster-related information on Twitter found that users share those tweets because they wish to provide current and updated information to their community, they desire to share what they believe as relevant information, they want to engage with their community, and they base their sharing decisions on their feelings about the tweet [71].

5.3.2 Location information

Prior research in the field of public safety found that location plays a significant role in terms of information sharing. For example, researchers found that residing in, or living close to a location that was hit by a disaster was highly related to tweeting about the said disaster [35], [91]. Researchers also found that social media users are more likely to share significant incidents if they are in a close geographic location [92]. A case in point is when more Twitter users shared information about the disaster when they were closer to the incident than users who live further away [53], [87].

Local law enforcement vastly utilizes social media in hopes of increasing public safety. Many law enforcement official accounts request information from the public to identify suspects and to spread awareness [16]. During the Boston marathon bombings, law enforcement requested intelligence from the local crowds to identify the criminals and send any information such as videos and pictures [97].

Prior literature focused on significant incidents and found that location information affects social media users' decisions to share those large-scale incidents. In

our inquiry line, we conducted two studies to understand if location information still affects decisions to share if the severity of the incident is minor. We found, through online surveys, that the location of the incident is indeed a predictor of decisions to share minor incidents on Twitter.

Location information was found to be very important in shared tweets about public safety events. Previous research found that authorities and individuals use Twitter hashtags to discuss specified disasters such as the Boston Marathon bombing, the Texas plant explosion, and others [114]. Prior research also found that Twitter users included location information in tweets about specified disasters such as floods and wildfires [70], [111]. During Hurricane Sandy, a study found that most tweets about the disaster included location related hashtags. The authors found that "five of the top ten hashtag pairs [for Hurricane Sandy] include a storm-related hashtag with a location-related hashtag" [70]. Moreover, during disasters, Twitter users share location information when tweeting about disasters to allow communicating with other users near the incident and reach out to first responders [70], [111].

Thus, using an online experiment, we hypothesize the following:

- H7. Twitter users who are exposed to location information will be more likely to share incidents on Twitter than people who are not exposed to location information.

- H7.1. When Twitter users decide to share minor incidents on Twitter, they will more likely share using the 'Shield button', which allows for increased local exposure, than the regular Twitter retweet button.

5.3.3 Coercion

Coercion can be explained as any form of oppression that compels a person to act in a certain way. Coercion can be witnessed as a form of rule, authority, or regulation that includes consequences for violators.

In this research, we introduce two types of coercion in the form of authority:

- Platform authority in the form of an update to Twitter Terms of Service that requires users to share public safety incidents.

- A high versus low authority of the tweeter such as an official citizen action group account versus a regular Twitter user.

Tweeter authority Previous literature found that people perceive law enforcement and other authorities as trustworthy and just entities [105]. Also, prior research found some evidence that when law enforcement accounts on Twitter are transparent with their online community, Twitter aids in increasing perceived legitimacy of those law enforcement accounts [36]. Many research found that legitimacy leads to positive public safety-related behaviors such as compliance with regulations and cooperation with legal entities [45], [69], [79]. In the case of public safety, a study used content analysis techniques to understand retweeting behaviors related to the South Korean anti-terrorism regulation [80]. The researchers found that tweets initially created by authorities such as political figures and higher authority individuals were retweeted more than tweets originally posted by regular Twitter users; hence, providing evidence that the tweeter's authority matters in the context of public safety [80].

Thus, based on previous literature findings, and as a form of cooperation with authorities, we predict that Twitter users will be more likely to share tweets that are tweeted or sent from law enforcement accounts, more than tweets from random people with no legitimate authority. We hypothesize the following:

- H8. Twitter users who are exposed to minor public safety incidents shared by officials on Twitter will be more likely to share those incidents than people who are exposed to minor public safety incidents shared by normal users on Twitter.

Platform authority Platform authority has the power to instate their own rules in the Terms of Service and have the right to enforce them. Researchers found that people are more likely to obey or adhere to rules and regulations from higher

authorities such as law enforcement [44], [104], [106]. Moreover, our previous research found that Twitter users are more likely to share minor public safety incidents if provided with a hypothetical rule from an authority such as the government (Chapter 3).

According to collective action theory, a government rule is considered a form of coercion and is supposed to influence decisions when participating in a public good [74]. In our prior research, we utilized online surveys and found a significant positive influence of the availability of an authority regulation on decisions to share minor incidents. To test for platform authority, we present participants with consequences that we predict will serve as coercive elements and motivate sharing decisions. We isolate and test the effect of platform authority to understand further if a higher power has more influence on social media in minor public safety incidents. Drawing from collective action theory [74], and our previous findings (Chapter 3), we assume Twitter users will be more likely to follow the Twitter platform's rules due to perceived legitimacy in authority and their ability to coerce users to follow appropriate conduct. We hypothesize:

- H9. Twitter users who are exposed to platform authority will be more likely to share incidents on Twitter than people who are not exposed to platform authority.

Due to a lack of studies and literature in this area, we would like to explore any interaction between the three manipulations we are studying. We ask the following research question:

- RQ1 Are there any interactions between the main effects?

5.4 Methods

5.4.1 Participants

We needed three different samples to run the study. We recruited two samples for pretesting and later one sample for the online experiment. For material pretesting regarding severity of tweets, we recruited 32 Mechanical Turk participants and offered them $3 for their participation. 29 responses were deemed acceptable and used in the study. We also recruited a total of ten participants and interviewed them about the design of the experiment (Appendix C). Participants were recruited through snowball method, starting with lab members and fellow colleagues at NJIT.

To indicate the approximate number of participants required for the experiment, we conducted a power analysis using G*power software. Since we are using a mixed experimental design, there is no specific formula to calculate the sample for this design to the best of our knowledge. Therefore, we can either use a small effect size (where the formula would suggest a higher number of participants) or assume we will use a between-subjects design. The formula will suggest a large number of participants to be able to see an effect. We first ran the power analysis (power = .80, and p = 0.05) for a complete within-subjects, assuming low effect size. The result suggested a need to have at least 108 participants in total. Then, we reran the power analysis assuming a complete between-subjects design. The result suggested recruiting at least 27 participants per group, a total of 217 for the experiment. Thus, in hopes of being able to see better results, and to have a more conservative estimate, we use the latter calculation.

The experiment sample was comprised of adults aged 18 and older residing in the U.S. who are also Twitter users. We used a panel from Qualtrics where a project manager helped with the initial data collection of 256 participants. After the soft launch, we received 10% of the data to check the quality of the data-points and to see if there are variances in the answers and that the treatments are generally causing

variance in answers. Then, we continued with the full launch of the experiment. The total number of responses received was 256. After manually checking the results, we identified 29 responses as poor quality. The reasons were answering in a straight-line manner and writing irrelevant text in the open-ended questions. The project manager then ran the experiment and collected 19 more participants. The total responses that were deemed usable are 246. We paid $5 per participant recruited by Qualtrics. The average time spent taking the survey was 7.5 minutes and the data collection was completed in one week.

5.4.2 Procedure

We choose to conduct a within-subjects and a between-subjects experiment design (mixed design). Since platform authority is difficult to erase after it's introduced to participants, to prevent transferred learning that occurs if the same group is exposed to the no treatment and the treatment, this manipulation will be conducted as a between-subjects experiment, where participants will only either see the treatment or not. Therefore, location information and sender authority will be treated as a within-subjects design, while platform authority will be treated as a between-subjects design, where only half of the participants will be exposed to the treatment.

After testing the posts' content, the proposed design, and the manipulation variables, we conduct the experiment. The experiment is an online experiment with recruits from Qualtrics. We use a 2 (location information vs. no location information) by 2 (authority of tweeter whether official authority or an average person) within-subjects by 2 (coercion from platform authority, no coercion from the platform) between-subjects design experiment. In this experiment, we propose three design manipulations: availability of location information, tweeter (sender) authority, and availability of a platform coercive element. The main dependent variable that we test is likeliness to share minor incidents on Twitter. Our main independent

variables are: availability of location information, availability of source authority, and availability of platform authority.

Pilot Testing Here, we test tweets if they constitute a minor incident or not. We present a collection of tweets for minor incidents that are supposed to be tweeted by a high authority (Appendix B) such as a citizen watch group versus a no authority sender (Appendix A) such as the average Twitter user. Then, we test the posts if they constitute a minor incident using five-point Likert-type questions borrowed from prior literature to determine the severity of the incident [15], using the degree of Hurt scale [109].

Thinking about the previous tweet, the situation:

1. Was not at all hurtful.....Was extremely hurtful
2. Caused no emotional pain ..... Caused intense emotional pain
3. Did not hurt the victim at all ..... Hurt the victim quite a bit
4. Was not severe at all ..... Was very severe
5. Was not serious at all ..... Was very serious

We used Mechanical Turk to recruit participants and used survey monkey to gather the results. Each participant was paid $3 for their volunteer participation. We surveyed 32 participants, and we found 29 results to be suitable for the study because two participants did not finish the survey and one participant answered that she does not use Twitter. In Excel, we found the average score for each tweet severity. We aimed to use tweets that ranked lower on the degree of Hurt scale [109]. The scale ranges from 1 to 5 and we chose responses between 2 and 3. We found participants rated 12 out of 25 tweets as a low severity. The tweets used in the experiment can be found in Appendix D.

As part of pretesting, the interviews were short and took about 15-20 minutes. We also showed participants a fictitious message from Twitter about an update to their Terms of Service that hints at the need to share incidents to raise awareness and find perpetrators, which constitutes of coercion and platform authority. The first part of the message includes the fictitious update to Twitter's Terms of Service. The second part contains an original text from the Twitter website that provides information on how the platform enforces its rules [3]. After showing participants the update to Terms of Service, we ask them qualitative questions such as how real they think the update looks (Appendix C). The researcher took notes while participants answered questions about the experiment materials. Most of the comments were related to the language of the Twitter update and some grammatical issues. The author then updated the experiment materials accordingly. Participants were rewarded with $10 for their volunteer participation.

Manipulation 1 For the first manipulation (availability of location information with the incident tweet), we add a fictitious button next to each tweet that looks like a shield. We call it the 'Shield' button, which will utilize local location-related trending hashtags and attach those hashtags to the tweet's content that the user wants to share. Let's assume that someone is posting about a suspicious van in their street; if another user wants to share this information locally, they can press the Shield button and have the tweet shared in their local location to increase its exposure. When clicking the button, to avoid misuse of the function, the button will quickly run an embedded algorithm to test the topic of the post and ensure that it is safety-related and to circumvent any attempt to advertise one's content, that is not safety related, using the proposed button.

Participants will be asked to read through the instructions. They will see a picture with arrows that explain the feature of the Shield button and its function.

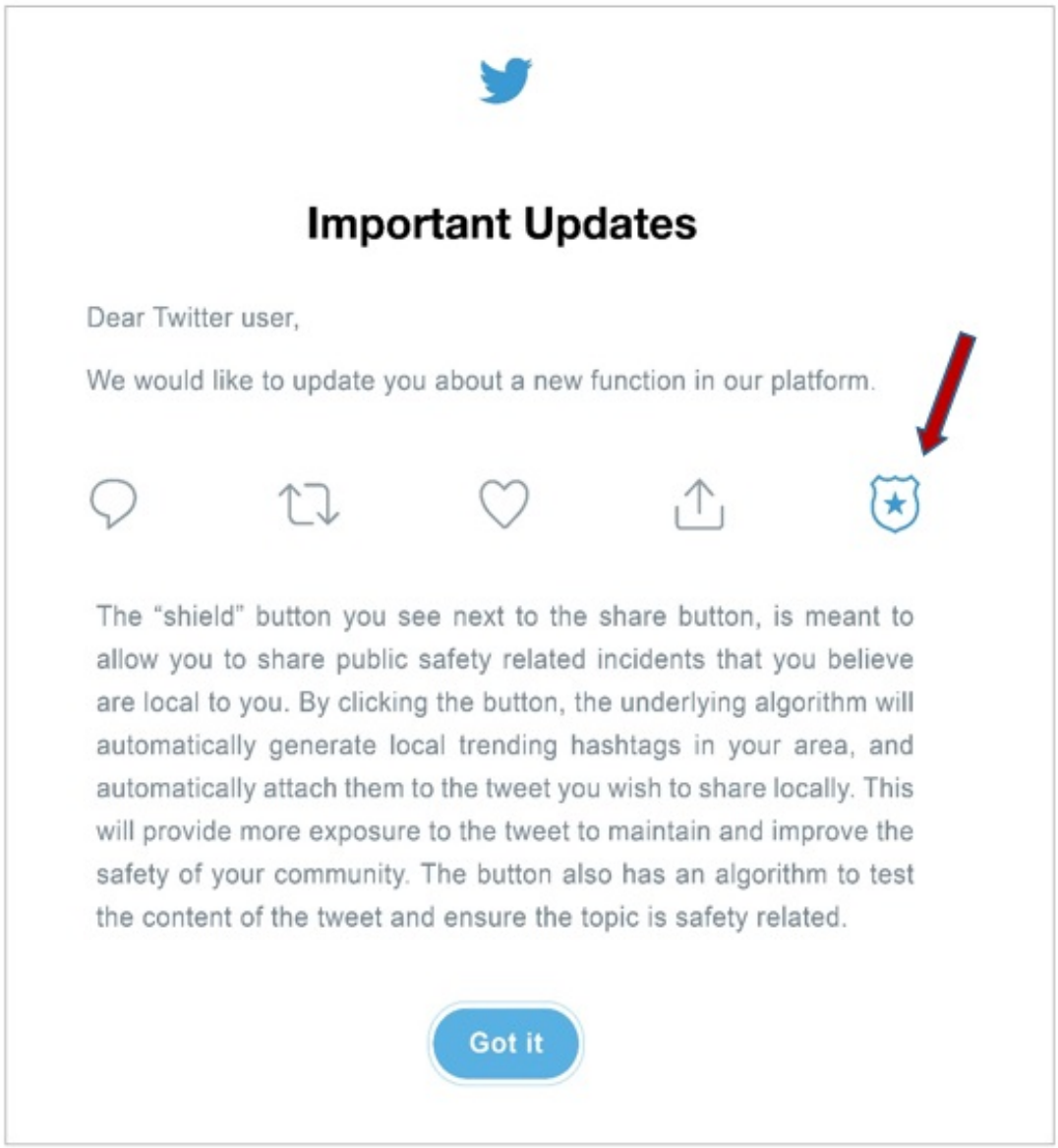

Figure 5.1 Fictitious update to Twitter that introduces the Shield button.

Figure 5.2 Location Treatment Versus Control Group

We show participants the new button and explain how and when it could be used. Participants in the treatment group will be presented with four posts about local public safety incidents that we have used in the pilot study and found suitable and reflect minor safety incidents. The tweets will have more information next to them that reads "happening locally".

Participants will then be asked to answer a question, as shown below:

1. After viewing the previous tweet, how likely will you share it on Twitter? *A Likert-type scale ranging from one (not likely at all) to seven (very likely)*

2. How will you share the tweet?

- I will retweet using the Twitter retweet button
- I will retweet using the "Shield" button. (Shield button increases local exposure for public safety tweets)

The control group will see the same posts but will not have the extra information "happening locally". Therefore, not providing them with location information.

Manipulation 2 For the second manipulation (sender authority, whether they are an official authority such as a citizen action group or a neighbourhood watch group vs. an average person), participants in the treatment group would see four posts from higher authority accounts on Twitter. The sender (tweeter) of this post will be a high authority. Those posts have been tested in the pilot study and were found suitable and reflect minor safety incidents.

Then, participants will be asked to answer the following question after each tweet:

- Q1 . After viewing the previous tweet, how likely will you share it on Twitter? *A Likert-type scale ranging from one (not likely at all) to seven (very likely)*

The control group will include public safety tweets from regular users who are not officials, which constitutes low authority. Participants will see four tweets of minor incidents and will be asked the same question presented for the treatment group. We anticipate that the treatment group will have a higher likelihood to share compared to the control group.

Manipulation 3 The third manipulation (providing a rule that the platform instated, which requires sharing public safety incidents) tests the possible effects of coercion on decisions to share on Twitter through platform authority. According to

Figure 5.3 Sender Authority Treatment Versus Control Group.

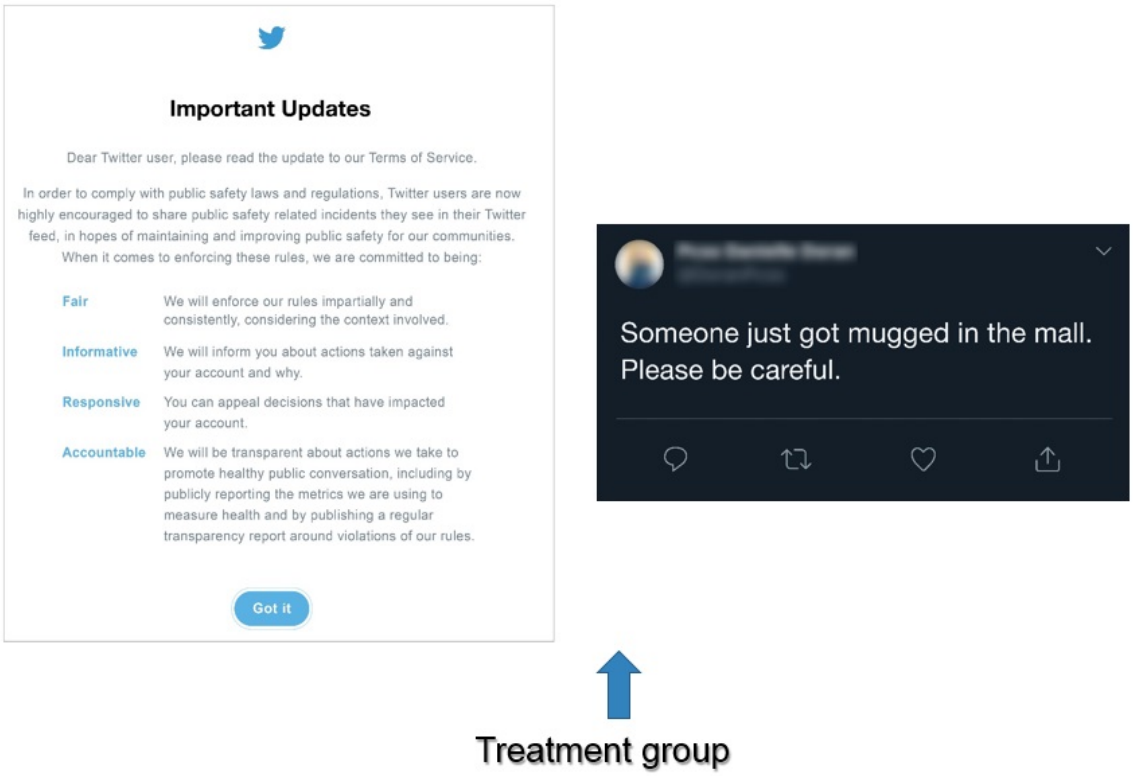

Figure 5.4 Platform authority treatment group.

collective action theory, and a previous study we conducted in this regard, coercion affects Twitter users' tendency to share incidents. Though, in the last research, coercion was used as a hypothetical situation. In this study, we aim to see if the platform itself can instate something similar to coercion and affect decisions to share. In this experiment, we aim to test this hypothesis further. The treatment group will be presented with text that resembles the Terms of Service of Twitter.

The participants will read that this is an update to Twitter Terms of Service in an attempt to have a more responsible community and a new requirement to abide by law enforcement rules; and that Twitter expects its users to assume a more responsible role to share public safety incidents on Twitter to help maintain and improve public safety for everyone (Figure 5.4). Then, participants will see four posts about minor public safety, where we expect them to mostly decide to share.

Figure 5.5 Platform authority control group.

The question they will see after each minor incident tweet will look like this:

- Q1 . After viewing the previous tweet, how likely will you share it on Twitter? *A Likert-type scale ranging from one (not likely at all) to seven (very likely)*

The control group (Figure 5.5) will only see the same minor incident tweets and will be asked the same question after the tweets, similar to the treatment group.

5.4.3 Measures

Basic participants demographic data were collected. Our participants' gender demographic was comprised of women (50.4%), men (49.2%), prefer not to say (0.4%). Age was measured using a one to five scale that corresponds to the following values accordingly: 18-27 years old (32.9%), 28-37 years old (7.3%), 38-47 years old (24.8%), 48-57 years old (20.7%), and 58+ (14.2%). Participants reported the following ethnicities: White (80.1%), Black or African American (6.9%), Asian (6.5%), Mixed race (3.7), American Indian or Alaska native (1.6%), Other (1.2%). Basic Twitter usage frequencies were collected. Participants education (M=18.03, SD=3.9) was reported as a number of years of education they received. We asked how often do you use Twitter? (M=4.15, SD=0.99) and How often do you tweet or retweet? (M=3.18, SD=1.37). The former two questions were measured using a Likert-type scale ranging from one to five, using the following categories: less than once every three months, once or twice every two months, several times a month, several times a week, several times a day. We also asked a number of questions post survey. Participants were asked to answer the following statement: I paid attention throughout the time I was doing the survey, Yes (98.4%), No (1.6%). Participants were also asked: Were the instructions and explanations in the survey clear to you? (M=6.49, SD=0.90), and Were the questions clear to you? (M=6.49, SD=0.93). The former two questions

were measured using a Likert-type scale ranging from one to seven, where 1=Not clear at all, and 7= very clear.

To check for the attention of participants we asked them to report the type of content they read. The question included the following options: public safety, nature, education, politics, other. Participants who did not select public safety were removed from the analysis. To test for the sender authority treatment, we asked the question: How much authority did you perceive in the sender of the previous tweet? (M=4.37, SD=1.68), where participants answered using a Likert-type scale ranging from 1=no authority to 7=very high authority. To test for the platform authority treatment, participants were asked: Do you think Twitter as a platform has an authority to influence users about the content they post? Where they answered Yes (75%), or No (25%).

5.4.4 Results

For the dependent variables, participants were presented with fictitious tweets and were presented with the following question: How likely will you share the previous tweet on Twitter?, where participants answered using a Likert-type scale ranging from 1=not likely at all, to 7 = very likely. The same question was presented to participants in all treatments. The location treatment was a within-subjects treatment where participants saw tweets containing location information and other tweets that did not contain that information. The second treatment was a within-subjects and testing whether the authority of the tweeter has an effect on Twitter users' likelihood to share public safety incidents. Participants in the treatment group were presented with tweets that had high authority sender such as "citizen action group", while participants in the treatment group saw tweets that originated by an unknown sender (blurred profile picture and name). Both treatment and control groups were presented with the previous question of how likely they would share the post. The last

treatment, platform authority, was a between subjects treatment where half of the participants saw an update to Twitter Terms of Service, then presented with public safety tweets and asked whether they would share or not, while the control group did not see the fictitious update.

To test for the hypotheses, we run full factorial mixed-design ANOVA and paired samples t-tests. One of ANOVA's assumptions is that the dependent variable is continuous. The dependent variables in this study are measured in a scale of 1-7, therefore, considered continuous. Normality of distribution is required by ANOVA and we tested the Kurtosis and Skewness. All values were within -2 and +2 which is considered acceptable and data is not significantly distinguishable from a normal distribution [33]. To satisfy ANOVA's assumptions, we run Levene's test which is not significant. We also assume sphericity because we only have two conditions per treatment, therefore, Mauchly's sphericity test is equal to 1.

After running the ANOVA, we found no significant difference between the treatment group viewing location information (M=4.42, SD=1.51) and the control group (M=4.16, SD=1.45). The main effect of location information on sharing was not significant, F (1, 244) = 0.38, p = 0.54. Therefore, we reject H7. We found a significant difference between the treatment group viewing high source authority tweets (M=4.36, SD=1.47) and the control group(M=4.14, SD=1.54). The main effect of source authority of sharing was significant, F (1, 244) = 13.85, p <0.001. Therefore, we accept H8. For platform authority, we found no significant difference between the treatment group viewing the Twitter update (M= 4.16, SD= 1.66) and the control group (M= 3.99, SD= 1.75). The main effect of platform authority was not significant (F (1, 244) = 0.24, p = 0.63). Therefore, we reject H9.

We found no significant interaction between location and platform authority, F (1, 244) = 3.17, p = 0.08. Source authority and platform authority had no significant interaction, F (1, 244) = 0.02, p = 0.89. Location and source authority had no

significant interaction, F (1, 244) = 0.17, $p = 0.68$. Location, source authority, and platform authority had no significant interaction, F (1, 244) = 0.26, $p = 0.61$.

For H7.1 (When Twitter users decide to share minor incidents on Twitter, they will more likely share using the 'Shield button', which allows for increased local exposure, than the regular Twitter retweet button), we tested using paired samples t-test. The variables (how likely will you share using the Twitter retweet button, how likely will you share using the Shield button), were measured using a 7-point Likert type scale. The distribution of the variables was not normal, so we computed variables using square root function in SPSS to bring down the Kurtosis to normal levels, between -2 and 2. The resulting four variables adjusted are: likelihood to share tweets with location using the Shield button, likelihood to share tweets without location using the Shield button, likelihood to share tweets with location using the Twitter retweet button, likelihood to share tweets without location using the Twitter retweet button. The former variables values range from 0.50 to 2.65.

Here, we hypothesized that when Twitter users decide to share an incident, they will share using the Shield button (shares locally by attaching local trending hashtags). There was a significant difference in the scores for sharing tweets with location using the Shield button (M=1.34, SD=0.93) and sharing tweets without location using the Shield button (M=1.24, SD=0.93); t (245) = 2.37, p <0.05. There was also a significant difference between sharing tweets with location using the Shield button (M=1.34, SD=0.93) and sharing tweets with location using the Twitter retweet button (M=0.78, SD=0.88); t (245) = 5.96, p <0.001. For the last pair, there was a significant difference between sharing tweets without location using the Shield button (M=1.24, SD=0.93) and sharing tweets with no location using the Twitter retweet button (M=0.82,SD=0.88); t (245) = 4.49, p <0.001. Therefore, we report that H7.1 is supported.

Table 5.1 Hypotheses and Research Question Results

Hypothesis/ R.Q.	Result
H7. Twitter users who are exposed to location information will be more likely to share incidents on Twitter than people who are not exposed to location information.	Rejected
H7.1. When Twitter users decide to share minor incidents, they will more likely share the incident with location information, more than sharing without location information.	Accepted
H8. Twitter users who are exposed to minor public safety incidents shared by officials on Twitter will be more likely to share those incidents than people who are exposed to minor public safety incidents shared by normal users on Twitter.	Accepted
H9. Twitter users who are exposed to platform authority will be more likely to share incidents on Twitter than people who are not exposed to platform authority.	Rejected
RQ1. Are there any interactions between the main effects?	No

We opted for not using correction statistical tests such as Bonferroni, because all the hypotheses were planned for.The hypotheses were based on the findings of prior literature in the field of public safety and based on collective action theory premises.

5.5 Discussion

The location of an incident has a major effect on decisions to share that incident on social media [5]. When we looked at decisions to share using the Shield button (allows for more local exposure to public safety tweets), we saw a significant difference of decisions to share using that button. We were able to see an effect of location on decisions to share perhaps for a number of reasons. The new design addition (Shield button) was explicitly explained to participants in a new update to Twitter. The new button was highlighted to participants before they started the experiment, therefore, participants were very aware of its utility and its presence.

The prior finding suggests that Twitter, and possibly other social media platforms, are able to make design enhancements to improve and maintain overall safety. Twitter already has many safety initiatives. For example, with the COVID pandemic, Twitter updated its Terms of Service and included new policies. Posts such as misleading medical tweets, fake news about cures and vaccines, and others have been blocked [32]. We saw that Twitter introduced new censorship guidelines to prevent certain content from being viewed by the public, as well as censoring entire users' profiles. Twitter also has a dedicated Twitter handle @TwitterSafety that is dedicated to maintaining safety while using Twitter worldwide. However, there is always opportunities for improvements and we believe that Twitter could utilize the Shield button and pilot test it with a subset of their customer-base and see if the results we found in the self-report experiment is possible in real life situations.

Examining the effect of coercion on decisions to share was interesting. In Olson's collective action theory, it is presumed that rational individuals are inclined to abide by rules and regulations if there is a form of coercion [74]. We looked at coercion from the perspective of an authority. For source authority we used citizen action group as a source of neutral authority. We presented the source information in a way that may infer authority such as adding a check next to the Twitter handle conveying that the account is authentic. Also, we asked our participants to report how much authority they perceive in the source "citizen action group" ranging from one to seven (highest authority), and they reported a relatively mid to high authority (M=4.37,SD=1.68). When the authority of the original sender of the tweet was high (we used citizen action group), we found that participants were more inclined to share those tweets. This finding is consistent with prior research which found that authority has an impact on compliance [23]. The finding is also consistent with collective action theory [74], proving that the scope of the theory explains behaviors in social media and in the field of public safety. What is interesting is that the type of authority we had was citizen

action group which is a less authority compared with law enforcement. Prior research found that the higher the authority and trustworthiness, the higher the compliance with the said authority [23]. Thus, when participants decided to share the tweets posted by the citizen action group, they might have done so because of authority or because of perceived trustworthiness of the citizen action group, which might be perceived as a neutral party compared to law enforcement. This is an opportunity for future research to look into different levels of authority and explore whether this difference will have a varying effect on decisions to share incidents.

Threats to validity are a serious issue in experimental design. Internal validity threats such as history and maturation do not apply in this experiment because there is no long time periods between treatments. We also tried to remove any possible extraneous variables such as blurring personal information about the author of a tweet, and also removed information such as time and date of the post. However, in certain treatments, the instrument we used might not provided enough of an intervention for it to cause a significant effect. For example, the result of location effect on decisions to share minor incidents is against our expectations. We found that there was no significant difference between sharing posts that contain location information (in the form of extra text next to the post that reads happening locally) compared with tweets that do not. The result failed to support previous well-established research. We speculate a number of reasons of why we did not see a significant difference. The treatment group was exposed to tweets with an extra fictitious information written in blue that says, "happening locally". This addition is not part of the original Twitter design and was not introduced to the participants before the experiment. Perhaps the unfamiliarity of the design change interfered with any possible effects. It is quite possible that participants did not notice this addition and, therefore, inhibited any possible effect on their decisions. Circling back to our results in Chapter 3, we see a clear contradiction. The results of Chapter 5 found no effect of location on decisions to

share based on the ANOVA analysis (although the mean of sharing in closer locations was higher than the mean of sharing with no location information). In Chapter 3, we used a survey tool and found that location had a positive significant effect on decisions to share minor incidents. We believe the results of Chapter 3 are more accurate since it supports prior findings and literature about the role of the physical location on decisions to share minor incidents. It is also common sense for physical location to effect people's decisions about their well being and general safety. It is difficult for us to know the exact reason why we failed to support prior literature, however, as discussed earlier, the design of the experiment might have had an effect on the reported results, which is not uncommon when conducting experimental design.

Platform authority showed no effect on participants decisions to share. This finding is possibly due to the kind of treatment we used. We showed participants a page containing text of a fictitious update to Twitter Terms of Service. It is possible that participants did not fully read the text which is the manipulation. A national survey found that 91% of American users skip the Terms of Service and just consent or click 'ok' to proceed and get access to the content [17]. In fact, an interesting empirical research found that 98% of participants consented on a fake Terms of Service agreement to pay with their first newborn for social media access [72]. Therefore, we speculate that majority of participants failed to read the presented text, they also failed to perceive the authority we predict; therefore, we were not able to see any change in their sharing behavior. It would be interesting for future work to run the study and monitor the time spent on each task, or use eye-tracking tools to ensure that participants were properly exposed to the treatment.

Another possible reason is participant fatigue. We predict possible tiredness and exhaustion which may affect the quality of the reported data [2]. Whether the reason of no effect was fatigue, not reading the text, or the text language being weak and not showing enough authority, we do not recommend including important

updates about safety in the form of text only. Twitter could inform their participants about the update in the form of a short video with attractive animations, along with a voice explaining the new guidelines in a clear and friendly manner. Providing a 6-10 seconds video is proven to grab the most attention [2]. People who view videos tend to retain 95% of the content, while retaining only 10% when they read it as a text format [2]. Also, since 90% of the information that reaches our brains is actually visual [28], relying on short videos to present critical information such as public safety guidelines in social media is vital. Although we did not test this in our research, it would be interesting to run this study with an 'unskippable' short video of the update to Twitter Terms of Service instead of the text we presented.

We asked a question of whether there are any interactions between the main effects, and we found no interactions. We asked the question to explore possible interactions although there was no research that backs up this assumption. There might not be an interaction, or, due to the design limitations, such interactions were buried and failed to show in the ANOVA. Moreover, the nature of the context we tested was minor incidents. It is possible that participants thought that these tweets are not important enough to warrant a share on social media. Thus, running the study with higher severity incidents might reveal different insights.

5.5.1 Limitations

This study includes a number of limitations. The online experiment was based on self-reported data which is not always accurate. Also, running the study in the time of the COVID pandemic could have had an effect on the reported results. Participants' attention and how they view social media and Twitter in particular could have influenced the results. For example, with the rise of the COVID pandemic, the number of fake information and posts on the media skyrocketed [77] and many reports about fake news on social media surfaced. This might have had an effect

on decisions to share critical information on social media. Likewise, we only tested content that was of low severity, where we predict could affect the results and lower decisions to share. Also, the study was conducted on Twitter only, and therefore, any results cannot be generalized to other platforms. Running the same study on different platforms such as Facebook would be interesting to compare and contrast the found results. Finally, the experiment was controlled and, in a semi-controlled environment, therefore, results might vary when the same material is tested in real life contexts.

5.5.2 Summary

In this study, we looked at three variables that might influence Twitter users' tendency to share public safety incidents. We ran a 2 x 2 x 2 repeated measures and between-subjects online experiment (mixed design). We found that location of an incident does not affect decisions to share that incident. Although this finding does not support prior literature, we discuss possible reasons for lack of significant effect. We proposed a design suggestion in the form of a button "we call it the Shield button" that increases exposure to public safety tweets by attaching locally trending hashtags to those tweets. Participants reported using the Shield button significantly more than they used the traditional retweet button. We also looked at whether the authority of the sender of the public safety tweet has an effect on decisions to share. We found that Twitter users are more likely to share incidents if the original tweeter had high authority. We also tested possible effects of platform authority in the form of a fictitious update to Twitter Terms of Service where it explicitly states rules to share safety incidents to improve and maintain safety. We found no effect of platform authority on decisions to share. Design implications and possible future research ideas are discussed.

CHAPTER 6

FUTURE WORK AND CONCLUSION

Public safety is is a basic need for human beings. Dedicating research and valuable resources in this field to explore, study, and analyze possible ways of maintaining this necessity is a work that requires not only law enforcement but also the public. We noticed a gap in research regarding incidents of lower severity and we decided that minor incidents matter too. For example, the number of people who are directly affected by a large incident is larger than a minor incident, however, individuals are more likely to encounter and be the victim of a minor incident than they would be a victim of a much less likely major incident. This dissertation included three completed studies that investigate motivations to share minor public safety incidents on social media. The first study looked at external motivations to share incidents on Twitter and we found that people needed an incentive to participate in this public good. In the second study, we looked at internal motivations to share such as being altruistic. We found that internal motivations had little effect on decisions to share compared with external motivations. In the last study, we focused on external motivations since they were the most salient factors affecting decisions to share. We also tested a possible design implication that allows users to increase exposure to their public safety Tweets.

In this line of research we learned motivations that affect decisions to share incidents on social media. Understanding these motivations allows us to influence such decisions in the interest of the public's safety. In the field of crisis informatics, specialists could emphasize the use of location of an incident to increase the attention given to it. We suggested relying on locally trending hashtags to increase exposure to public safety tweets, however, it was only tested in a controlled setting. In future

work, we could test the button in a natural setting where we ask participants to download an add-on to their browsers that includes the Shield button and test it. Crisis or disaster informatics could use the findings in this research usable in the fight against crimes. Relying on locally trending hashtags is one way of utilizing location, but other possible ways may include sending text messages to people in a local area about an incident, prompting individuals to follow local law enforcement on social media, and possibly remind people of the importance of being part of a local watch group. Under collective action theory, we found that people need an incentive to participate in minor public safety incidents. Therefore, this is an opportunity for public safety apps to focus on a reward system such as allowing users to collect points every time they are involved in reporting or sharing an incident. These points could be redeemed in discounts at local stores, or only as badges of appreciation in the app. Of course, this needs to be further studied because it might come with the problem of misinformation, fake reports, etc. However, we think it is worth looking into the idea of law enforcement or authoritative agencies providing subtle incentives to people in order to get intelligence from them.

In the last study, we mainly looked at geographic location of incidents. In the first study in this dissertation, we found that psychological location closeness has a positive effect on decisions to share incidents. The emotional and personal connectedness a person feels towards a location certainly impacts their behaviors. If a person has loved ones in a remote city, or if they have lived in a location that is far from their home for a while, they continue to hold these feelings that would influence their behaviours related to public safety. This is particularly important perhaps for larger incidents that require more effort and more collaboration and collective action by the public. Minor incidents might not benefit a lot from a person that lives thousands of miles away that feels connected to a location, but disaster incidents might. For example, people who live remotely and feel connected to a location, might

have an active role of participating in petitions, sharing incidents to increase their exposure, provide emotional and mental support to who need it in the effected areas. Such finding needs to be further researched. It is still not clear what are the exact factors that increase or influence one's feelings of connectedness to a location. Also, how can we properly measure them and gauge their exact effect on participating in public safety.

Although this research does not focus on larger incidents, we believe there are similarities in motivations to share incidents of different severity. When we looked at minor incidents, we found that location affected decisions to share, which is also true for larger incidents. However, the effect of location on larger incidents might be more significant. If people see a report on social media about a killer wandering in their neighbourhood, their immediate reaction to this incident would be a lot more significant than when they see a post about someone using drugs in the same neighbourhood. A life threatening situation would always result in larger reactive behaviours. When looking at coercion, in the first study, participants reported that when there is a law or rule from a government they will share minor incidents and follow the rule. However, when we looked at coercion from the Twitter platform, it showed no effect on decisions to share. Compared to larger incidents, we speculate that the effect of coercion will have a larger effect on decisions to share. When there is a rule about sharing an incident that is minor, people might ignore this recommendation due to the low severity and the limited consequences of an incident. Also, coercion in minor incidents needs to be extremely subtle, and logically cannot include punitive actions. But, with larger incidents, coercion could be more severe such as requiring people to share information about such incidents, and if they do not, they are held responsible. Properly communicating such rules would certainly increase sharing of information related to public safety incidents.

Although this research does not provide concrete solutions that have been tested in a real-life context to the problem of under-reporting and under-sharing of incidents, we believe it could be the beginning of such solutions. The first step to make design changes is to understand users' behaviors, then design and test possible changes to current systems. This dissertation is the beginning of more work in this field and hopefully more subsequent work that supports the findings and provides real-life and usable solutions for the public.

This thread of research allowed us to explore and understand sharing behaviors on Twitter in the context of minor public safety incidents. Understanding such behaviors in a social media medium through the collective action theory lens prompts us to further try to explore other similar behaviors on social media using the same theory. For example, when we look at news sharing behavior, would people only share when they have an interest in the matter? Would collective action theory help us understand and explain the reasons why people share news on social media? Other interesting contexts, given the current times, would be COVID related news and incidents. What effects decisions to share COVID news on social media? Is it bounded by collective action theory premises, which is that people will share such news only when there is a benefit for them? Or would it explain only part of the sharing behaviors. This would be an interesting future work agenda due to the fact that the number of sharing fake COVID related news and incidents has increased [77], which is a hazard to public health and safety. Understanding such behaviors would help us attempt to shape them, or at least influence such behaviors in a matter that is favourable to the general health and safety for everyone.

APPENDIX A

PUBLIC SAFETY TWEETS THAT WERE PILOT TESTED FOR TREATMENT ONE

This appendix includes text from fictitious tweets that we tested to be used in the online experiment.

- I just saw someone get mugged in the mall. Please be careful.
- Guys, I just lost my phone after leaving it in a library when I went to the bathroom. Please be careful.
- The wind had a tree fall in the middle of the road and electric cables are down. Watch out!
- I am pretty much sure I was mugged today. I had a $20 bill in my pocket and after leaving the subway, it was gone. Please be careful.
- My wife saw a man pickpocketing someone on the street. She yelled at him and he ran away. Please be careful.
- A drunk man showed up out of nowhere threatened to hurt me because I refused to let him use my phone. Watch out!
- I saw someone trying to break into a car late at night. I was too scared to take a photo of them because they looked sketchy. Watch out!
- Ok, so I left my car in front of a convenience store and when I came back, I noticed that my car wheels rims were gone. Watch out!
- Someone was pretending to be our neighbor and tried to break in our neighbors' home. He refused to leave until I threatened to call the police. Watch out!
- A suspicious person just asked me if I can give them a ride. I refused and immediately left. Please be careful.
- I saw someone intentionally picking fights with random people in a grocery store. He might have a weapon on (not sure tho!). Watch out!
- My cousin just got robbed from a hitchhiker who took her wallet, phone, and her sunglasses. Please be careful.
- There is a lot of unremoved debris on the road from yesterday's truck accident. I just got a piece stuck in my tire. Watch out!
- I was walking my dog in a busy park and was pickpocketed. Please be careful.
- I saw a stranger picking up a package from my front door and when he saw me, he threw the package and ran away. Watch out!
- Someone just stole my phone charger in the mall parking lot. Please be careful.
- A disturbing looking person was cursing at me and he looked very threatening. Please be careful.

- There is a tree and an electrical line down from the storm, along Maple Avenue in town. Be careful
- There is a tornado warning in effect for our area. Be careful
- The traffic light is out where Main Street crosses the highway, be careful.
- The roads are very icy this morning, I just skidded on my street and hit a tree. Be careful
- High heat warning today, stay inside if possible
- My Amazon packages were stolen from my doorstep this morning. Be careful
- There is a bike race scheduled to come through our streets this Saturday, be sure to watch out for them.
- My mailbox was opened by somebody walking by this morning, and they took some things out before I could stop them. Be careful

APPENDIX B

PUBLIC SAFETY TWEETS THAT WERE PILOT TESTED FOR TREATMENT TWO

This appendix includes text from fictitious tweets that we tested to be used in the online experiment.

- Someone just got mugged in the mall. Please report any information you may have to your local law enforcement office.
- An iPhone was stolen from the library today. Please report any information you may have to your local law enforcement office.
- The wind had a tree fall in the middle of the road and electric cables are down. Please stay safe and watch out.
- Mugging incidents have increased in the subway. Please report any information you may have to your local law enforcement office.
- A drunk man threatened to hurt a civilian because he refused to let him use his phone. Please report any information you may have to your local law enforcement office.
- Someone was seen trying to break into a car late at night. Please report any information you may have to your local law enforcement office.
- Stolen car wheel rims from a car parked in front of a convenient store. Please report any information you may have to your local law enforcement office.
- Someone was pretending to be the resident of a house and tried to brake in. Please report any information you may have to your local law enforcement office.
- We received a number of reports about suspicious people asking for rides. Please stay safe and watch out.
- Someone was reported conducting disorderly conduct in a grocery store. Please report any information you may have to your local law enforcement office.
- A hitchhiker took a wallet, phone, and sunglasses from the person who offered them a ride. Please stay safe and watch out.
- Traffic Advisory: There is a lot of unremoved debris on the road from yesterday's truck accident. Please stay safe and watch out.
- We received a number of reports about pickpocketing in a busy park. Please stay safe and watch out.
- A stranger picked up a package from someone's front door and when he was seen, he threw the package and ran away. Please report any information you may have to your local law enforcement office.
- Someone stole a phone charger in the mall parking lot. Please stay safe and watch out.

- A disturbing and threatening looking person was cursing at people. Please stay safe and watch out.
- There is a tree and an electrical line down from the storm, along Maple Avenue in town. Be careful
- There is a tornado warning in effect for our area. Be careful
- The traffic light is out where Main Street crosses the highway, be careful.
- The roads are very icy this morning, I just skidded on my street and hit a tree. Be careful
- High heat warning today, stay inside if possible
- Some Amazon packages were reportedly stolen this morning. Be careful
- There is a bike race scheduled to come through our streets this Saturday, be sure to watch out for them.
- A mailbox was reportedly opened by somebody walking by this morning, and they took some things out before they were stopped. Be careful

APPENDIX C

TESTING PROTOCOL

This appendix includes the protocol questions used for the pretesting.

C.1 Treatment One Pre-testing: Qualitative Interview

Protocol questions:

1. How old are you? Or if you prefer to give me a range?
2. What is your gender?
3. How often do you use Twitter?
4. How often do you interact in Twitter such as tweeting, retweeting, and liking?

Then I presented the Shield button design to participants, and asked them to read the text below, the asked the questions that follow:

"Dear Twitter user, we would like to update you about a new function in the app. The "Shield" button you see next to the tweet button, is meant to allow you to share public safety related incidents that you believe are local to you. By clicking the button, the underlying algorithm will automatically find local trending hashtags in your area, and automatically attach them to the tweet you wish to share locally. This will provide for more exposure to the tweet to maintain and improve the safety of your community. The button also has an algorithm to test the content of the tweet and ensure the topic is safety related."

Questions I asked after showing the button design and the text to participants:

1. Do you notice anything different than the original design?
2. What do you think of the button design?
3. After reading the explanation text, is the button function clear to you?
4. What would you change in the design?

C.2 Treatment Two Pre-testing: Qualitative Interview

I showed this text to the same sample and asked them the questions below:

"Dear Twitter user, please read the update to our Terms of Service. In order to comply with public safety laws and regulations, Twitter users are now highly encouraged to share public safety related incidents they see in their Twitter feed, in hopes of maintaining and improving public safety for our communities. When it comes to enforcing these rules, we are committed to being:

- Fair – we will enforce our rules impartially and consistently, considering the context involved.
- Informative – we will inform you about actions taken against your account and why.
- Responsive – you can appeal decisions that have impacted your account.

- Accountable – we will be transparent about actions we take to promote healthy public conversation, including by publicly reporting the metrics we are using to measure health and by publishing a regular transparency report around violations of our rules."

1. Does the update look real?
2. What would you add/remove or change from the content of the text to make it seem more real?
3. Does the new update convey authority?

C.3 Stimuli Testing: Quantitative Study

This testing will be conducted in MTurk. Participants will see the short consent form below:

Welcome to this public safety tweet evaluation task!

Throughout the course of this study, you will be asked to evaluate 25 tweets related to public safety incidents. After every tweet, you will be asked to answer a number of questions regarding the severity of the incident.

This HIT should take around 10 minutes. You will receive $3 for completing the survey. Upon successfully completing the task, you will receive a code to enter in order to receive your payment.

Your participation in this study is voluntary and you may withdraw your participation at any point without any consequences.

If you agree to participate, please click "I consent" below. If you are no longer interested, please click "I do not consent" to exit this study.

- I consent.
- I do not consent.

After showing Mechanical Turk participants each tweet, they will be asked the following questions:

Degree of Hurt [109] Thinking about the previous Tweet, the situation:

1. Was not at all hurtful..... Was extremely hurtful
2. Caused no emotional pain ..... Caused intense emotional pain
3. Did not hurt the victim at all ..... Hurt the victim quite a bit
4. Was not severe at all ..... Was very severe
5. Was not serious at all ..... Was very serious

C.4 Online Experiment Survey

TITLE OF STUDY: Experiment study for a Ph.D. dissertation to understand if location, coercion, and public safety content exposure online has an effect on decisions to share incidents on Twitter

I have been asked to participate in a research study under the direction of Dr. Donghee Yvette Wohn.

PURPOSE: The purpose of this research is to conduct an online experiment to understand Twitter users' sharing behaviors. We aim to understand what motivates

Twitter users to participate and share public safety incidents on Twitter to increase public safety in general.

DURATION: My participation in this study will last for about 15 minutes.

I have been told that my participation in this research study is important for the success of the research and that the results of this research study are expected to produce the following benefits to society and for me as a subject.

BENEFITS FOR SOCIETY AND THE SUBJECT:

I have been told that the benefits are:

Understanding these effects will help the researchers propose design implications for Twitter and other social media platforms to encourage more participation from the crowd in public safety matters, which would result in improved public safety in general.

PROCEDURES:

I have been told that, during the course of this study, the following will occur:

I will be asked to participate in an online experiment through an online survey. I will see a number of tweets and answer questions about sharing behaviors and other demographic questions. My participation is voluntary and I can withdraw at any time.

EXCLUSIONS:

I will inform the researcher if any of the following apply to me:

- I am 18 years or older.
- I am a user of Twitter.

RISKS/DISCOMFORTS:

To the best of our knowledge, there will be no risk or pain associated with the survey questionnaire

There also may be risks and discomforts that are not yet known.

I fully recognize that there are risks that I may be exposed to by volunteering in this study which are inherent in participating in any study; I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in the study.

CONFIDENTIALITY:

I understand confidential is not the same as anonymous. Confidential means that my name will not be disclosed if there exists a documented linkage between my identity and my responses as recorded in the research records. Every effort will be made to maintain the confidentiality of my study records. If the findings from the study are published, I will not be identified by name. My identity will remain confidential unless disclosure is required by law.

RIGHT TO REFUSE OR WITHDRAW:

I understand that my participation is voluntary and I may refuse to participate, or may discontinue my participation at any time with no adverse consequence. I also understand that the investigator has the right to withdraw me from the study at any time.

- I consent.
- I do not consent.

Please answer the following questions to the best of your knowledge: [Qualifier questions]

1. What is your age?

- Under 18 years old
- 18 - 27 years old
- 28 - 37 years old
- 38 - 47 years old
- 48 - 57 years old
- 58+

exist survey if under 18 years old

2. *Are you a Twitter user?*
    - *(yes/no)*

    exist survey if answer is no

3. *How often do you use Twitter?*
    - *Less than once every three months*
    - *Once or twice every two months*
    - *Several times a month*
    - *Several times a week*
    - *Several times a day*

4. *How often do you tweet or retweet?*
    - *Less than once every three months*
    - *Once or twice every two months*
    - *Several times a month*
    - *Several times a week*
    - *Several times a day*

    General and demographic questions

5. *Please specify your ethnicity.*
    - *American Indian or Alaska Native*
    - *Asian*
    - *Black or African American*
    - *Native Hawaiian or Other Pacific Islander*
    - *White*
    - *Mixed race*
    - *Other*

6. *What is your gender?*
    - *Female*
    - *Male*

- *Other [ ]*
- *Prefer not to say*

7. *Excluding kindergarten, how many years of education have you completed? [ ]*
8. *Have you shared posts on Twitter about public safety incidents?*
    - *Yes*
    - *No*

    If yes:

9. *Why do you share public safety incidents on Twitter?*

    text

    If no:

10. *Why don't you share public safety incidents on Twitter?*

    text

    Manipulation test:

    (a) *What was the topic(s) of the tweet(s) presented in this study? (check all that apply)*
        - *Public safety*
        - *Nature*
        - *Education*
        - *Politics*
        - *Other*

        answer options here will have a different order with different questions.

    (b) *How much authority did you perceive in the sender of the previous tweet?*
        - *1. Very high authority*
        - *2.*
        - *3.*
        - *4.*
        - *5.*
        - *6.*
        - *7. No authority*

    (c) *Do you think Twitter as a platform has an authority to influence users about the content they post?*
        - *Yes*
        - *No*

    Post survey question:

    (a) *Were the questions clear to you?*
        - *1. They were not clear at all*
        - *2.*

- *3.*
- *4.*
- *5.*
- *6.*
- *7. They were very clear*

(b) *Were the instructions and explanations in the survey clear to you?*

- *1. They were not clear at all*
- *2.*
- *3.*
- *4.*
- *5.*
- *6.*
- *7. They were very clear*

(c) *I paid attention throughout the time I was doing the survey (this will not affect your payment)*

- *Yes*
- *No*

(d) *Is there anything you would like to tell us about the survey?*

- *text*

Post survey statement:

Thank you so much for your input! We would like to state that in this study, we have used photoshop to add certain fictitious elements to the design of tweets and Twitter to see how it would affect your decision to participate in sharing incidents on social media. In particular, the following elements you have seen in the previous study were not real:

- *All tweets, along with tweeters identities are fictitious.*
- *The update to Twitter Terms of Service (if you were exposed to this in this survey) is fictitious.*

Your input will greatly help us understand users sharing behavior in an effort to maintain and increase public safety for everyone.

Sincerely,
The researchers

APPENDIX D

PUBLIC SAFETY TWEETS USED IN THE EXPERIMENT

This section includes the fictitious tweets that were found to be of minor severity and used in the online experiment.

- Guys, I just lost my phone after leaving it in a library when I went to the bathroom. Please be careful.
- The wind had a tree fall in the middle of the road and electric cables are down. Watch out!
- I am pretty much sure I was mugged today. I had a $20 bill in my pocket and after leaving the subway, it was gone. Please be careful.
- A suspicious person just asked me if I can give them a ride. I refused and immediately left. Please be careful.
- There is a lot of unremoved debris on the road from yesterday's truck accident. I just got a piece stuck in my tire. Watch out!
- I saw a stranger picking up a package from my front door and when he saw me, he threw the package and ran away. Watch out!
- Someone just stole my phone charger in the mall parking lot. Please be careful.
- There is a tree and an electrical line down from the storm, along Maple Avenue in town. Be careful.
- There is a tornado warning in effect for our area. Be careful
- The traffic light is out where Main Street crosses the highway, be careful.
- High heat warning today, stay inside if possible
- There is a bike race scheduled to come through our streets this Saturday, be sure to watch out for them.

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