Social Stress and Social Media

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A good deal of evidence shows that members of stigmatized groups suffer disadvantages directly attributable to their stigmatized identities (Hatzenbuehler, Phelan, and Link 2013). For instance, LGBTQ youth are more likely to report being homeless (Coker, Austin, and Schuster 2010), obese people face increased employment discrimination (Puhl and Heuer 2009), and African-Americans suffer from suppressed educational achievement (Steele 1997). Besides obviously being undesireable, these chronically experienced disadvantages represent regular reminders that one's social identity is devalued. The regular ocurrence of these reminders, and their accrual across a lifetime have been linked to a variety of negative health outcomes, including suicide (Hatzenbuehler 2011), heart disease, and stroke (Major and O'Brien 2005). Notably, it is not just the objective disadvantages that lead to these negative health outcomes, but some research suggests that the subjective experience of being devalued contributes to these problems as well (Schmitt et al. 2014).

However, most of the literature on the experience of stigma and discrimination addresses experiences of personal discrimination - the occurrence of a discriminatory event that happens to an individual. In contrast, experiences of group discrimination - when the discrimination is directed to a stigmatized group as a whole, has received somewhat less scrutiny. In a recent meta-analysis, Schmitt et al. (2014) analyzed 296 studies concerning the effects of perceived personal discrimination on mental and physical well-being, finding a statistically reliable negative association. Studies of group discrimination were rarer, with only 55 studies in this sample. Nonetheless, this analysis suggested a negative link between preceived group discrimination and health, though given the paucity of work, this is clearly a relatively underexplored area.

In addition to a dearth of studies on the effects of perceived group discrimination, the ones that exist tend to rely on some form of self-report. While this is a valuable and important way of obtaining information, it clearly isn't ideal. The typical compliment to these self-report studies is a lab-based experiment. Unfortunately, studying these phenomenon in the lab is difficult, as health effects tend to occur over time scales that are not ammenable to lab methodology. Furthermore, maintaining external validity is paramount to study these phenomena. Subjecting individuals to externally valid forms of discrimination is not only difficult, but also ethically dubious in light of the evidence of negative consequences for well-being. The work proposed here uses methods that overcome these concerns. Coincidentally, the technology that allows the use of these methods also increases the importance of asking questions about how individuals respond to instances of perceived group discrimination.

A new social environment and research tool

In the last decade, the social environment for most people living in the United States and beyond has fundamentally changed. The ease and speed with which we can connect with others and communicate and receive information has exponentially increased due to the internet and social media. It is now possible to be aware of global or national events in real-time. Furthermore, information about events that may have once not spread out of a geographical area or select social groups now has the potential to rapidly spread outside of these geographic and social feifs, capturing the attention and influencing the behavior of much larger numbers of people. Consequently, individuals with stigmatized identites are now more likely to come into contact with events depicting instances of discrimination against their group. For instance, while the recent uptick in attention on police violence towards African Americans might suggest an increase in the occurrence of police violence, an equally likely (perhaps more likely) possibility is simply that it is now easier to broadcast news of these events.

Beside changing communication, these developments also have ramifications for scientific methodology. By using the internet and social media, we can explore data on a large scale that also reflects extraordinarily detailed behavior. Recent work has shown that it's possible to track a number of interesting behaviors

using social media data, including diurnal activity (Grinberg et al. 2013), symptoms of mental health (De Choudhury et al. 2013), affective responses to traumatic national events (Doré et al. 2015), and even patterns of activisim during social protest movements (De Choudhury et al. 2016).

In this work, I propose to leverage these developments to study pressing questions about stress and behavior that have previously been very difficult or impossible to explore Specifically, this research will aim to answer the following broad research questions:

1. How does perceived group discrimination influence mental and physical well-being?
2. How does perceived group discrimination influence the way in which we engage in social contact?
3. Do the effects of perceived group discrimination (i.e. stress and its behavioral responses) spread through a social network in the same way as other information (e.g. emotion, (Kramer, Guillory, and Hancock 2014)).
4. How do the effects of stress experienced due to perceived group discrimination differ from the stress that is experienced for other social regions (e.g. geographical or social proximity to a traumatic event)

Pilot data support

There are a number of ways of answering these questions. One coarse way of providing initial evidence is to simply look at when individuals are active on Twitter following an event highlighting perceived group discrimination. Previous work has provided some support for a connection between experiences of heightened stress and diurnal activity. For instance, Lavie (2001) reviews the relationship between trauma and sleep, highlighting a strong link, but one with inconsistencies. One issue is that retrospective reports of sleep disturbances tend to conflict with detailed lab-based studies. While self-reports suggest loss of sleep following stressful events, lab studies suggest otherwise. However, it's difficult to know which is more accurate, given that the lab studies tend to feature small sample sizes and substantially reduced ecological validity. As previously mentioned, ecological validity is paramount when exploring these issues. In short, this work would predict that individuals who perceived extensive group discrimination toward their group would show signs consistent with a loss of sleep - including being more active on social media late into the night.

As a preliminary step, I gathered tweets from the followers of twitter accounts associated with a number of distinct demographic groups - African Americans (@todayinblk, @drgoddess, and @shani_o), Latino Americans (@americanlatino, @latism, @NCLR), Asian American (@AsAmNews, @NBCAsianAmerica, @NCAPAtweets), Christians (@christianpost), news organizations (@reutersus), and two police organizations - one closely associated with the events in Ferguson (@stlcountypd) and one without close connections (@NYPDnews). The individuals following these accounts should identify with their respective demographic group at a higher level than the general population, since these accounts tweet about issues related to identity, culture, and lifestyle of the respective group, and users can voluntarily choose who to follow.

For a specific event that would be perceived as discriminatory towards the group, the shooting of Michael Brown and subsequent events in Ferguson is one of the more salient discriminatory events for African Americans in the last several years. This analysis focuses on the number of tweets issued by the followers of the above accounts in the two weeks before and after the shooting of Michael Brown.

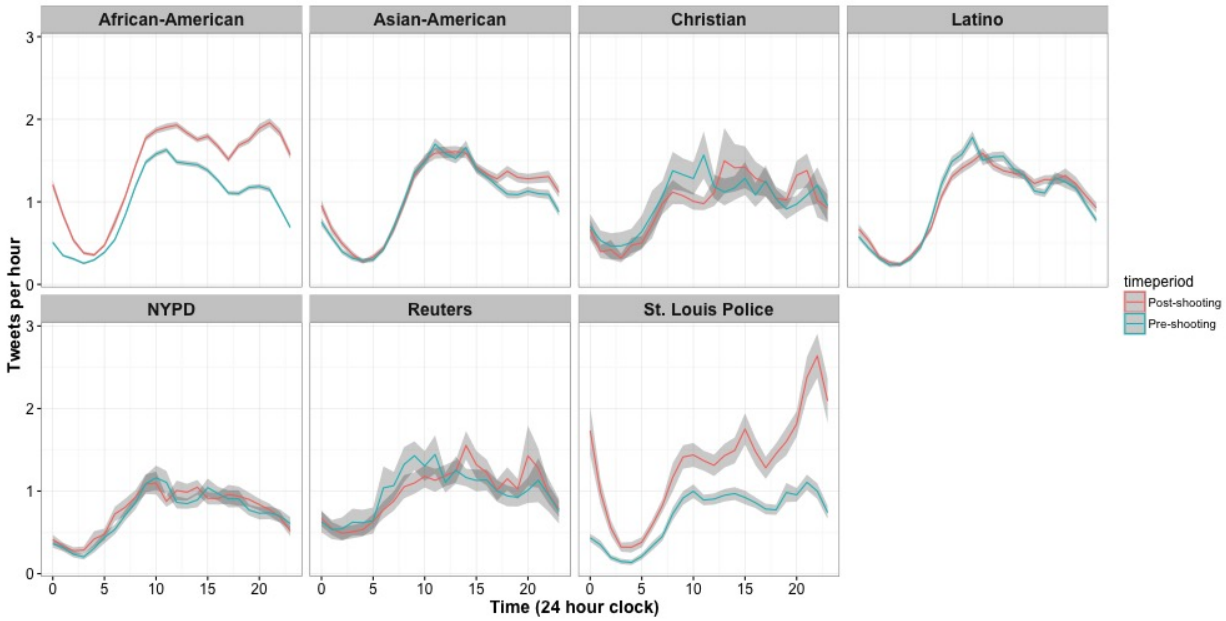

Figure 1: Twenty-four hour activity cycle on twitter for two weeks before and after the Michael Brown shooting. Shading represents +/- 1 standard error

Due to rate limits on Twitter's API, data collection is still ongoing. Currently, the data from this month-long period is composed of almost 1.5 million tweets from 28,479 users. Figure 1 presents the average number of tweets at each hour of the day from this month-long period. A systematic diurnal cycle is apparent from the low point in the early morning, and the increase in activity in the late morning and evening. Even the most cursory examination shows that there are two groups who appear to have changed their behavior after the shooting - those who follow the African-American focused accounts, and those who follow the St. Louis Police Department account. Figure 2 shows this same information, but disaggregated across the two weeks, showing the daily fluctuations longitudinally.

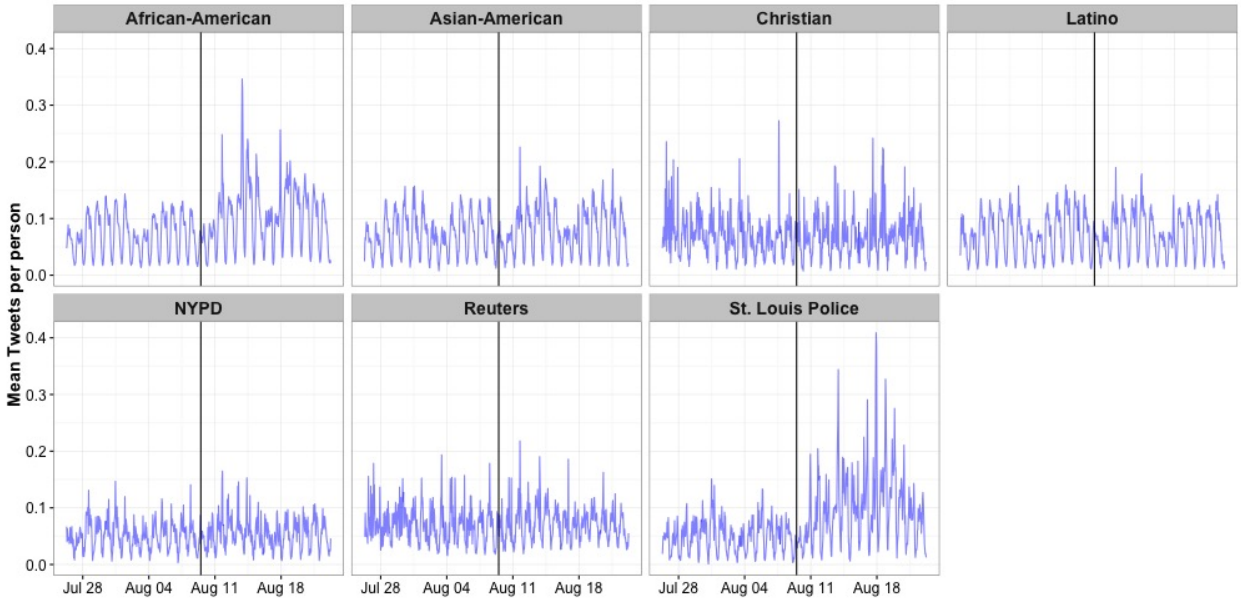

Figure 2: Activity on twitter for two weeks before and after Michael Brown shooting. The black line is the time point at which Michael Brown was shot.

Although it's clear that there is increased activity in general after the shooting, it's especially noteworthy that this increase in activity persists late into the night for these two groups. The behavior exhibited by the African American group is consistent with the hypothesis that the events in Ferguson lead to sleep disturbances among this group. A similar pattern is exhibited by those who follow the St. Louis Police Department's twitter account. However, it's notable that there is no such pattern exhibited by the followers of the NYPD account, suggesting that the stress experienced as a function of this event does not generalize to those who closely identify with law enforcement. Instead, the response shown by the St. Louis Police Department is likely due to the close geographic and social connections with the event.

There are, of course, other explanations for these patterns, and these data require a more formal analysis. Furthermore, a simple exploration of *when* people tweet is much different than a full analysis of the behavior on social media. For instance, what is the content of these tweets, and is there any observable effect of the shooting on when and how people reach out to make contact with one another on the platform? It's nuanced analyses such as these that can give a fuller picture of the psychological and behavioral responses to these tragic events.

Literature support

Do social stressors modulate our diurnal cycles? The pilot work above sheds some light on how we can study trauma on sleep patterns for a wide swath of people. Of course, this would not be the first work on these topics. As mentioned above, the published literature in this area has some inconsistencies that this work could help clarify (Lavie 2001). Furthermore, in this work, it is possible to follow these effects across a longer period of time than would be possible in lab or self-report studies. This work would also make a novel contribution, as it would be the first to explore whether stress that is attributable to identification with a social identity has the same effects as stress that is attributable to close social and geographic connections to traumatic events.

How do social stressors change how we engage in social contact and how do they diffuse through a network? This methodology allows us to explore how social contact changes following a traumatic event. For example, do those affected by a traumatic event increase contact with each other? Or is this increased twitter activity dedicated to outreach of those outside of their immediate social networks/those not as affected by the event? Does ingroup vs. outgroup twitter contact affect how traumatized individuals are coping with the event? When people affected by an event engaged with those outside of their social circle, what is the content of these tweets?

There is also some work exploring how individuals under threat will engage in social contact. Notably, Schachter (1959), extending social comparison theory, clearly predicts that individuals will induce affiliative motives, and that these same processes also extend to a construction of a socially shared reality. This idea would also provide a potential explanation for any contagion effects of emotion or stress that may occur. Some empirical evidence exists supporting that individuals will engage in these behaviors (Gump and Kulik 1997; Luminet IV et al. 2000), but the scope of the evidence is somewhat limited, and there is some ambiguity with regard to whether and when these hypotheses are supported. For the current work, this would suggest that the clustering of people within networks would grow stronger after a stressful experience as described above, and that individuals would be more likely to initiate and reciprocate contact with others who are members of the network under threat. To my knowledge, this work would also be the first to explore changes in the structure of a social network as a function of stress or threat, though this appears to be consistent with the theorizing of Schachter (1959).

In addition to relying on social media data for these insights, it may also be possible to obtain fine-grained activity data from one of a number of companies who collect such data with specialized hardware. Fitbit, Garmin, Jawbone, Apple, Google, and Microsoft are just a few of the several companies who have developed activity tracking hardware. Some of these companies, in particular Google and Microsoft, are well-known for their academic collaborations and scholarly activity, making interest in collaboration more likely.

Conclusion

This project would consist of examining the effects of social stressors on behavior using two data sources - social media data, and activity tracker data. The objective is to better understand how traumatic events influence behavior on a large scale. The questions, specific events, and data sources described here are not exhaustive, and there are many other ideas that can be explored in this common framework. In addition to methodological novelty, this work will address questions of social identity and health that have fundamental importance to researchers working in the areas of social and health psychology.

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