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Individual Costs and Community Benefits: Collectivism and Individuals' Compliance

with Non-Pharmaceutical Interventions to Combat COVID-19

A Thesis submitted in partial satisfaction of the requirements for the degree Master of

Arts in Psychological & Brain Sciences

by

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The thesis of Su Yi Leong is approved.

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David K. Sherman, Committee Chair

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ABSTRACT

Individual Costs and Community Benefits: Collectivism and Individuals' Compliance

with Non-Pharmaceutical Interventions to Combat COVID-19

by

Su Yi Leong

Digital contact tracing (DCT) and face coverings are community-benefiting non-pharmaceutical interventions (NPIs) to combat COVID-19 that impose some personal cost. Collectivism, a cultural orientation associated with prioritizing group goals over individual goals, has been shown to predict greater compliance to NPIs. However, the psychological mechanism underlying this association has not been investigated. The present study examined different aspects of collectivism (i.e., concern for community, normative influence, trust and perceived institution efficacy) that could explain greater compliance. More collectivistic individuals were more likely to comply with NPIs and this relationship was explained by collectivists' greater susceptibility to normative influence and, trust and perceived institution efficacy, but not by greater concern for community. This research reveals specific pathways by which collectivism leads to community-benefiting compliance behaviors and highlights the role of cultural orientation in shaping individuals' decisions that involve a tension between individual cost and community benefit.

I. Introduction

In response to the COVID-19 outbreak, countries have implemented a wide variety of community non-pharmaceutical interventions (NPIs) to control the pandemic, observing varying degrees of implementation success (Flaxman et al., 2020). Despite their clear benefits to the community as well to the individuals in it, NPIs were met with resistance in many parts of the world as they impose some personal costs. Some people readily wore face coverings, while others protested against mask mandates as they viewed it as violating personal liberty (Stewart, 2020). Similarly, surveillance technology like DCT is accepted by some as an effective tool in protecting the community, while others reject it as a violation of personal privacy (Megnin-Viggars et al., 2020). For these NPIs to be successful, a society needs its citizens to be willing to make decisions that pose personal costs for the sake of their community.

Collectivism, a cultural orientation associated with the maintenance of interdependence through prioritizing group goals over individuals' goals (Markus & Kitayama, 1991; Triandis, 1989), is a closely relevant psychological factor that could predict more successful adaptation of these NPIs. Indeed, recent studies on cultural orientation and COVID-19 found stronger compliance with NPIs in more collectivistic countries (e.g., Lu et al., 2021; Im & Chen, 2020, preprint; Im, et al., 2021, preprint). In the present study, we seek to advance the understanding of the specific psychological mechanisms underlying the influence of collectivism on individuals' decisions to adapt NPIs. In two studies, we examine whether collectivism, as an individual-level cultural orientation, is related to individuals' likelihood to comply with two COVID-preventive NPIs (i.e., opting-in to digital contact tracing and wearing face coverings) and test three aspects of collectivism as potential explanations –

concern for community, normative influence, and trust and perceived institution efficacy.

A. COVID-19 Compliance Behaviors

Digital contact tracing and wearing face coverings are important NPIs to curb the spread of COVID-19. DCT aids traditional contact tracing efforts by identifying potential exposure to the virus based on the location and duration of interactions between two (or more) people through cellular technology; wearing face coverings creates a barrier to prevent respiratory droplets from reaching others (CDC, 2020). However, despite their effectiveness and accessibility, DCT and face covering were not universally adopted.

This study focuses on opting-in to DCT and wearing face coverings as key compliance behaviors that are particularly relevant to collectivism for several theoretical reasons. First, opting-in to DCT and wearing face coverings are clear examples of behaviors that impose some individual costs to achieve a collective goal. Specifically, because DCT tracks one's location and interactions with others, individuals may view it as a violation of one's privacy, a new form of government surveillance (Megnin-Viggars et al., 2020; Whitelaw et al., 2020) or a potential source of discrimination and stigmatization (e.g., fear of being judged) even if COVID-19 exposure notifications are anonymous (Megnin-Viggars et al., 2020). Wearing face coverings can be uncomfortable and inconvenient, and is associated in some contexts with the stigma of being sick and weak (Leung, 2020; Bakhit et al., 2020; Sotgiu & Dobler, 2020). Second, both measures require a sufficient proportion of the population to comply to be optimally effective. For example, at least 60% of the population has to opt-in to DCT for the technology to be effective (Ferretti et al., 2020). Thus, how and why individuals comply is an essential question to understand in order to carry out successful community-level interventions.

Yet, there is also a key feature that differentiates opting-in to DCT from wearing face coverings in public. During data collection, the United States had no official implementation of DCT. Recognizing that intentions to opt-in does not necessarily translate to actual behaviors, we included wearing face coverings in public as a behavioral outcome in Study 2. Furthermore, in most contexts, opting-in to DCT is a private decision that only involves downloading an app to the phone without the need to inform anyone whereas wearing face coverings is an inherently publicly visible behavior. We included both outcome variables to test the generalizability of people's compliance with different types of NPIs. With these target behaviors, we examine whether and why collectivism as an individual value orientation plays a significant role in influencing people's decisions to comply with these NPIs.

B. The Role of Collectivism

Cultural orientation shapes individuals' views of themselves in relation to others, and influences individuals' reactions and behaviors in social situations (Markus & Kitayama, 1991; Triandis, 1989). Collectivistic individuals tend to view themselves as inherently part of a larger group, and subordinate their personal goals to prioritize communal goals (Kim & Lawrie, 2019; Triandis, 1989). Such collectivistic tendencies are particularly beneficial, both psychologically and behaviorally, in the face of a common threat. For instance, collectivistic characteristics, such as the sharp in-group/out-group distinction and greater conformity, serve as important functions of antipathogen defense and inhibit pathogen transmissions within the community (Fincher et al., 2008).

Further, collectivism, both as an individual- and context-level factor, offers a psychological safety net that buffers the negative effects of heightened vulnerability when

faced with a disease threat. In research on Ebola during the 2014 outbreak (Kim et al., 2016), the influence of collectivism was explained by collectivists' tendency to believe that they and their community can protect themselves. In the context of COVID-19, national- and U.S. state-level collectivism positively predicted mask wearing (Lu et al., 2021), and national-level collectivism predicted quicker mobilization of social distancing behaviors (Im & Chen, 2020; preprint). Although collectivism's psychological and behavioral protective functions have been established, why collectivism fosters community-protective individual behaviors is not well understood. We test three paths through which individuals may yield their self-interest for collective goals – the potential roles of concern for community, normative influence, and trust and perceived institution efficacy – to better understand the ways through which collectivism is associated with behavioral compliance.

1. Community Concern

Because adhering to NPIs incurs some personal cost for a collective goal, greater concern towards in-group members may explain why collectivists are likely to make community serving decisions even if there is some personal cost. Numerous studies have demonstrated that collectivists were more concerned about the impacts and consequences of their actions on their in-group members, and would more likely engage in behaviors that preserve group harmony (Hui & Triandis, 1986; Triandis, 1989; Markus & Kitayama, 1991). Even when resources were scarce, collectivists would more likely allocate resources to those who made great contribution to a collective entity (e.g., society), and evaluated them more positively (Mullen & Skitka, 2009). Similarly, in situations that involved sacrificing self-interest for a collective goal, more collectivistic individuals would more likely sacrifice their self-gain and allocated more resources to benefit their in-group members (Leung & Bond, 1984). Given

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the greater emphasis on in-group goals and priorities, we posit that people higher on collectivism may comply with NPIs to a greater extent due to greater concern for community wellbeing.

2. Normative Influence

In collectivistic cultural contexts, behaving in a manner that is consistent with others validates the self as a good person, and enhances life satisfaction (Kitayama et al., 2000; Suh et al., 1998). There are two paths that explain collectivists' greater susceptibility to normative influence. First, collectivists make fewer distinctions between self and others, and view personal and group identities as interchangeable (Spencer-Rodgers et al., 2007). Prior studies have demonstrated that collectivists overestimated the extent to which their preferences and feelings are transparent to their close others (Vorauer & Cameron, 2003), as well as the percentage of people who agree with their opinions (Choi & Cha, 2019; H.S. Park, 2012), termed "false consensus effect". Thus, it is possible that collectivists will project their own behaviors to the group levels, and use group behaviors to inform their own. As a result, more collectivistic individuals may perceive, and sometimes even overestimate, consensus between their personal and group behaviors.

The second path is through conformity. In more collectivistic cultural contexts, conformity and behaving in ways consistent with the group are more prevalent and valued, compared to more individualistic cultural contexts (Kim & Markus, 1999; Kinias et al., 2014). Thus, when clear norms are present, people from more collectivistic cultural contexts are more likely to conform than people from individualistic cultural contexts. Taken together, we hypothesize that more collectivistic individuals will report greater perceived proportion of people who complied with each NPI, and in turn, the greater perceived social norms will

predict greater compliance with NPIs.

3. Trust in Institutions

Combatting COVID-19 is a collective effort that requires public compliance spearheaded by an authority, oftentimes the government. Public compliance was greater in many Asian countries, possibly because of collectivists' tendency to follow authorities' recommendations (An & Tang, 2020). As evidenced in pandemics current and past, individuals who had greater trust in government were more likely to follow health guidelines and engage in preventive behaviors (Bargain & Aminjonov, 2020; Blair et al., 2017). Compared to more individualistic people, collectivistic people tend to make decisions that reflect deference to authority and experience greater guilt if they behave in a way that violates the expectations of authorities (Savani et al., 2012). A recent cross-cultural study (Travaglino & Moon, 2021) that examined the role of trust in government and the relationship between cultural orientation and compliance to health measures revealed that collectivism was associated with stronger trust in government. Taken together, collectivists' obedience to authority and trust in authority as benevolent and efficacious may be one reason why they more closely follow governments' recommendations. The present study examines which of these paths explain the association between collectivism and compliance with NPIs.

II. Overview of the Study

The present study was a survey that included measures of individualism-collectivism, three potential mediators, and compliance with NPIs. The study was conducted in two different samples – college students and the general U.S. population - to test generalizability of the theoretical model across different populations. Unlike recent findings that rely on state- and country-level indices (e.g., Lu et al., 2021), we operationalized individualism and

collectivism at the individual level as value orientations. Prior work examining has shown stronger relationships of collectivistic value orientation than individualistic value orientation in response to collective threats such as disease (Kim et al., 2016) and climate change (Sherman et al., 2021). Thus, we primarily focus on collectivism, although we control for and examine individualism as an additional factor. Taken together, we predicted that individual-level collectivism will predict greater compliance.

III. Study 1 Method

A. Participants

A total of 454 participants were recruited from a large public university in the West Coast. Due to campus closure, participants were recruited from multiple platforms, including departmental subject pools ($N = 231$), courses ($N = 175$), and convenient sampling through flyers and newsletters ($N = 48$). 69.6% of the participants identified themselves as female, 28.6% as male, and 1.8% as non-binary/other. The mean age of participants was 20.4 ($SD = 1.77$). 41.1% of the participants identified themselves as White, 32.4% as Asian, 18.2% as Hispanic/Latino, 3.3% as Black, 0.2% as Native American, and 4.7% as Multiracial/Other. Participants who identified as White were considered a majority group member (41.3%), while participants who identified as other racial/ethnic identities were considered a minority group member (58.4%). Refer to Table 1 for full demographic information.

B. Procedures

The survey was conducted online in May 2020. After consenting to the study, participants answered questions about their cultural orientation and general beliefs. Next, participants were randomly assigned to read one of the three messages: general DCT information (control), DCT information highlighting personal benefits, and DCT information

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highlighting community benefits.[1] Participants responded to questions about DCT, and completed scales measuring mediator variables, and demographic information. The survey took approximately 8 minutes to complete. Participants recruited via departmental subject pools were offered 0.5 research credit, while participants recruited via course received extra credit for their assignments. Participants recruited through convenient sampling volunteered their time and effort.

C. Measures

Refer to Table 2 for descriptive statistics and zero-order correlation for all measures.

1. Predictor Variable

Individualism-Collectivism. Participants completed a 14-item individualistic and collectivistic value orientation measure (Kim et al., 2016; adapted from Oyserman et al., 2002). Individualism items included "it is important for me to develop my own personal style," while collectivism items included "it is important for me to think myself as a member of my religious, national, or ethnic group." All items were assessed on 7-point scales ranging from 1 (strongly disagree) to 7 (strongly agree). Individualism and collectivism items were averaged and each formed a composite score, with higher values indicating higher endorsement of each cultural value orientation.

2. Outcome Variables

DCT Decision. At the time of data collection, the U.S. did not implement an official DCT app. Therefore, we measured participants' intention to opt-in to DCT as one key

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[1] The intention of including multiple framings was to test whether highlighting different types of health benefits (community vs. personal) of DCT influence participants' decisions to opt-in. However, given that there was no difference in participants' responses across all conditions, we combined all responses and controlled for condition in the subsequent analysis.

outcome variable (0 = I will not consider opting-in to DCT; 1 = I will consider opting-in to DCT).

3. Mediator Variables

Concern for Community. To measure their motivation to engage in NPIs, participants responded to the following question: "in considering DCT, which factor is more important to you?". Participants rated on sliding a scale from 0 (protecting myself from COVID-19) to 100 (protecting my campus community from COVID-19), with higher values indicating the tendency to prioritize the community's health over oneself. While we recognize that participants may comply with these NPIs to protect themselves and their community health, these single-item measures were designed to examine participants' primary motivation in their decision-making process.

Perceived Consensus with Others. To assess perceived consensus with others (adapted from Eom et al., 2016), participants indicated on a 0 to 100% slider scale the proportion of people in their community who opt-in to DCT. Higher values indicated a larger perceived proportion of people in their community who comply with these behaviors.

Trust in University. Participants completed six items that were adapted from the trust in government survey (Pew Research Center, 2015). Example items included "I am confident that my university is capable of dealing with the Coronavirus (COVID-19) pandemic," and "in general, I trust the university to do what is best for their students." All items were assessed on 6-point scales ranging from 1 (strongly disagree) to 6 (strongly agree). Items were averaged and formed a composite score, with higher values indicating greater perceived government efficacy and trust.

Covariates. We controlled for participants' gender, age, income, majority group status,

and political ideology. To account for majority group status, participants who identified as White were categorized as "majority", while participants who identified as non-White were categorized as "minority". Political ideology was measured on a 7-point scale ranging from 1 (extremely liberal) to 7 (extremely conservative). Given that there was no manipulation effect on participants' responses, we combined all responses and controlled for manipulation condition in the subsequent analyses.

IV. Study 1 Results

Overall, 77.2% participants were interested in opting-in to DCT, and 22.8% were uninterested. Table 2 presents descriptive statistics and correlation among key variables.

We conducted a binary logistics regression to examine the relationship between collectivism and intention to opt-in to DCT. The analysis controlled for individualism, manipulation, gender, age, majority group status, political orientation, and annual income. Collectivism significantly predicts DCT opt-in rates, $\beta = .39$, $SE = .15$, $p = .01$, 95% Confidence Interval [CI] of $\beta = [1.10, 1.99]$). More collectivistic participants had greater intention to opt-in to DCT (Table 3).

Next, we used Hayes' PROCESS to conduct a series of mediation analyses to test whether concern for community, greater perceived consensus with others, and trust in university explain the relationship between collectivism and compliance with NPIs (Hayes, 2013). We placed all three mediators in a parallel mediation model (Model 4) to examine which mediator best explains the relationship.

There was a marginally significant positive association between collectivism and greater concern for community health, $b = 2.67$, $SE = 1.41$, $p = .06$, and a significant positive association with perceived social norms, $b = 4.62$, $SE = 1.27$, $p < .001$, as well as trust and

perceived university efficacy, $b = .03$, $SE = .06$, $p < .001$. In turn, greater perceived social norms, $b = .04$, $SE = .01$, $p < .001$, as well as greater trust and perceived university efficacy, $b = .32$, $SE = .15$, $p = .03$, predicted greater likelihood of opting-in to DCT; but not greater concern for community health, $b = -.004$, $SE = .01$, $p = .53$. Consequently, perceived social norms, and greater trust and perceived university efficacy explained the relationship between collectivism and opting-in, but not greater concern for community health (norm: $b = .19$, $BootSE = .07$, BootCI[.09, .35]; trust in uni.: $b = .10$, $BootSE = .06$, BootCI[.01, .22]; concern for community: $b = -.01$, $BootSE = .02$, BootCI[-.06, .03]). After controlling for all mediators, the association between collectivism and DCT opt-in was non-significant, $b = .12$, $SE = .17$, $p = .47$. See Table 4 for full regression coefficients, and Figure 1 for mediation model.

V. Study 1 Discussion

Study 1 revealed a significant, positive association between collectivism and participants' intention to opt-in to DCT. This association was explained by participants' greater perceived social norms, and trust and perceived university efficacy, but not greater concern for community health. In other words, more collectivistic participants expressed greater intention to opt-in to DCT because they perceived others to opt-in, and trusted that the university would be efficacious in handling the pandemic. However, we recognized that students may be eager to return to campus and would be more inclined than the general population to opt-in to DCT. Therefore, in Study 2, we recruited participants from the U.S. population to examine whether the findings from Study 1 were generalizable across different demographics.

VI. Study 2

There were several key differences from Study 1. First, instead of presenting information that highlighted personal or community benefits of digital contact tracing, we only presented participants with general DCT information to remain neutral. Additionally, we also acknowledged that intention to opt-in might not translate to actual opt-in behaviors. Given that there was no immediate plan of DCT implementation in the U.S., we included a new set of questions with wearing face coverings as another key outcome variable to examine the relationship between collectivism, mediators, and health compliance behaviors.

VII. Study 2 Method

A. Participants

A total of 530 participants were recruited through Amazon Mechanical Turk. 37.4% of the participants identified as female, 57.5% as male, 0.6% as non-binary/other, and 4.5% unspecified. The mean age of participants was 37.21($SD = 11.28$). 68.1% of the participants identified themselves as White, 13.4% as Black, 6.4% as Hispanic/Latino, 5.5% as Asian, 0.4% as American Indian, 0.2% as Native Hawaiian or Pacific Islander, and 1.6% as multi-racial/others. Participants who identified as White were considered majority group members (68.1%), while participants who identified as other racial/ethnic identities were considered minority group members (27.4%). The remaining participants did not identify their racial/ethnic identities. Refer to Table 1 for full demographic information.

B. Procedures

The survey was conducted online in July 2020. The structure of the survey was identical to Study 1, with a few notable differences. First, we removed the manipulation from Study 1.

All participants read about general DCT information without the emphasis on personal or community benefits. Second, we added a new set of questions about face covering behaviors. The survey took approximately 12 minutes to complete, and participants were compensated $1.50.

C. Measures

The predictor variables (i.e., collectivism), DCT decision, and covariates remained the same. However, because participants were recruited from the general population, we changed the wording in the questions from "campus community" and "university administrations" to "local community" and "health authorities". We also added a new section on face covering. Thus, participants responded to the mediator variables twice, one for each set of NPI.

1. Outcome Variables

DCT Decision. Participants responded to the question "if your health authority administers digital contact tracing, would you opt-in (sign up for the app) or opt-out (not sign up for the app)?" to indicate their intention to opt-in to DCT. (0 = I would opt-out; 1 = I would opt-in).

Face Coverings (FC). Participants responded to the questions, "do you wear a mask where it is required?", and "do you generally wear a mask even when it is not required (in social places where you interact with other people)?" Responses to both questions were dichotomous (0 = No, 1 = Yes).

2. Mediator Variables

Concern for Community. Similar as Study 1, participants responded to the question "in considering DCT, which factor is more important to you?" Participants rated on a sliding scale from 0 (*protecting myself from COVID-19*) to 100 (*protecting my community from*

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COVID-10), with higher values indicating the tendency to prioritize the community's health over oneself. The same question was posed for wearing face coverings.

Perceived Social Norms. Participants indicated on a 0 to 100% slider scale the proportion of people in their community who opt-in to DCT, and the proportion of people in their community who wear face coverings when not required; with higher values indicating a larger perceived proportion of people in their community who comply with these NPIs.

Trust in Government. Participants completed six[2] items that were adapted from the trust in government survey (Pew Research Center, 2015). Example items included "I am confident that the government is capable of dealing with the Coronavirus (COVID-19) pandemic," and "I generally think the government is run for the benefit of all the people in this country". All items were assessed on 6-point scales ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Items were averaged and formed a composite score, with higher values indicating greater perceived government efficacy and trust.

Covariates. We controlled for participants' gender, age, income, majority group status, and political ideology. The criteria to determine majority group status remains the same as Study 1. In this study, 68.1% participants were from the majority group, while 27.4% were from the minority group. 4.5% of the participants did not indicate their ethnicity.

VIII.   Study 2 Results

A. Compliance with Health Compliance Measures

Overall, 65.1% of participants were interested in opting-in to DCT, and 34.9% were uninterested. For analyses with face covering, we only focused on the decision to wear face

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[2] We removed the item "I think my country will be able to use digital contact tracing technology effectively" from the analyses on face-covering, as this item was specifically about DCT. The general pattern of the results remained the same.

covering when it is not required, given that almost all participants (95.9%) reported wearing

face coverings when required. When it was not required to wear a face covering, 77.2%

participants reported that they still wore a face covering, while 22.8% did not.

Once again, we conducted a binary logistics regression and controlled for individualism,

gender, age, majority group status, political orientation, annual income, and years of

education. Consistent with the findings from Study 1, collectivism significantly predicted

DCT opt-in rates (Figure X), $\beta = .55$, $SE = .10$, $z = 30.61$, $p < .001$, and participants'

likelihood of wearing face covering when not required (Figure X), $\beta = .32$, $SE = .11$, $z = 8.57$,

$p = .003$. More collectivistic participants were more likely to opt-in to DCT and to wear a

face covering when it was not required (Table 3).

We conducted a set of mediation analysis for each of the two health measures to test

whether concern for community and trust in government explain the relationship between

collectivism and compliance. Refer to Table 4 for regression coefficients.

B. DCT Opt-In

Consistent with the findings from Study 1, collectivism predicted greater concern for

community health in relation to opting-in to DCT, $b = 8.66$, $SE = 1.16$, $p < .001$, greater

perceived social norms, $b = 7.83$, $SE = .95$, $p < .001$, and greater trust and perceived

government efficacy, $b = .50$, $SE = .04$, $p < .001$. In turn, greater perceived social norms, b

$= .03$, $SE = .01$, $p < .001$, and greater trust and perceived government efficacy, $b = .32$, SE

$= .13$, $p = .01$, but not greater concern for community health, $b = .01$, $SE = .01$, $p = .21$,

predicted greater likelihood of opting-in to DCT. Consequently, perceived social norms and

greater trust and perceived government efficacy each mediated the effect of collectivism on

opting-in, as indicated by significant indirect effects (norm: $b = .25$, $BootSE = .06$,

BootCI[.15, .40]; trust in gov.: $b = .16$, *BootSE* $= .07$, BootCI[.05, .31]). By contrast, greater

concern for community health was not a significant mediator ($b = .04$, *SE* $= .04$,

BootCI[-.03, .13]). After controlling for all mediators, the association between collectivism

and DCT opt-in was non-significant, $b = .19$, *SE* $= .12$, $p = .12$.

C. Face Covering

Unlike opting-in to DCT, we found some inconsistencies with regards to the relationship

between collectivism and wearing face coverings in public when it is not required.

Collectivism predicted all three mediators, as it was positively associated with concern for

community health in relation to wearing a face covering, $b = 8.97$, *SE* $= 1.26$, $p < .001$,

greater perceived social norms, $b = 8.78$, *SE* $= 1.02$, $p < .001$, and greater trust and perceived

government efficacy, $b = .46$, *SE* $= .04$, $p < .001$. However, only greater perceived social

norms predicted greater likelihood of wearing face coverings in public, $b = .02$, *SE* $= .01$, p

$<.001$. Neither concern for community health, $b = .01$, *SE* $= .01$, $p = .53$, nor greater trust and

perceived government efficacy, $b = -.06$, *SE* $= .13$, $p = .65$, explained the relationship

between collectivism and wearing face covering. Consequently, only perceived social norms

mediated the effect of collectivism on wearing a face covering ($b = .20$, *BootSE* $= .06$,

BootCI[.11, .33]). Neither concern for community health ($b = .02$, *BootSE* $= .04$,

BootCI[-.05, .11]), nor trust and perceived government efficacy ($b = -.03$, *BootSE* $= .06$,

BootCI[-.14, .09]) were significant mediators. After controlling for all mediators, the

association between collectivism and DCT opt-in was non-significant, $b = .15$, *SE* $= .13$, p

$= .23$.

IX. Study 2 Discussion

Consistent with the findings from Study 1, collectivism predicted greater likelihood of

opting-in to DCT and wearing face coverings in public. However, we found mixed patterns for collectivistic individuals' greater compliance with each NPI. Greater perceived consensus with others appeared to explain the relationship between collectivism and compliance with both NPIs, but greater trust and perceived efficacy in government only explained the relationship between collectivism and opting-in to DCT, while greater concern for community health was not a significant mediator for both NPIs.

There are two reasons that may explain the inconsistent mediating patterns between opting-in to DCT and wearing face coverings in public. First, as mentioned in the introduction, opting-in to DCT is a much more private decision, while wearing a face covering is directly observable. Only perceived consensus with others predicted greater likelihood of wearing face coverings suggested that people's decisions to wear a face covering may be largely shaped by the behaviors of people around them, but not necessarily their own concern for community health or belief in government. Furthermore, although there was a positive association between collectivism and trust and perceived government efficacy, our results suggest that trust in government has greater importance for people's decision to opt-in to DCT, but not wearing a face covering in public. One possibility is that government directly implements and oversees programs such as digital contact tracing, whereas face covering, especially in places where it is not required, is an individual choice.

X. General Discussion

Taken together, both studies reveal that collectivism predicted greater likelihood of opting-in to DCT (Studies 1 & 2) and wearing face coverings in public (Study 2). In other words, more collectivistic individuals tend to comply with these health measures more. The examination of different potential mediators explains why collectivistic individuals are more

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likely to comply to these NPIs. These findings highlight the generalizability of collectivism as a predictor of compliance to NPIs, and provide insights into why collectivists behave this way.

A. Theoretical Implications

The present study contributes to the literature in several ways. First, the robust association between collectivism and compliance with both NPIs is consistent with the studies that examined compliance with NPIs at the state and national levels (e.g., Lu et al., 2021; Im & Chen, 2020, preprint). The robustness of collectivism as a predictor at both the collective- and individual-level highlights the role of culture in the making of health decisions that may impose some personal cost for a collective good.

Second, the present study examined how different aspects of collectivism shaped compliance. Across both studies, greater concern for community health did not explain the relationship between collectivism and compliance with NPIs. Perhaps one reason why community concern was not associated with compliance was due to the way we measured this item. Opting-in to DCT and wearing face coverings provided protection for both personal and community health. While the intention was to put personal and community health at both ends of the spectrum to gauge which was a stronger factor that shaped people's decisions, we acknowledge that this way of measuring overlooked the possibility that people comply with NPIs to protect *both* their personal *and* community health. One way to refine this measure is to separate personal and community health into two distinct items. Nevertheless, the results suggest that more collectivistic individuals do not comply with these items solely or primarily because they are concerned about their community.

In contrast, perceived social norms appears to be a strong mediator for compliance with

both NPIs. Without knowing the actual statistics of local community members who complied with NPIs, those high on collectivism perceived that a greater proportion of people in their local community complied with NPIs than those low on collectivism, and in turn, were more likely to comply themselves. While there is some ambiguity in whether participants projected their own behaviors to the group or vice versa, our study provided consistent evidence with studies demonstrating that collectivists tend to overestimate consensus with their in-group members (Vorauer & Cameron, 2003), and are more likely to act in accord with perceived social norms (Eom et al., 2016).

Furthermore, our findings suggest that greater trust in institutions may be another additional underlying mechanism that shape people's compliance. Consistent with Travaligno & Moon (2021), we found a positive association between collectivists' trust and deference to institutions or authority. However, the mixed patterns between opting-in to DCT and wearing a face covering suggest that the extent to which people's trust in institutions translate to actual compliance is also conditional. In Study 2, we found that while collectivists place great faith in their government, the lack of association between the role of government and wearing face suggests that the degree to which individuals make decisions to comply with NPIs depends on whether the health measure is directly regulated or implemented by the government.

Lastly, in the face of a common threat such as disease pathogens, prior research has revealed the psychological benefits of collectivism such as providing greater protection efficacy (Kim et al., 2016). Findings from the present study suggest that collectivists may feel more efficacious against threat by placing greater trust in authorities and perceiving greater social norms of compliance among their in-group members. Collectivists' orientation

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towards others fosters group coordination and may also explain why individuals become more collectivistic in the face of a common threat (e.g., pathogen, Fincher et al., 2008).

B. Limitations

There are several limitations in this study. First, the nature of this study is correlational, and we are unable to claim the causal role of either of collectivism or the mediators. We sought in our analyses to control for different demographic and political variables, as well as individualism, to isolate the role of collectivism. Nevertheless, the limitations of correlaiotnal analyses are applicable. Moreover, while the study explores different aspects of collectivism, we also recognize that individual (e.g., perceived vulnerability to COVID-19) and institutional (e.g., sanctions for violation of policies) variables could explain individuals' compliance behaviors. Second, the study was conducted in the United States, where the handling of the pandemic may be vastly different from other countries. Even within the United States, each state has their own health regulations, and variability such as mask mandates (or lack thereof), and the spread of COVID-19 are factors that may affect how participants react to these health measures. However, despite all these differences, we still found a robust positive association between collectivism and compliance with NPIs.

C. Final Thoughts

The present study highlights that individual-level collectivism may be powerful in encouraging NPI compliance. Public health campaigns that emphasize group cohesion and trust in institutions may be one route to goal. The benefit of identifying psychological mediators points to additional levers, such as increasing the perception of public norms (Miller & Prentice, 2016) and fostering trust in government (Blair et al., 2017) that can be pulled to facilitate compliance in situations that involve tension between personal costs and

collective benefits. As the Director-General of the World Health Organization put it,

"COVID-19 has…shaken the foundations of our world; …but it has also reminded us that for

all our differences, we are one human race. And we are stronger together (WHO, 2020)." The

relevance of this message goes beyond pandemic responses. Such invocations of togetherness

may be an essential ingredient for coordinated human efforts to combat many threats and

challenges that humans face.

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Appendix

Table 1

Participants Demographic Characteristics

Characteristics	Study 1			Study 2		
	M(SD)	n	%	M(SD)	n	%
Age	20.43(1.77)			37.21(11.28)		
Years of Education	-			14.58(4.30)		
Income (Median)	$80,000 - $89,999			$40,000 - $49,999		
Political Ideology	2.91(1.24)			3.86(1.88)		
Gender						
Male		129	28.4		305	57.5
Female		314	69.2		198	37.4
Other		8	1.8		3	.6
Missing		3	.7		24	4.5
Ethnicity						
American Indian/Alaska Native		1	.2		2	.4
Asian/Asian American		146	32.2		29	5.5
Black/African American		15	3.3		71	13.4
Hispanic/Latino American		82	18.1		34	6.4
Native Hawaiian/Pacific Islander		0	.0		1	.2
White/European American		185	40.7		361	68.1
Other		21	4.6		8	1.5
Missing		4	.9		24	4.5
Majority Group Status						
Majority		185	40.7		361	68.1
Minority		265	58.4		145	27.4
Missing		4	.9		24	4.5

Table 2

Descriptive Statistics and Zero-Order Correlations between Key Variables - Study 1

	M	SD	*a*	COL	IND	Comm. Concern	Norm	Trust in Uni.	DCT Decision
COL	4.70	.92	.74	-					
IND	5.75	.70	.70	.31**	-				
Comm. Concern	46.93	23.18	-	.07	-.01	-			
Norm	50.85	20.22	-	.20**	.04	.11*	-		
Trust in Uni.	3.95	.98	.88	.23**	.12	.02	.36**	-	
DCT Decision	-	-		.10	-.05	.01	.33**	.25**	-

*p <.05; **p <.01; ***p<.001

†COL = collectivism; IND = individualism; Comm. Concern = concern for community; Norm = perceived social norms; Trust in Uni. = trust in university; DCT = digital contact tracing; FC = face covering

Table 3

Collectivism Predicts Compliance to Health Measures

Variable	β	SE of β	z	p	95% CI LL	95% CI UL
Digital Contact Tracing (Study 1)						
Intercept	2.84	2.11	1.81	.18		
Collectivism	.39	.15	6.77	.01	1.10	1.99
Individualism	-.42	.20	4.34	.04	.45	.98
Gender	-.31	.29	1.17	.56	.41	1.29
Age	.04	.08	.22	.64	.89	1.21
Majority Group	-.23	.29	.61	.44	.45	1.41
Political Ideology	-.39	.11	13.64	<.001	.55	.83
Income	.01	.04	.03	.87	.93	1.09
Condition	-.40	.32	1.54	.22	.36	1.26
Digital Contact Tracing (Study 2)						
Intercept	-.09	.93	.01	.92		
Collectivism	.55	.10	30.61	<.001	1.43	2.12
Individualism	-.25	.14	3.18	.08	.60	1.03
Gender	-.10	.21	.24	.63	.61	1.35
Age	-.004	.01	.21	.46	.03	4.71
Majority Group	.13	.23	.32	.57	.73	1.78
Political Ideology	-.14	.06	5.82	.02	.78	.97
Income	.09	.04	5.32	.02	1.10	1.17
Years of Education	-.03	.02	1.66	.20	.93	1.02

	Intercept	1.94	1.06	3.36	.07		
	Collectivism	.32	.11	8.57	.003	1.11	1.70
	Individualism	-.17	.15	1.17	.28	.63	1.14
	Gender	-.12	.23	.27	.61	.01	1.55
Face Covering (Study 2)	Age	-.001	.01	.01	.93	.98	1.02
	Majority Group	-.40	.27	2.17	.14	.40	1.14
	Political Ideology	-.33	.07	22.74	<.001	.63	.83
	Income	.16	.05	12.47	<.001	1.08	1.29
	Years of Education	-.03	.02	1.51	.22	.93	1.02

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 4
Regression Coefficients for Mediation Models

Study 1	b	SE of b	z	p	95% CI of b LL	UL
Direct Effects						
COL → DCT	.12	.17	.72	.47	-.21	.46
Indirect Effects						
COL → concern for comm.	2.67	1.41	1.89	.06	-.10	5.45
COL → norm	4.62	1.27	3.65	<.001	2.13	7.12
COL → uni.	.30	.06	5.23	<.001	.19	.42
Concern for comm. → DCT	-.004	.01	-.62	.53	-.02	.01
Norm → DCT	.04	.01	5.30	<.001	.03	.06
Uni. → DCT	.32	.15	2.17	.03	.03	.62

Bootstrapped Indirect Effects	b	BootSE	Boot LLCI	BootULCI		
Total	.28	.09	.13	.48		
Concern for Comm	-.01	.02	-.06	.03		
Norm	.19	.07	.09	.35		
Uni.	.10	.06	.01	.22		

Study 2	b	SE of b	z	p	95% CI of b LL	UL
Direct Effects						
COL → DCT	.19	.12	1.55	.12	-.05	.42
Indirect Effects						
COL → concern for comm.	8.66	1.16	7.44	<.001	6.37	10.95
COL → norm	7.83	.95	8.27	<.001	5.97	9.69
COL → gov.	.50	.04	13.11	<.001	.43	.57
Concern for comm. → DCT	.01	.01	1.24	.21	-.01	.01
Norm → DCT	.03	.01	5.78	<.001	.02	.04
Gov. → DCT	.32	.13	2.54	.01	.07	.58

Bootstrapped Indirect Effects	b	BootSE	Boot LLCI	BootULCI		
Total	.46	.09	.31	.67		
Concern for Comm	.04	.04	-.03	.13		
Norm	.25	.06	.15	.40		
Gov.	.16	.07	.05	.31		

	b	SE	t	p	LLCI	ULCI
Direct Effects						
COL → FC	.15	.13	1.20	.23	-.10	.40
Indirect Effects						
COL → concern for comm.	8.97	1.26	7.09	<.001	6.48	11.45
COL → norm	8.78	1.02	8.64	<.001	6.78	10.78
COL → gov.	.46	.04	12.10	<.001	.39	.54
Concern for comm. → FC	.01	.01	.63	.53	-.01	.01
Norm → FC	.02	.01	4.44	<.001	.01	.03
Gov. → FC	-.06	.13	-.44	.65	-.31	.20
Bootstrapped Indirect Effects	*b*	*BootSE*	*Boot LLCI*	*BootULCI*		
Total	.19	.09	.05	.38		
Concern for Comm	.02	.04	-.05	.11		
Norm	.20	.06	.11	.33		
Gov.	-.03	.06	-.14	.09		

* *p* < .05; ** *p*<.01; ***p <.001

†COL = collectivism; IND = individualism; Comm. Concern = concern for community;
Norm = perceived social norms; Uni. = trust in university; Gov. = trust in government;
DCT = digital contact tracing; FC = face covering

Table 5a

Descriptive Statistics and Zero-Order Correlations between Key Variables - Study 2

	M	SD	*a*	COL	IND	Comm. Concern (DCT)	Norm (DCT)	Trust in Gov.	DCT Decision
COL	4.94	1.19	.86	-					
IND	5.65	.81	.76	-.39**	-				
Comm. Concern (DCT)	61.53	28.44	-	.35**	.09	-			
Norm (DCT)	58.99	24.84	-	.45**	.20*	.46**	-		
Trust in Gov.	3.05	1.08	.85	.56**	.09*	.33**	.52**	-	
DCT Decision	-	-	-	.25**	.03	.27**	.43**	.32**	-

*$p < .05$; **$p < .01$; ***$p < .001$

†COL = collectivism; IND = individualism; Comm. Concern = concern for community; Norm = perceived social norms; Trust in Gov. = trust in government; DCT = digital contact tracing

Table 5b

Descriptive Statistics and Zero-Order Correlations between Key Variables - Study 2

	M	SD	a	COL	IND	Comm. Concern (FC)	Norm (FC)	Trust in Gov.	Face Covering
COL	4.94	1.19	.86	-					
IND	5.65	.81	.76	.39**	-				
Comm. Concern (FC)	61.96	30.32	-	.29**	.01	-			
Norm (FC)	59.68	26.23	-	.45**	.13**	.38**	-		
Trust in Gov.	3.05	1.08	.85	.56**	.09*	.32**	.45**	-	
Face Covering	-	-	-	.10*	.02	.12**	.22**	.08	-

*p <.05; **p <.01; ***p<.001

†COL = collectivism; IND = individualism; Comm. Concern = concern for community; Norm = perceived social norms; Trust in Gov. = trust in government; FC = face covering

Figure 1. The relationship between collectivism and compliance with NPIs (DCT top, face coverings bottom) as mediated by concern for community health, perceived social norms, and trust in government.
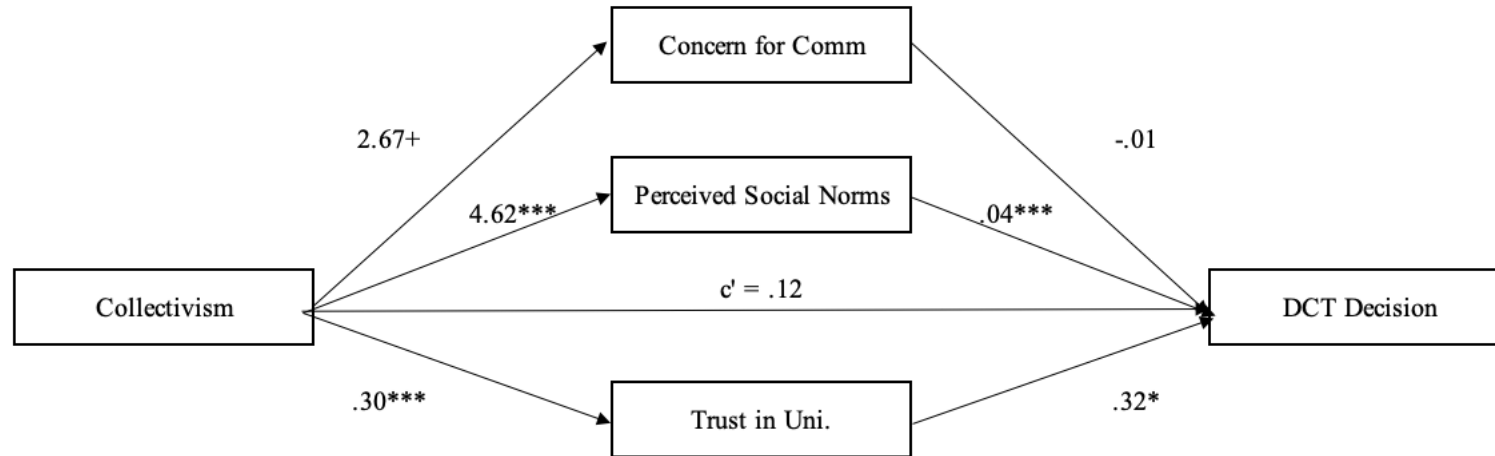
Figures 2A and 2B. The relationship between collectivism and compliance with NPIs (DCT top, face coverings bottom) as mediated by concern for community health, perceived social norms, and trust in government.