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# Affinity for Technology Relates to Group Cohesion for New, But Not Existing, Groups

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## Abstract

During the 2020 COVID-19 pandemic, governments around the world mandated shutdowns and social distancing, limiting how much people could see other people outside of their household. Because of this, people had negative mental health outcomes, and many people turned to technology to maintain connections and create new ones. In this paper, we examine the relationship between technology, mental health, and group cohesion with *existing groups* (*N* = 202) and *new groups* (*N* = 74). We surveyed U.S. participants in June 2020, two to three months after the start of mandated social distancing. Results indicated that, as predicted, higher levels of reported group cohesion typically related to better reported mental health; however, the relationship occurred differently for *existing* groups compared to *new* groups.

Further, higher levels of affinity for technology did not relate to group cohesion for existing groups, but did relate to more perceived cohesion for new groups. Researchers and mental health practitioners can use these results to help people develop a sense of group cohesion with new and existing groups and improve mental health during relative social isolation; technology may be especially beneficial for people to connect with new groups compared to existing groups.

**Keywords**
Mental health; social connection; group cohesion; isolation; loneliness; technology; COVID-19

## 1. Introduction

Social cohesion and social support improve health such as by decreasing depression, anxiety, and stress [1, 2], as well as reports of physical pain [3, 4]. Feelings of social isolation are prevalent in many populations, including people with decreased ability to leave their homes and host guests, such as people with chronic health issues and older adults [5, 6].

When in-person social connection is challenging, people can use technology to decrease social isolation and facilitate interaction [7-9], whether that be with existing groups or interaction to help create new groups. Affinity for technology can increase group cohesion within new groups [10, 11] and may help increase perceived social support and mental health in people who feel socially isolated.

To experience social group cohesion, people can maintain *existing* group connections or build *new* connections. Prior research seldom differentiates between these two strategies [12-16]. However, people typically perceive higher group cohesion with *existing* rather than *new* groups [17, 18], and these relationships with existing groups may have more positive effects on mental health than with new groups. Further, socially isolated people connect with more new groups online, which may make affinity for technology more important for perceived group cohesion [19] and mental health for *new* than *existing* groups.

Recently, the coronavirus pandemic (COVID-19) has disrupted function in society across the world [20], causing a great amount of social isolation. COVID-19, formally known as SARS-Cov-2, began December 2019, in Wuhan, China and spread rapidly around the world. By July 1, 2020, more than ten million people in the world had been infected by the virus [21]. Mental health suffers in any pandemic. In the Ebola and SARS outbreaks in the late 1900s and early 2000s respectively [22], people reported increased self-blame, grief, depression, and anxiety and stress about getting sick or dying [23-26]. These issues were so intense that they even resulted in insomnia [22]. The COVID-19 pandemic similarly caused increased depression, anxiety, and stress [27].

Further, the pandemic causes people's social lives to change; in the U.S., the Centers for Disease and Control (CDC) announced mandatory stay-at-home orders during March 1 – May 31, 2020, for all 50 states [28]. This meant that only essential workers (e.g., healthcare, grocery workers) could attend work in-person, and people could only leave their homes go into public for essential shopping or for outdoor exercise. After the stay-at-home orders ended, businesses started opening again. Across the U.S., different states had different requirements for levels of social distancing, which

unevenly disrupted social groups, group cohesion, and mental health. Overall, people had decreased ability to see others in-person as governments recommend or mandate social distancing – that is, requirements to maintain 6 to 10 feet distances and wear protective facial masks – and quarantine [23].

In this paper, we use the COVID-19 pandemic as an opportunity to study social isolation across ages and across people who are not usually socially isolated. COVID-19 was many people's first experience of extended social isolation. We report results of surveys completed in June 2020 in the U.S., two to three months after the start of social distancing mandates. The U.S. COVID-19 infection rate slowly grew during the two-week period before the present study began, then doubled over the course of the study [29]. This work contributes to the literature by providing insight into how people respond to new experiences of social isolation. We also focus on how connection to *existing groups* and *new groups* relate to different patterns of how group cohesion and affinity for technology affect mental health. Researchers and practitioners can use these results to help people who are socially isolated determine strategies to improve their well-being.

## 2. Literature Review

### 2.1 Social Isolation Affects Mental Health and Social Support

Mental health is a critical factor of people's overall health and wellness. Mental health is a broad topic, which can include panic attacks, irrational anger, sleep disorders, emotional disturbance, and suicidal behavior [30]. Core components of mental health, examined in numerous studies, are perceived depression, anxiety, and stress [14, 15, 27, 31, 32]. Loneliness, defined as the discrepancy between actual and desired interpersonal relationships [33], is intimately tied to negative mental and physical health [1, 2].

Group cohesion, or feeling like a unified group [34, 35], improves loneliness, mental health, and performance across domains [36-40] and facilitates group members' sense of group identification, belonging, and safety [35]. Further, group cohesion boosts social support, which also improves many types of physical and mental health [41-44]. In fact, perceived social support alone is enough to improve health outcomes [41]. Research has shown that improving group cohesion improves mental health; when researchers taught participants about the value of groups for mental health and trained them to network, connect, and improve group cohesion, those participants had improved mental health outcomes [14, 15].

Researchers have studied group cohesion broadly in relation to team performance and productivity, group therapy, identity, and more (see [45] for a review). Although "group cohesion" was originally defined as a set of forces that combine to keep the group together [46], recent definitions have grown more complex related to interpersonal attraction, task commitment, and more [34, 35, 47]. A recent review indicated that additional research is needed to determine which factors are most important [45]. In this paper, we selected a common conceptualization of group cohesion that allows us to examine subcomponents of group cohesion [34] that may have differential effects on mental health [10, 48-50].

Researchers following this conceptualization of group cohesion divide group cohesion into cohesion related to **tasks** (e.g., the group's goals and productivity) and **social** purposes (e.g., group bonding as a social unit, and general social interactions). They further divide group cohesion related to **individual attraction to the group** (how the individual feels about the group's personal

acceptance of them and their personal involvement in the group) and **group integration** (how close the overall group is). Together, these create four dimensions of ***Group Cohesion*** [34]. We chose this model specifically because two major ways in which social isolation will affect people relate to social connection with work groups (task) and friends or family (social).

To measure group cohesion via these dimensions, most researchers use the Group Environment Questionnaire (GEQ) [34]. Its subscales are: attraction to the group for task purposes (ATG-T), attraction to the group for social purposes (ATG-S), group integration for task purposes (GI-T), and group integration for social purposes (GI-S).

Research shows that these dimensions of group cohesion predict staying with the group, depending on how long the group has existed. However, more evidence is needed to develop a solid pattern [50-52]. In the context of exercise groups, Estabrooks and Carron (2000) found that people with higher GI-T scores were more likely to stay with the group long term (prioritizing doing the work of exercising), and Loughead et al. (2001) found that people who had higher levels of GI-S were more likely to only stay for the short term (prioritizing socializing). However, Spink et al. (2014) found that people who had high GI-T and high GI-S were more likely to stay with the group for a moderate duration, and Carron et al. (1998) found that people with higher levels of ATG-T were more likely to stay with a group for the short-term (prioritizing doing the work). Most of the above studies were performed in the context of exercise groups and without the ability to compare across different durations within the same study. In this study, we will gather more evidence in a different (non-exercise) context about how dimensions of group cohesion relate to mental health for long-term and short-term groups.

### 2.2 Existing Versus New Groups – How Do They Function Differently?

In research on strengthening social cohesion to improve mental health, researchers seldom distinguish between effects of *existing* groups and *new* groups. In most studies and interventions, researchers seek to improve participants' social network by both strengthening existing ties and integrating new groups [12-16]. Studies examining how new groups improve mental health typically work with vulnerable populations. For example, homeless people, people undergoing cognitive-behavioral therapy [53], and people with multiple sclerosis [54] can achieve greater mental health benefits from socializing with new groups compared to existing groups. When groups are highly cohesive, benefits like these can extend beyond the course of therapy [35]. However, literature is lacking related to if new groups would differently benefit the general population during a world crisis, like the COVID-19 pandemic.

Research on entitativity may offer insights. Entitativity, which developed from Gestalt theory, refers to how much a group is "like an entity," or cohesive [55]. Groups that have existed for longer are perceived as more entitative [17, 18], or cohesive. Because higher group cohesion and group identification relate to better mental health [15, 16, 56-63], relationships within existing groups may have stronger effects than new groups on mental health.

With COVID-19 isolation, like with many other reasons for isolation, social groups experience upheaval [20]. People may seek ties with existing groups and/or seek out new groups for social connections [9]. The differential effects of group connection with existing versus new groups are important to examine to understand how to effectively increase social connection and improve mental health.

### 2.3 Affinity for Technology Enables Social Connection Across Distance

Using technology can help isolated people enhance social connection [64-66], thereby improving mental health [7, 8]. However, how people use the technology (e.g., social media versus video calls) affects the benefits they can gain from it [67-69]. Likewise, people with high affinity for technology – that is, a tendency to engage in high levels of technology interaction [70] – can use the internet more widely, such as for connecting with others [19]. Thus, having a high affinity for technology could enhance people's chance for group cohesion during isolation and act as a protective factor against negative effects of the pandemic on mental health [9]. In this paper, we examine if affinity for technology related to group cohesion and mental health during the start of the COVID-19 pandemic. Because many older adults have lower affinity for technology than younger adults, and struggle to use it to its potential [64, 65], we also examine if affinity for technology is predictive beyond the effect of age.

The strength of the relationship between affinity for technology, group cohesion, and mental health may vary for existing versus new groups. Many people that participants see day-to-day, such as family and colleagues, are likely to be parts of groups that existed before COVID-19. Groups like families may see each other at home, and work groups may be required to see each other online regardless of their affinity for technology. Therefore, for existing groups like family and work, we predict that affinity for technology may have small positive relationship with group cohesion and mental health. Conversely, it is likely that many newer groups during social distancing were formed entirely online. In this case, affinity for technology may have a larger positive relationship with group cohesion and mental health for new than existing groups.

### 2.4 Current Study and Hypotheses

In an online survey study, we examine the effect of affinity for technology and social cohesion on loneliness and mental health. We examine these effects for *existing groups* and for *new groups*. We assess this via online surveys distributed in June 2020. We hypothesize the following:

**Hypothesis 1.** Higher ratings of dimensions of group cohesion (GEQ scale) [34] will predict better mental health by decreasing loneliness (TIL scale) [71], depression, anxiety, and stress (DASS scale) [72]. We predict this effect for these dimensions: (A) attraction to the group for social purposes (ATG-S), (B) attraction to the group for task purposes (ATG-T), (C) group integration for social purposes (GI-S), and (D) group integration for task purposes (GI-T). We further predict that (E) this relationship will be especially strong for existing groups, rather than new groups.

**Hypothesis 2.** During social isolation, higher ratings of affinity for technology (ATI scale) [70] will predict increased group cohesion (GEQ scale) [34] as measured by: (A) attraction to the group for social purposes (ATG-S), (B) attraction to the group for task purposes (ATG-T), (C) group integration for social purposes (GI-S), and (D) group integration for task purposes (GI-T). We further predict that (E) this relationship will be especially strong for new groups, rather than existing groups.

**Hypothesis 3.** Because of the above relationship, higher ratings of affinity for technology (ATI scale) [70] will predict better mental health (TIL scale) [71]; DASS scale; [72] by decreasing (A) loneliness, (B) depression, (C) anxiety, and (D) stress. We further predict that (E) this relationship will be especially strong for new groups, rather than existing groups.

## 3. Material and Methods

### 3.1 Design

In this study, we which group type (existing or new group; see Participants section) participants reported about. We used quasi-independent variables of age, reported affinity for technology, and reported group cohesion; we also measured reported mental health (see Measures section). In this study, group type, age, and affinity for technology are exogenous variables, and group cohesion and mental health are endogenous variables.

### 3.2 Participants

We recruited and paid U.S. participants aged 27 and older through Qualtrics for an online survey study between June 9 and June 22, 2020. The oldest participant was 89 years old (*M* = 48.04, *SD* = 12.83). We specifically chose participants 27 years and older because a great deal of research already focuses on the college age population (Gosling, Sandy et al. 2010), and we wanted this research to expand beyond that age group. Qualtrics recruited participants online through their recruitment pool. In recruitment, Qualtrics balanced gender as much as possible and provided a wide range of ages. Power analysis indicated that to achieve 0.8 power for a small effect size (0.2), we would need 70 viable participants per condition.

After participants verified their age and signed the informed consent, we assigned them to one of two Group Types: either the *existing groups* condition or the *new groups* condition. *Existing groups* condition participants answered questions about a group they had been a part of for greater than six months; we chose this number because it indicated a time before the COVID-19 pandemic began. *New groups* condition participants answered questions about a group they had been a part of for less than two months; we chose this number because it indicated a time after the pandemic and shutdown had begun. These time periods also aligned with prior research [48, 51] and, by excluding four months between the existing and new groups, we further differentiated the two conditions. *New groups* participants who could not think of a new group switched to the *existing groups* condition. This left a total of 202 (60% women) and 74 (57% women) participants in the *existing groups* and *new groups* conditions respectively. Participants were compensated at a rate of $4.87 based on Qualtrics' rates for the survey that lasted less than 30 minutes. The median completion time was 14 minutes.

We excluded participants who did not complete the survey were provided nonsense answers to free response questions (e.g., "fjdsdkllsdj"), who failed the attention checks (see Measures section), and who sped through the survey (defined here as taking less than half of the median time to complete; seven minutes). See Table 1 below for details on the number of participants excluded for various reasons.

**Table 1** Number of participants we recruited and excluded overall and for each condition and pay rate.

|  | USA |
|---|---|
| Recruited | 1066 |
| Excluded- did not consent | 80 |

| | Existing group condition | New group condition |
|---|---|---|
| Excluded- under age 27 | 162 | |
| Excluded- withdrew of their own choice pre-assignment | 334 | |
| Recruited | 255 | 235 |
| Excluded- incomplete or nonsense answers | 29 | 33 |
| Excluded- failed attention check | 62 | 45 |
| Excluded- duration <7 minutes (half the median completion time) | 15 | 30 |
| Switched to existing group condition for not thinking of a new group | +53 | -53 |
| Total participants | 202 | 74 |
| Pay rate | $4.87 | |

### 3.3 Procedure

Once participants read and signed the informed consent document, they answered survey questions. In the first block, participants responded to questions about their mental health and loneliness. In the second block, participants identified a specific group of which they were a member for greater than six months or less in two months as described in Section 3.2. To help participants understand what we meant by a "group," we provided examples in alphabetical order: "Church, Clubs, Discord server, Dungeons & Dragons group, Ethnic group, Facebook group, Family, Fandom, Fashion community, Gaming clan, Going out to eat with friends, Instagram community, Neighborhood, Political party, Sports team, Subreddit community, Support group, Volunteer organization, Workplace, Yoga." They rated their social cohesion with their identified group. In the third block, they answered questions about their personality and experience with technology. Finally, they completed demographics, and we debriefed and paid them.

### 3.4 Measures

Participants completed the measures below. We did not exclude any items from the scales.

*Mental health*. We measured loneliness, depression, anxiety, and stress as below. In this paper, we include loneliness as a general mental health indicator because we asked about it before we asked participants about specific social groups and because loneliness is closely linked with mental health [14, 73, 74].

- The **Three-Item Loneliness Scale** (TIL) [71] assessed participants' loneliness using 3 items (e.g., "How often do you feel isolated?") on a Likert scale from 1 ("Never") to 4 ("Very often"). The scale correlated strongly ($r = 0.82$) [71] with the Revised UCLA loneliness scale [75]. As in prior literature, we averaged these items to create the overall score.
- The **Depression, Anxiety and Stress Scale-21** (DASS) [72] examined participants' recent experiences with depression (e.g., "I couldn't seem to experience any positive feeling at all"), anxiety (e.g., "I felt that I was using a lot of nervous energy"), and stress (e.g., "I felt scared without any good reason"). Participants rated this 21-item survey on a Likert scale from 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"). As in prior literature, we summed these items to create the overall score.

*Group Measures*. We asked participants to describe the type of group they were reporting about and cohesion with the group, as below.

- **Type of group** was examined through free-response answers. We asked, "What is a social group that you have been a part of for greater than six months?" Using theory on types of groups as they relate to entitativity [18], we categorized participant responses into four categories: Friends, Family, Workplace, and Collection of People (e.g., organized around an activity). We also coded this answer for if this was a group that met exclusively online or might meet in-person. This resulted in moderate to high interrater reliability (IRR between 0.67 and 0.85) [76], reported in tables throughout the paper. For codes that mismatched, both raters discussed their reasoning and determined a final code.

- The **Group Environment Questionnaire** (GEQ) [34] is a typical measure of group cohesion [45, 50-52, 77], most often applied to a sports team. We modified it to refer to participants' identified social group. It measured participants' Individual Attractions to the Group-Social (ATG-S; e.g., "I do not enjoy being a part of the social activities of this group," reverse-coded), Individual Attractions to the Group-Task (ATG-T; e.g., "I am not happy with the amount of interaction I have with my group," reverse-coded), Group Integration-Social (GI-S; e.g., "Members of our group would rather go out on their own than get together with the group," reverse-coded), and Group Integration-Task (GI-T; e.g., "Our group is united in trying to reach its goals for performance"). Participants rated the 18-item questionnaire on a Likert scale from 1 ("Strongly Disagree") to 9 ("Strongly Agree"). As in prior literature, we averaged the items to create the overall score.

*Technology use*. We measured affinity for technology, as below.

- The **Affinity for Technology Interaction** (ATI) [70] scale examined participants' interaction with technology (e.g., mobile device, TV, computer). Participants rated the 9-item questionnaire on a Likert scale of 1 ("Completely Disagree") to 6 ("Completely Agree"). As in prior literature, we average the items to create the overall score.

- We also asked participants about exercise habits, what activities they left the house for, number of social connections, personality, and other demographics. We do not report these data in this paper because they do not relate to our main hypotheses.

- **Attention checks.** Participants also completed attention check items. We included one question in the DASS and one question in the GEQ that instructed participants to select a specific answer (e.g., "Select the number seven for this question"). If participants answered either question incorrectly, we excluded them from the study (Table 1).

## 4. Results

We analyzed data in SPSS version 27. Because most the data was continuous data, we typically ran generalized linear model tests using the dependent variable as a continuous dependent variable. In the equation, we included main effects from Group Type and the other variables (age, ATI, GEQ), as well as interaction effects between Group Type and these other variables. Then, we excluded nonsignificant variables one at a time until all variables included in the model had a significance value of $p < 0.1$. This is a typical procedure to determine which independent variables significantly affect the dependent variables. We report these values that approach significance ($p < 0.01$), but we consider only values of $p < 0.05$ to be statistically significant.

Because ATI and age are typically negatively correlated to each other [64, 65], when we included the ATI, we also tested age as a covariate to determine if the relationship could be predicted by age alone or if the ATI predicted effects beyond the effect of age.

We report means, standard deviations, standard error, and Cronbach's alpha values separately for each condition (Table 2). Cronbach's alpha values were moderate to high for most measures [76]. For ATG-S in both conditions and GI-T in the New Groups condition, Cronbach's alpha was lower than is ideal. This is typical of the GEQ when including reverse coded items [78]. Further, excluding one or two questions had little effect on Cronbach's alpha. Therefore, we maintained the scale in its original form.

**Table 2** Descriptive statistics, including mean, standard deviation (SD), and Cronbach's alphas (α) for all measures. Higher values indicate higher levels of affinity for technology (ATI) group cohesion on the group environment questionnaire (GEQ), loneliness on the three-item loneliness scale (TIL), and depression, anxiety, and stress on the depression, anxiety, and stress scale (DASS).

| | | Existing Groups | | | | New Groups | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *Mean* | *SD* | *SE Mean* | *α* | *Mean* | *SD* | *SE Mean* | *α* |
| Age | | 50.05 | 15.08 | 1.06 | | 48.20 | 14.04 | 1.63 | |
| ATI | Affinity for technology | 3.50 | 0.94 | 0.07 | 0.805 | 3.71 | 0.93 | 0.11 | 0.811 |
| | ATG-S | 6.43 | 1.66 | 0.12 | 0.659 | 6.17 | 1.72 | 0.20 | 0.598 |
| GEQ | ATG-T | 6.70 | 2.05 | 0.14 | 0.859 | 6.51 | 2.15 | 0.25 | 0.826 |
| | GI-S | 5.80 | 1.85 | 0.13 | 0.763 | 5.50 | 2.05 | 0.24 | 0.761 |
| | GI-T | 6.27 | 1.47 | 0.10 | 0.704 | 6.32 | 1.40 | 0.16 | 0.566 |
| TIL | Loneliness | 2.12 | 0.88 | 0.06 | 0.840 | 2.40 | 0.93 | 0.11 | 0.832 |
| | Depression | 13.37 | 6.02 | 0.42 | 0.925 | 15.03 | 6.12 | 0.71 | 0.928 |
| DASS | Anxiety | 12.23 | 5.56 | 0.39 | 0.905 | 13.92 | 5.90 | 0.69 | 0.892 |
| | Stress | 13.79 | 6.01 | 0.42 | 0.917 | 15.95 | 6.37 | 0.74 | 0.922 |

Below, we first indicate what type of groups participants reported about, and then we test our hypotheses.

## 4.1 Type of Groups

Most participants reported both existing and new groups with a collection of people, rather than people who were part of existing friend, family, or workplace social circles (Table 3). A higher percentage of *existing groups* participants described family, and a higher percentage of *new groups* participants described something that did not fit any of the above categorizations.

**Table 3** Types of groups participants reported, including interrater reliability (IRR).

| Label | Examples | Existing Groups; IRR: 0.76 | | New Groups; IRR: 0.85 | |
|---|---|---|---|---|---|
| | | N | % | *N* | % |
| Friend | "Going out with friends," "Getting together with friends," "Eating with friends" | 5 | 2.40 | 2 | 2.70 |
| Family | "Family," "Son's family" | 38 | 18.54 | 4 | 5.41 |
| Workplace | "Workplace," "Sandy's Sanders County Second-Hand Treasures" | 16 | 7.80 | 2 | 2.70 |
| Collection of People | "Neighborhood," "Yoga," "Women's group," "Church," "Dancing," "Live in a flat together," "Political group" | 129 | 62.93 | 54 | 72.97 |
| None of the Above | "Magazines." "Volunteer" | 17 | 8.30 | 12 | 16.22 |

Most participants did not indicate the in-person or online nature of their groups (Table 4). Of the minority who did, *existing groups* had a smaller percentage of explicitly online groups than *new groups*, which were divided between online and in-person.

**Table 4** Whether groups were or were not exclusively online.

| Label | Examples | Existing Groups; IRR: 0.74 | | New Groups; IRR: 0.67 | |
|---|---|---|---|---|---|
| | | N | % | *N* | % |
| Online community | "Instagram community," "Facebook group," "90 Day Fiancé Subreddit" | 51 | 25.12 | 18 | 24.32 |
| Not exclusively online community | "Community center," "Workplace," "Going out to eat with friends," "Work social group" | 17 | 8.37 | 21 | 28.38 |
| Unspecified | "Church," "Garden club," "Family," "Elks lodge," "Knitting," "Women over 40 Hiking" | 135 | 66.50 | 35 | 47.30 |

### 4.2 H1. Higher Group Cohesion Will Relate to Better Mental Health, Especially for Existing Groups

We performed a series of generalized linear model tests. Each model used one mental health scale (loneliness or one of the DASS subscales) as a dependent variable. We examined each subscale separately to avoid an overly complex 2 × 4 × 4 statistical design, which would be difficult to interpret. Each model used Group Type and all GEQ subscales as predictors. We reorganized this data in Table 5 because effects were more consistent across the predictive than dependent variable.

**Table 5** Generalized linear model statistics of the effect of group cohesion on mental health (as measured by loneliness, depression, anxiety, and stress). *B* indicates how many scale points the GEQ subscales (attraction to the group for task purposes (ATG-T), group integration for task purposes (GI-T), group integration for social purposes (GI-S)) increase per scale point that the health scale increased. The table indicates beta (*B*), standard error (*SE*), *p*-values, chi-square ($\chi^2$) values, and degrees of freedom (*df*).

| | | Both | | | Existing Groups | | | New Groups | | | Overall | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *B* | *SE* | *p* | *B* | *SE* | *p* | *B* | *SE* | *p* | $\chi^2$ value | *df* | *p* |
| Intercept | Loneliness | 3.38 | 0.24 | <0.001 | | | | | | | 95.51 | 6 | <0.001 |
| | Depression | 22.66 | 1.48 | <0.001 | | | | | | | 73.01 | 6 | <0.001 |
| | Anxiety | 20.38 | 1.37 | <0.001 | | | | | | | 79.35 | 5 | <0.001 |
| | Stress | 23.99 | 1.51 | <0.001 | | | | | | | 68.09 | 4 | <0.001 |
| ATG-T | Loneliness | -0.23 | 0.03 | <0.001 | | | | 0.17 | 0.06 | 0.002 | | | |
| | Depression | -1.29 | 0.22 | <0.001 | | | | 0.94 | 0.39 | 0.016 | | | |
| | Anxiety | -1.41 | 0.20 | <0.001 | | | | 0.78 | 0.35 | 0.027 | | | |
| | Stress | -1.45 | 0.21 | <0.001 | | | | 1.09 | 0.39 | 0.005 | | | |
| GI-S | Loneliness | -0.09 | 0.03 | 0.013 | | | | | | | | | |
| | Depression | | | | -0.81 | 0.30 | 0.007 | 0.02 | 0.41 | 0.953 | | | |
| | Anxiety | -0.47 | 0.22 | 0.037 | | | | | | | | | |
| | Stress | | | | | | | | | | | | |
| GI-T | Loneliness | | | | 0.12 | 0.05 | 0.011 | -0.15 | 0.08 | 0.050 | | | |
| | Depression | | | | 0.65 | 0.34 | 0.057 | -0.91 | 0.50 | 0.073 | | | |
| | Anxiety | | | | 0.65 | 0.30 | 0.031 | 0.02 | 0.40 | 0.967 | | | |
| | Stress | | | | -0.06 | 0.28 | 0.824 | -0.92 | 0.40 | 0.021 | | | |

First, we make a note on how to interpret data from our table and statistical analyses. In Table 5, the far right "Overall" column reports the chi-square statistics from each overall model. The far left "Both" column indicates main effects of the GEQ scale. Data under the "Existing Groups" and "New Groups" columns indicates interaction effects. These interaction effects must be interpreted in relation to the main effect. For example, reading the top row, for *existing groups*, for every -0.23 scale points that the ATG-T increases, loneliness increases one point. For new groups, for every (-0.23 + 0.17 = -0.06) scale points the ATG-T increases, loneliness increases one point. In instances in which the main effect variable was nonsignificant and excluded from the model, we also include the predictive variable for the other condition to provide context for interpretation of how similar or different the effect was in each condition.

Results indicated that there were no significant findings for ATG-S. This measure also had low reliability for both existing and new groups.

Higher ATG-T scores related to decreased loneliness, depression, anxiety, and stress, but these effects were stronger for existing than new groups.

Higher GI-S scores related to lower loneliness and anxiety scores for both types of groups and lower depression scores for existing, but not new, groups.

Higher GI-T scores typically predicted worse mental health for existing groups, but better mental health for new groups. This was statistically significant for loneliness related to both existing and new groups, anxiety related only to existing groups, and stress related only to new groups.

### 4.3 H2. Affinity for Technology Will Relate to Increased Group Cohesion, Especially for New Groups

We ran a series of generalized linear model tests with Group Type, age, and ATI, and in the interactions between Group Type and age, and Group Type and ATI, as predictors. We used GEQ subscales as the dependent variable.

For most variables, the ATI did not affect the GEQ after accounting for the effect of age (Table 6; Figure 1). Only higher ATI scores predicted higher GI-T scores for new groups, but not existing groups.

**Table 6** Generalized linear models of the effect of age and ATI on GEQ subscales.

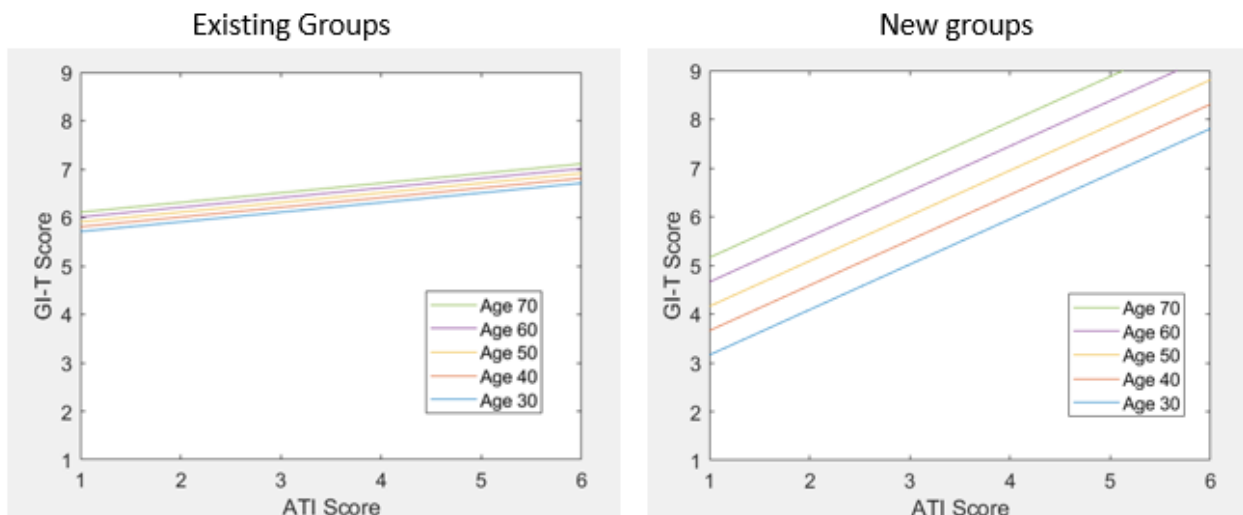|  |  | Both | | | Existing Groups | | | New Groups | | | Overall | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | *B* | *SE* | *p* | *B* | *SE* | *p* | *B* | *SE* | *p* | $\chi^2$ *value* | *df* | *p* |
| Intercept | GI-T | 5.21 | 0.60 | <0.001 |  |  |  |  |  |  | 24.87 | 5 | <0.001 |
| Age | GI-T | 0.01 | 0.01 | 0.287 |  |  |  | 0.04 | 0.02 | 0.014 |  |  |  |
| ATI | GI-T | 0.20 | 0.11 | 0.072 |  |  |  | 0.73 | 0.23 | 0.001 |  |  |  |
| Group Type | GI-T |  |  |  |  |  |  | -4.48 | 1.36 | 0.001 |  |  |  |

**Figure 1** Graphs of the effect of Group Type (existing groups, left; new groups, right), age, and ATI on GI-T scores.

### *4.4 H3. Affinity for Technology Will Relate to Better Mental Health*

We ran a series of generalized linear models with Group Type, age, and ATI, and in the interactions between Group Type and age, and Group Type and ATI, as predictors. We used GEQ subscales as the dependent variable.

The ATI had no effect on mental health after including age in the model.

## 5. Discussion

In this paper, we report on an online survey of U.S. adults aged 27 and above during July 2020 – two months after U.S. national regulations first required social distancing for the COVID-19 pandemic. In a between-subjects design, participants reported about either *existing* groups (groups of which they had been a member for greater than six months; *N* = 202) or about *new* groups (groups of which they had been a member for less than two months; *N* 74). Results indicated that group cohesion affected health differently for existing compared to new groups (H1 partially supported). Affinity for technology had no relationship on group cohesion or mental health for existing groups, but it related to greater cohesion for new groups (H2 partially supported, H3 rejected).

### *5.1 Group Cohesion and Mental Health*

Group cohesion typically related to better mental health, as hypothesized; however, the relationship occurred differently for *existing* groups compared to *new* groups. For existing groups, greater attraction to the group for task purposes and greater group integration for social purposes related to better mental health, but for new groups, they had no consistent relationship to mental health. Conversely, for existing groups, greater group integration for task purposes related to worse mental health, but for new groups it related to better mental health.

As our qualitative results showed, most participants described a "Collection of People" that they were a part of (e.g., a group revolving around a specific interest) regardless of if they were describing existing or new groups. This suggests that the type of group participants described does not

adequately account for the differences in how group cohesion relates to mental health. However, future studies should examine the effects of group cohesion on mental health when participants report more specifically about family and friend groups.

The finding that group integration for task purposes related to worse mental health for existing groups (but not new groups) contradicted H1d. The reason for this may be that it is harder for long-term task groups to continue many of their usual functions, and that social distancing protocols were more disruptive to task groups that were highly integrated, thus resulting in worse mental health. This may be the opposite for newer task groups because the newer groups must develop, and become integrated, within the constraints of social distancing.

It is important to note that dimensions of group cohesion have different effects based on context [48-50], meaning that in different situations, effects may vary. One critical situation that researchers should examine is culture. Group cohesion and social support are critical for mental health across countries [79-86]. For example, higher social cohesion in neighborhoods was shown to be a protective factor against the negative effects of low income in the UK [86] and against the negative effects of aging in the U.S. [82] and Japan [83]. Future research should examine cross-cultural differences in need for group cohesion during the pandemic.

Based on these findings, we recommend that theories in social psychology and health psychology more closely examine how different dimensions of group cohesion, such as measured by the GEQ, affect loneliness, depression, anxiety, and stress. In particular, future research should examine the mechanism by which types of group cohesion affect mental health.

### 5.2 Affinity for Technology on Groups and Mental Health

Supporting the above interpretation of the differential effect of group integration for task purposes in existing and new groups, in newer groups, affinity for technology related to increased group integration for task purposes (partially supporting H2d). Most participants did not specify if their groups were exclusively online or not, but new groups had a higher percent of exclusively online groups than existing groups. It is likely that when people form new groups during social distancing, these groups are online, and therefore affinity for technology helps improve group integration for task purposes, which improves mental health. Conversely, with existing groups, people may still have some in-person interaction, which makes technology less important. The finding that there was no direct effect of affinity for technology on mental health indicates that being skilled at using technology alone does not improve mental health. It is how people use it to interact with their new group that can improve mental health.

Affinity for technology showed no relationship with group cohesion or mental health for people reporting about existing groups, and no direct relationship to mental health for people reporting new groups. This fails to support H2 and H3. There are many possible interpretations for this. It may be that being good at using technology was not enough to help people maintain social connection during the first months of social distancing. It may also be that during the first months of social distancing, there was little change to perceived social connection relative to life before the pandemic; if researchers replicate the survey further into the pandemic, affinity for technology may affect group cohesion and mental health. It may also be that people with low affinity for technology continued to maintain social connection through in-person interactions. Indeed, in the U.S., many nonessential businesses were reopening during this time, and social distancing requirements had

relaxed. Based on these data, we cannot comment on if people in this study strictly maintained social distancing, if they found ways to meet in-person at social distance (e.g., yoga in a park), or if they disregarded social distancing altogether. It may be that during more strict social distancing requirements in the U.S. or other countries, affinity for technology would be more important for group cohesion and mental health. The subject requires future research to fully parse apart.

Future research on how technology can support group connection should account for what type of group people are connecting with: existing groups or new groups. Further research should confirm and expand upon why affinity for technology especially supports group cohesion with new groups and how it can better be used for supporting group cohesion for existing groups.

### 5.3 Technological Recommendations

During the pandemic, it can be difficult to feel socially connected, which has a negative impact on mental health. Based on this work, we recommend how researchers and practitioners could employ and test technology to help people maintain existing and make new social connections to improve mental health.

### 5.3.1 Maintaining Existing Connections

This research indicates that being satisfied with the group's task-related behavior (ATG-T) and being integrated to spend social time together (GI-S) relate to better mental health. If technology could help mediate people's group and task behavior, and could encourage safe ways to spend time together, it might help people maintain strong cohesion with their group and mental health.

### 5.3.2 Making New Social Connections

This research indicates that affinity for technology related to group cohesion in achieving its goals (GI-T) with new groups, which related to better mental health. We recommend testing if providing technology training to improve people's affinity for technology could help them develop greater group integration for task purposes with new groups. If so, this might help improve their mental health when socially isolated – whether from COVID-19 or for people who have difficulty leaving their houses for other reasons.

### 5.4 Limitations and Future Directions

Scale internal reliability was low for two measures of the ATG-S (for existing and new groups) and GI-T (for new groups). This is similar to in prior studies, which found that altering question text to make a new scale so that no items to be reverse coded resulted in much higher reliability [78]. In this study, we elected to use the wording as it was originally written to account for acquiescence bias in our online sample [87]. We did not exclude measures that related to low Cronbach's alpha because doing so would exclude half the scale. Maintaining the scale this way related to health outcomes. These results should be interpreted with caution, and future studies should determine if this relationship remains using the new scale [78].

Because these data are correlational and subjective in nature, we can only speculate as to causal relationships. Research shows that poor mental health can also decrease perceived closeness with groups [43, 88-90]. Additionally, because this was a survey study, the data may have recall bias –

that is, participants may remember some things over others, may remember things in a more positive or negative light, and so on. Future research should experimentally examine causal relationships or gather deeper insights via interviews or focus groups. Future researchers may also wish to examine mental health using behavioral or other measures, to supplement these subjective metrics, which may produce different study results.

Future studies should also examine how other qualities of participants' group, such as group size, affect the relationships reported in the study. Connection to a large community versus a small close-knit group may have different effects on how perceived group cohesion affects mental health.

In this data, we included only U.S. adults aged 27 years and older. Future research should examine if this extends to children and young adults, and how this relates to people in other countries.

## 6. Conclusion

In this paper, we examined the relationship between affinity for technology, group cohesion, and mental health, for people describing *existing* and *new* groups. The survey occurred in the U.S. in June 2020, three months after the government required social distancing. For *existing* groups, affinity for technology did not relate to group cohesion or mental health. Attraction to one's group for task purposes and group integration for social purposes related to better mental health, while group integration for task purposes related to worse health. Conversely, for *new* groups, affinity for technology related to increased group integration for task purposes, which related to better mental health. Scholars can use these results to help develop technology to improve group cohesion and mental health.

## Author Contributions

Fraune, Langlois, Preusse, and Tsui were responsible for project development. Langlois and Preusse collected and cleaned the data. Fraune analyzed data and wrote the first and final drafts of the paper. Langois, Preusse, Rheman, Ling, and Tsui made substantial edits to the paper throughout the process.

## Competing Interests

The authors have declared that no competing interests exist.

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