

Connecting Online: The Effects of Social Interaction on Academic Performance

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Abstract

I study whether online social interaction can improve well-being and academic performance, and whether people accurately anticipate these effects. I conduct a randomized controlled trial with 339 college-aged adults, in which treated individuals engage in a short video conversation with someone they know. The social interaction treatment significantly improves well-being, increasing happiness and reducing loneliness. Its effect on an academic reasoning test is positive but statistically insignificant. Participants' beliefs are directionally correct: they expect that other individuals are lonely, and that social interaction improves well-being and academic performance. However, they overestimate both their peers' baseline loneliness and the magnitude of the treatment's benefits. These results show that even a brief, digitally mediated interaction can improve well-being. They also provide evidence against the hypothesis that people underinvest in social connection because they underestimate others' loneliness or the benefits of interacting.

1 Introduction

Over the past several years, the question of how social isolation affects individuals' physical and mental health has come to the forefront of many scientific and policy debates. An abundance of research from sociology and social psychology has shown that recent changes in lifestyle and social infrastructure have been associated with greater social isolation and loneliness, and in turn with negative health effects, including increasing the risk of cardiovascular disease, obesity, and poor sleep (S. Cacioppo et al., 2015; Holt-Lunstad et al., 2015). Simultaneously, a newer body of work has documented the importance of psychological well-being for workers' productivity (Oswald et al., 2015). The increasingly widespread and potentially dangerous nature of loneliness has led many researchers and public policy officials to call these trends a "loneliness epidemic" (Kristof, 2019; Smith, 2018).

Recently, the question has become even more pertinent due to COVID-19, as the pandemic has forced individuals around the world to socially isolate, but often still continue their normal work routines from their home environments. In particular, university students have been required to move off campus, away from many of their strongest support resources, but often still continue taking classes and participating in extracurricular activities as normal. As a result, throughout the pandemic, surveys have recorded significant increases in rates of loneliness and mental health issues, particularly among young adults (Varga et al., 2021; Horigian et al., 2021; Lee et al., 2020; Weissbourd et al., 2021).

Simultaneously, digital technologies have been increasingly mediating how individuals form social relationships. Social media platforms can lower the cost of connecting with others when face-to-face contact is difficult. However, they also provide access to digital content that may crowd out these social interactions. Thus, their effects on well-being can be mixed (Allcott et al., 2020; Mosquera et al., 2020).

These changes raise questions about the effects of social isolation on people's work, the extent to which digital platforms can correct for social isolation, and the extent to which people may be aware of these effects. Thus, in this paper, I seek to answer two questions: (1) Can interventions that increase social interaction improve people's well-being and academic performance? (2) Do people have accurate beliefs about others' loneliness levels and the effects of socialization, such

that they can invest in an optimal level of social interaction?

I examine these topics among a university student-age population, as the effects of loneliness on this population are currently understudied, despite the fact that young adults have been acutely affected by loneliness during the pandemic (Varga et al., 2021; Weissbourd et al., 2021), and the fact that loneliness could have severe impacts on their well-being and academic success (Oswald et al., 2015). Furthermore, if students systematically underestimate how much they could benefit from social interactions or how lonely their peers are, they may reach out to others less frequently than optimal, generating a self-reinforcing cycle of loneliness (Epley & Schroeder, 2014).

To study these questions, I run an experiment online with 339 participants, in which I randomly vary the amount of social interaction that participants receive over a short span of time. Participants sign up for the experiment with a friend, family member, or acquaintance whom they do not talk to on a regular basis, and pairs are randomized into two groups. Individuals in pairs that are placed in the treatment group spend 20 minutes talking to each other over a video call, whereas individuals in pairs that are placed in the control group spend 20 minutes watching YouTube videos alone. After the treatment, all participants complete a 25-question verbal reasoning test and answer several questions about their well-being. Participants also make predictions about the prevalence of loneliness among the study sample and the effects of social interaction on well-being and academic outcomes.

First, I examine the effects of the social interaction treatment on well-being. I find a positive and significant effect on the aggregate well-being index. Disaggregating the index, I find improvements in the happiness, loneliness, and life satisfaction measures, though the life satisfaction effect is not significant. Thus, I see that the treatment results in small improvements in well-being.

Next, I turn to the effects on academic outcomes. I administer a short 25-question verbal reasoning test. I find a slightly positive but insignificant effect of the treatment on the academic measure. Similarly, examining different subsets of the verbal reasoning questions — i.e., by question difficulty and question type — I again do not find significant results. Thus, although I find evidence that is suggestive of the importance of well-being for academic performance, the results are ultimately inconclusive.

Finally, I assess whether individuals hold accurate beliefs about the prevalence of loneliness and effects of social interaction. Participants' beliefs are directionally consistent with observed outcomes — they predict meaningful levels of baseline loneliness, and the social interaction intervention will improve well-being and academic performance. However, they modestly over-predict the magnitudes of both results — i.e., they predict a higher degree of baseline loneliness and a larger effect of the treatment, with some of these differences being significant. Taken together, these results provide evidence *against* the hypothesis that individuals underinvest in social connection because they underestimate others' loneliness or the benefits of interacting. Instead, it may be the case that investment is constrained by other costs that the experiment does not measure.

This paper contributes to several strands of literature. First, a growing body of literature examines the relationship between psychological well-being and economic outcomes. In particular, research has documented a bidirectional relationship between mental health and poverty (Oswald et al., 2015; Ridley et al., 2020). In particular, part of this literature examines the role of individuals' beliefs about loneliness on their inclination to connect with others (Epley & Schroeder, 2014). I contribute to this literature by conducting a study on the short-term effects of improved well-being on academic performance. I provide a comparison of results in Section 4.

Second, a body of literature, largely from social psychology, has focused on interventions to reduce loneliness. Generally, social psychologists have grouped loneliness interventions into five different categories: 1) improving social skills, 2) enhancing social support, 3) increasing opportunities for social contact, 4) addressing maladaptive social cognition, and 5) pharmacological treatment. However, thus far, evidence has largely been correlational and results have been mixed. A meta-analysis that summarized the results from studies on several interventions to increase social support (e.g. through mentoring programs, Buddy-care programs, conference calls) or increase opportunities for social contact (e.g. social recreation intervention) found limited effects (Masi et al., 2011; S. Cacioppo et al., 2015). I complement this literature by experimentally testing the effects of interaction with an existing social connection.

Finally, the paper relates to an emerging literature in economics about the effects of digital technologies. In particular, some research has found that restricting access to social media can improve well-being and increase offline social interaction (Allcott et al., 2020). At the same time,

digital technology can facilitate communication that reduces psychological distress (Annan & Archibong, 2021). This paper contributes to this literature by evaluating one way that digital technologies can shape social interactions and economic outcomes.

The rest of the paper is structured as follows. Section 2 provides some background about the topics of loneliness, social isolation, and work and academic outcomes, including a more detailed description of the existing literature. Section 3 describes the experimental design, with descriptions of the recruitment process, treatment, and outcome measures, as well as balance and attrition checks. Section 4 presents the results. Finally, I conclude in Section 5.

2 Background and Literature

Loneliness is defined as the discrepancy between a person's desired and actual social relationships. It is distinct from social isolation, as the former is a subjective measure regarding how satisfied one is with their social connections, while the latter is a more objective measure regarding the number of people one may interact with. However, these two concepts are correlated, as greater social isolation can result in greater levels of loneliness (Peplau & Perlman, 1982).

Currently, a substantial body of literature exists on the negative effects of loneliness on physical and mental health, but very few studies have examined the effects of loneliness in work or school environments. Of the few studies that have done so, the majority have focused on characterizing levels of loneliness and identifying factors that may contribute to loneliness. For instance, some studies have found that, within workplace environments, low hierarchical position and poor organizational structure are correlated with higher levels of loneliness (Erdil & Ertosun, 2011; Reinking & Bell, 1991). Diehl et al. (2018) found that loneliness is rather prevalent among university students, with 32.4% of students feeling moderately lonely and 3.2% of students feeling severely lonely, based on a survey of university students in Germany (Diehl et al., 2018). Several recent studies have found that young adults have been disproportionately affected by loneliness during the pandemic (Varga et al., 2021; Weissbourd et al., 2021).

Recently, social psychologists have begun to conceptualize loneliness as a biological construct, much like hunger, thirst, or pain. Similarly to these phenomena, loneliness can serve as a signal that a person may be in threat of danger and need to change their behavior in order to

avoid harm. In the same way that a lack of food or water can lead people to focus all of their attention on the challenges associated with getting these resources (i.e. a "scarcity trap"), a lack of companionship can lead people to focus all of their attention on their social interactions (or lack thereof), detracting attention from other issues in their life (J. T. Cacioppo et al., 2006; Shafir & Mullainathan, 2013; Schilbach et al., 2016; Dean et al., 2017). This focus could consequently have negative results on people's ability to work productively.

Some lab studies have supported this claim, showing that loneliness can have negative effects on cognitive function, most notably through decreased attentional processes. This pattern was studied in Cacioppo (2000). Researchers asked college students to perform a dichotic listening task in which participants were required to respond to stimuli in their dominant and non-dominant ears, and they ultimately found that loneliness can compromise effortful attentional processes (J. T. Cacioppo et al., 2000). The effects of the lack of regulation of emotions are often rather subtle, such that they can lead to changes in behavior and outcomes that individuals may not necessarily even realize (Hawkley & Cacioppo, 2010). I hope to build on this literature regarding the effects of loneliness on workplace productivity and cognitive outcomes by directly examining the impacts of loneliness on academic performance among university student-age individuals.

To date, there has not been careful empirical research on the causal effects of loneliness on students' academic performance. However, several studies show suggestive evidence that a negative relationship could exist. For instance, Ozelik and Barsade (2011) served as the first empirical examination of the impact of loneliness on productivity in workplace environments. Analyzing survey data, they found that loneliness was associated with lower task, team role, and relational performance. They also posited that these effects emerged through two main channels: first, through attentional deficits (i.e. attention spent on self-regulation of emotions detracted from attention that could otherwise be spent on work) and second, through relational withdrawal (i.e. employees felt less of an affective commitment to their workplaces, and thus invested less energy in their work) (Ozelik & Barsade, 2011).

Finally, some research has shown that loneliness can be a self-reinforcing cycle. One channel for this self-reinforcement is posed by Cacioppo et al. (2015), which found that lonely individuals perceive social situations differently from non-lonely individuals, as they tend to be hyper-attentive to the potential for negative social interactions, and consequently may avoid interacting

with others altogether (S. Cacioppo et al., 2015). Another possible channel of self-reinforcement emerges from mismatched perceptions regarding the prevalence of loneliness or others' desire for increased social interaction — i.e. if individuals believe that they are the only people who are lonely or desire increased social interaction, they may be less likely to reach out to other people. A similar idea is examined in Epley and Schroeder (2014). The paper showed that participants underestimate the likelihood of having a positive experience when connecting with a stranger on a train or bus, largely because they underestimate the strangers' willingness to connect as well (Epley & Schroeder, 2014). Thus, I explore this latter channel by collecting information on perceived rates of loneliness among college students, and comparing this to actual rates of loneliness.

3 Experimental Design

3.1 Experiment Overview

To test the effects of social interaction on academic outcomes and well-being as well as the accuracy of people's beliefs about loneliness and social interaction, I run an experiment that randomly varies the amount of social interaction that participants have with other individuals. Participants are asked to sign up for the study with someone whom they do not talk to regularly but whom they would be interested in talking to, and all pairs are randomized into two groups. Participants in pairs assigned to the treatment group spend 20 minutes talking to each other, while participants in pairs assigned to the control group spend 20 minutes watching YouTube videos alone. All participants then complete a verbal reasoning test and answer several survey questions, such that I can determine the effects of the treatment on their academic performance and well-being. Additionally, they make predictions about the participant pool's average baseline loneliness levels as well as the average academic test scores and well-being levels of each treatment group, such that I can test the accuracy of their beliefs.

3.2 Recruitment and Screening

We began recruiting participants for the main study in April. Primarily, I recruited through the MIT Behavioral Research Lab (BRL), which posted a listing for the study on its website, sent weekly email advertisements to its mailing list, and posted advertisements on Facebook and LinkedIn. Additionally, I sent emails to mailing lists of undergraduate and graduate students, including to MIT and several universities' economics departments.

Individuals were informed that they would be participating in an online MIT study about "the way that people spend time online and the effects of these activities on their academic performance." To minimize sample selection bias and demand effects, the advertising did not explicitly indicate that the study was looking at the effects of social isolation or interaction.

They were also informed that they should sign up for the study with someone whom they do not talk to on a daily or weekly basis. I indicated that some examples could include "an acquaintance whom [they] would like to get to know better, a friend whom [they] have lost touch with due to COVID-19, or a family member whom [they] do not interact with regularly."

In each pair of two participants, one had to create an account on the BRL website, through which they registered for the study and then received a link to the Qualtrics site on which the study was administered. On the Qualtrics site, they then received a link to invite their partner to access the study as well. Both took a short pre-screen survey, which required that all participants are age 18-34, reside in the U.S., and have access to a video calling platform. Then, after signing a consent form, they could begin the study.

Table 1 shows the number of participants who begin the study, the number who were randomized into a treatment group, and the number who finished the study, separated by treatment group. It confirms that I did not have issues of differential attrition across the two groups.

3.3 Baseline Measurements and Treatment

The study begins with a baseline survey, which records participants' demographic information, baseline loneliness levels, and predictions about other participants' baseline loneliness levels. Participants are given an additional \$2 of compensation if they get at least half of the prediction questions correct. I count an answer to a prediction question as correct if it is within 10%

of the units of the correct average at the time that the participant is paid. Then, upon completing the baseline survey, participants are randomized into two groups:

Treatment Group — Participants spend 20 minutes talking to their study partner over a video call. They are informed that they could spend this time discussing any topics that they desired. They are also provided several conversation prompts and informed that they could use the prompts if they desired.

Control Group — Participants spend 20 minutes watching YouTube videos, out of a pre-selected set of four possible options. The four videos are all nature or cooking videos, selected to maintain participants' attention but have minimal effects on their mood or focus. They all featured little or no dialogue, as well as little action or change.¹

As participants complete the study online in their own time, I include several checks to ensure that they comply with the treatments.

I verify compliance in the treatment group in two ways: First, I ask them to upload a screenshot of them and their study partner over video call, with a time stamp clearly visible, at the end of their conversation — which I compare to the time that Qualtrics records for when they began their conversation. Second, I ask them to generally describe their conversation topics, and I compare the responses of each pair member against one another.

In the control group, participants spend 20 minutes watching YouTube videos online. I verify their compliance in two ways: First, I ask which video(s) they watched. Second, I asked two questions regarding the way they spent their 20-minute period: (1) whether at any point they left their seat, switched to another tab, or used their phone, and (2) whether they talked to anyone else. To these latter two questions, participants could answer “No”, “Yes, briefly”, or “Yes, for an extended period of time.” To elicit as truthful of responses as possible, I emphasize that participants' answers would not affect their payment.

In response to the question about whether or not participants left their seat, switching to another tab, or using their phone, 114 participants answer “No”, 52 answer “Yes, briefly”, and 6

¹ At the end of the study, these participants also spend 10 minutes talking to their study partner and then answered several questions about the conversation. I include this additional conversation period so all participants would get a chance to interact with their partner at some point in the study.

answer “Yes, for an extended period of time.” In response to the question about talking to someone else, 134 participants answer “No”, 33 answer “Yes, briefly”, and 4 answer “Yes, for an extended period of time.”

3.4 Sample Characteristics and Covariate Balance

I report background characteristics of the sample in Table 2. All participants are age 18-34, and the average age of the sample is 23.3 years. Additionally, 64.8% of participants identify as female, 15.6% are Black, and 79.8% are U.S. citizens. 58.0% have some college degree and 80.1% are currently enrolled in school (where 60.0% are currently undergraduate students and 20.1% currently graduate students). Finally, 56.0% are employed in some form (with 17.8% employed full-time and 38.2% employed part-time).

Table 2 also displays the average baseline loneliness levels, as measured by the 3-Item UCLA Loneliness Scale. Participants answered 3 questions on a scale of 1-4 points each, resulting in a loneliness score on a scale of 3-12 points. The average loneliness score in the sample is 7.82, i.e., moderately lonely.

Additionally, I report participants’ answers regarding their relationship to their study partner in Table 3. I ask each participant to indicate whether their study partner is a friend, acquaintance, classmate, coworker, parent, child, sibling, or other family member. Participants could also write in a response if their partner does not fall into one of the listed options. The two most common responses are friend (66.3% of respondents) and classmate (13.3% of respondents).

Finally, I report participants’ answers regarding the frequency of interactions with their study partner in the month prior to the study in Table 4. Participants could indicate that they had interacted with their partner “Not at all” (zero times), “Infrequently” (1-2 times in the past month), “Somewhat infrequently” (every other week), “Somewhat frequently” (once a week), “Frequently” (2-4 times a week), or “Very frequently” (everyday or almost everyday). The three most common responses are “infrequently” (34.3% of respondents), “somewhat infrequently” (24.3%), and “very frequently” (18.8%).

Tables 2, 3, and 4 also allow us to verify whether the randomization was done effectively. We see that the two groups are balanced on nearly all observables. The one exception is that the fraction of participants who signed up with a sibling is slightly higher in the control than the

treatment group, and this difference is significant at the 5% level (Table 3). However, none of the differences for the other partner categories are significant, even at the 10% level. Overall, these results suggest that the randomization was effective.

3.5 Outcome Variables

Directly after the treatment period, participants complete an academic test and answer several survey questions about their well-being levels as well as their predictions of these outcomes for the two treatment groups. They receive an extra \$1 of bonus compensation for getting at least half of the questions correct. I define a question as “correct” in the same way here as I do for the baseline prediction questions — i.e., if it is within 10% of the units of the correct average at the time that the participant is paid. The full texts of the survey questions are located in Appendix Section C. I evaluate the following outcomes:

Well-being — I ask participants several questions concerning their well-being. At baseline, I administer the 3-Item UCLA Loneliness Scale Survey, which is an abridged version of the standard questionnaire within the literature for measuring loneliness (Hughes, Waite, Hawkey, & Cacioppo, 2004). I also ask 4 questions about the impacts of COVID-19 on individuals’ abilities to study and do work. Post-treatment, I measure 3 outcomes:

1. **Happiness:** Participants are asked how happy they are at that moment in time. They respond on a scale of 1 to 5, where 1 represents “Not at all happy” and 5 represents “Very happy.”
2. **Life Satisfaction (Cantril Scale):** Participants are asked to imagine a ladder with steps numbered from 0 at the bottom to 10 at the top, where the top represents the best possible life for them and the bottom represents the worst possible life for them. They must indicate which step of the ladder they feel they are on.
3. **Loneliness (UCLA Loneliness Scale):** Participants are asked 20 questions regarding their relationships with other people. They receive a loneliness score on a scale of 0 to 60, where a score of 0 to 14 denotes a low degree of loneliness, 15 to 29 a moderate degree of loneliness, 30 to 44 a moderately high degree of loneliness, and 45 to 60 a high degree of

loneliness.

I also combine participants' responses to these three measures into a **well-being index**. To make the index, I normalize participants' scores on the three measures and sum the normalized scores together (flipping the loneliness score, such that a higher score is associated with greater well-being).

Academic Outcomes — I administer a 25-question GRE verbal reasoning test, which participants can spend up to 35 minutes completing. Each question is worth 1 point, and thus participants receive a verbal reasoning score on a scale of 25 points. I use this test as the outcome measure because it is a real-world academic measure that is (1) standardized to be complete-able by university students and does not require particular prior knowledge, and (2) requires participants to consume and synthesize substantial amounts of information. As a result, I hypothesize that performance on this test would be sensitive to differences in focus or attention that could result from changes in social interaction level, as explained in Section 2.

Additionally, I break down the 25 questions using two methods to determine if the treatment effects differ by question type:

1. **Difficulty level:** The test's answer key provides data on the percentage of test-takers who correctly answered each question when the test had previously been administered. Thus, I divide questions into two categories:
 - a. *Easy questions* — I define questions as "easy" if at least 60% of test-takers got them correct. 13 questions fell into this category.
 - b. *Hard questions* — Accordingly, I define questions as "hard" if fewer than 60% of test-takers got them correct. 12 questions fell into this category.
2. **Question type:** The test is composed of 3 different types of verbal reasoning questions:
 - a. *Reading comprehension* — Participants read a passage that ranges in length from one paragraph to several paragraphs, and then answer questions about the passage. Questions test participants' abilities to understand the meaning of the passage, distinguish between minor and major points, draw conclusions from information provided, identify the author's assumptions and perspective, and more.

12 questions fall into this category.

- b. *Text completion* — Participants read a passage composed of one to five sentences, which included one to 3 blanks, and then pick the word out of several choices that fit best in the blank. 8 questions fall into this category.
- c. *Sentence equivalence* — Participants read a single sentence with one blank, and then choose two words out of several choices that, when filled into the blank, lead to complete, coherent sentences that had the same meaning. 5 questions fall into this category.

Beliefs About Others' Loneliness — I also measure the accuracy of people's beliefs regarding others' loneliness levels. If people systematically underestimate the prevalence of loneliness, they may reach out to others less frequently than optimal. In the baseline period, after answering several questions about their own well-being, participants are also asked to make predictions about the well-being levels of the average participant in the study. They are provided basic demographic information about the participant pool, then presented the same 3-Item UCLA scale and 4-question COVID-19 survey as they had answered in the baseline period and asked to predict the averages for each of the questions. I then compare these predicted averages to the actual averages.

Beliefs About the Effects of Socialization — I am also interested in the accuracy of people's beliefs on the effects of social interaction. If people systematically underestimate the benefits of connecting with others, this could lead to under-investment in social connections. After completing the verbal reasoning test and the post-treatment well-being survey, participants are asked to predict the averages of each post-treatment outcome for each treatment group. They are again provided basic demographic information about the participant pool as well as descriptions of the two groups, then asked to predict the average verbal reasoning score, happiness level, life satisfaction level, and loneliness level of each group. I then compare the predicted difference in averages between the two treatment groups to the actual difference in averages.

3.6 Payment

All participants receive a baseline payment of \$12. They have the opportunity to receive additional payment in three instances, such that they could earn up to \$25 total for the study. First, on the verbal reasoning test, participants earn an additional \$0.40 for each question they answer correctly, such that they can earn a total of \$10 for answering all questions correctly. Second, on the baseline loneliness prediction questions, participants earn an additional \$2 if they get at least half of the baseline prediction questions correct. Finally, on the treatment effect prediction questions, participants earn an additional \$1 if they get at least half of the treatment effect prediction questions correct.

On average, participants receive \$16.75. The average payment for the verbal reasoning section is \$3.97 (approximately 10 questions correct). Of the participant pool, 53.4% earn the \$2 bonus for the baseline loneliness predictions and 20.7% earn the \$1 bonus for the treatment effect predictions.

4 Results

4.1 Descriptive Statistics of Outcome Measures

First, I provide some basic statistics on the 4 outcomes that I measure post treatment: the verbal reasoning test and the 3 well-being measures. Figure 1 shows the distribution of each outcome measure and Table 5 shows their means and standard deviations.

The summary statistics are interesting in a few different ways. First, the average score on the verbal reasoning test is relatively low. If extrapolated to a two-section 50-point test and converted to the scaled score, it would translate to a verbal reasoning score of 147, which is approximately the 34th percentile.

The summary statistics of the well-being measures are also informative. The average happiness level is 3.13 on a scale of 1 to 5, which translates to between “somewhat happy” and “happy.” Additionally, the average life satisfaction level is 6.44 on a scale of 0 to 10, indicating that people believe that they are somewhat close to being at the best possible life for themselves. Finally, the average loneliness level is 23.08 on a scale of 0 to 60, which indicates that participants are

moderately lonely on average. Further, 78.83% of participants are at least moderately lonely. Interestingly, only 3 participants fall in the high loneliness category.

4.2 Effects of Social Interaction

To estimate the effect of the social interaction treatment on the outcomes of academic performance, happiness, life satisfaction, and loneliness, I use the following regression model:

$$Y_i = \beta T_i + \gamma X_i + \varepsilon_i$$

where Y_i is the relevant outcome variable for participant i and T_i is an indicator variable that equals 1 if the participant is in the treatment group. Thus, β captures the average effect of the 20-minute social interaction treatment on the outcome of interest. Additionally, X_i is a vector of controls, which includes age, gender, race, highest level of educational attainment, current education status, current employment status, and baseline loneliness. Finally, all standard errors are robust and clustered at the study pair-level.

4.2.1 Well-being

I first report the estimates for the treatment effects on happiness, life satisfaction, and loneliness, as well as a summary index of these variables in Table 6. The results show that the 20-minute social interaction treatment increases well-being overall. In particular, it makes participants slightly happier, more satisfied with their lives, and less lonely. The coefficients on the well-being index, happiness level, and loneliness level are statistically significant, while the coefficient on life satisfaction level is not.

For each outcome, I report two estimates of the treatment effect: one from a regression without any controls, and one from a regression where I control for demographic characteristics and baseline loneliness.

Columns 1 and 2 report the estimates of the treatment effect for the well-being index. Per the estimate without controls, the social interaction treatment increased the well-being index by 0.456 points (SE 0.261), which is significant at the 10% level. The estimate with controls of baseline loneliness and demographic characteristics is similar, at 0.524 (SE 0.231), which is significant at

the 5% level.

Columns (3)-(8) report the estimates of the treatment effect for each of the specific well-being measures. Including the demographic and baseline loneliness controls, the point estimate of the effects of the social interaction treatment on happiness is 0.234 with a standard error of 0.126, which is significant at the 10% level. This indicates that the treatment is, on average, associated with an increase in happiness of 0.234 points on a 5-point scale. Additionally, the point estimate of the effects of the social interaction treatment on loneliness is -2.249 with a standard error of 1.216, which is also significant at the 10% level. This indicates that the treatment is, on average, associated with a decrease in loneliness of 2.249 points on a 60-point scale. The point estimate of the effects of the social interaction treatment on life satisfaction is 0.159 with a standard error of 0.221, which is not statistically significant. However, as the standard error around this estimate is quite large, I cannot rule out the possibility of there being an effect.

These results provide some evidence that even short periods of socialization can have positive effects on individuals' well-being. However, it is important to note that these results only indicate that the brief social interaction has a short-run effect on well-being. I am unable to conclude whether these effects persist over longer periods of time, and it is possible that longer-term forms of social interaction are necessary for this persistence.

4.2.2 Academic Outcomes

Given the above effects on well-being, I now discuss whether the treatment also resulted in an improvement in students' academic performance.

As reported in Table 7, I find no evidence of significant effects of the social interaction treatment on academic performance. Columns 1 and 2 report the results for overall test score, with the first column displaying the results of the regression that only includes the treatment dummy, and the second column displaying the result of the regression that also includes controls for demographics and baseline loneliness. In Column 1, the point estimate for the effect of treatment is -0.0828 (SE 0.942). In Column 2, the point estimate for the effect of treatment is 0.412 (SE 0.821). I see a similar pattern across the different breakdowns of test questions: all of the treatment coefficients are positive but small and not significant, and all estimated coefficients have rather large standard errors, with the exception of the coefficient for the text completion questions, which is

negative (but still not significant).

Table 7 Column 2 also shows a positive relationship between baseline loneliness and test score, which is significant at the 5% level. The point estimate is 0.324 points with a standard error of 0.151, indicating that an increase in baseline loneliness by 1 point is associated with a 0.329-point higher test score on average — a relationship in the opposite direction of what I had hypothesized, as described in Section 2. However, this result is consistent with the Coviello et al. (2020) paper, which found a negative relationship between mood and workplace productivity.

Although the estimated effect on academic performance is not statistically significant, the point estimate in the preferred specification is positive. Most of the adjusted estimates across question categories are also positive, although they are imprecisely estimated. These results are therefore directionally consistent with the hypothesis that social interaction — and the resulting improvement in well-being — could improve academic performance, but they do not provide conclusive evidence of such a relationship.

There are several reasons why a positive relationship might be difficult to detect in this experiment. First, due to budget constraints, we have a rather modest sample size, which limits our statistical power, as reflected in the large standard errors. Consequently, we cannot rule out meaningful positive effects.

In particular, it is possible that the verbal reasoning test is an imperfect measure of short-term academic performance. In particular, the average test scores are very low, which may indicate that the test is too difficult for many participants. Additionally, it is also possible that by nature of the test being difficult, many participants simply guess answers, such that my data is largely capturing noise rather than meaningful variation.

Finally, it is possible that the treatment conversation is too short to produce a sufficiently large change in well-being to affect cognitive performance. In contrast, a longer-run treatment could. In future research, I could examine the effects of socialization interventions that last several weeks or months.

4.3 Beliefs

Finally, I examine the accuracy of individuals' beliefs regarding others' baseline loneliness, as measured by the 3-Item UCLA Loneliness Scale, and regarding the effects of social interaction

on well-being and academic outcomes, as measured by the 3 well-being metrics and the verbal reasoning test. Inaccurate beliefs on both of these issues can lead individuals to under- or over-invest in social interaction. To test the accuracy of both of these forms of beliefs, I compare the actual measure of the outcome with the predicted measure of the outcome.

4.3.1 Predictions of Baseline Loneliness

First, I find that participants correctly predict that other participants experience meaningful levels of loneliness, but they overestimate others' loneliness levels. I display the differences in actual and predicted outcomes visually in Figure 3, which shows that participants tend to predict that others would provide answers on the higher end of the 4-point scale of each question than what the other participants actually gave.

Table 8 also reports these results mathematically. Specifically, Column 1 reports the mean and standard error of actual measured loneliness level, Column 2 reports the mean and standard error for participants' predictions of the average loneliness level, Column 3 reports the difference, and Column 4 reports the p-value from a two-sample t-test. On each of the 3 loneliness questions as well as the aggregate loneliness measure, I find that participants overestimate the average frequency of loneliness among others in the participant pool. Specifically, they overestimate the frequency that others lack companionship by 0.158 points, the frequency that they feel left out by 0.094 points, and the frequency that they feel isolated by 0.123 points. All 3 differences between predicted and actual mean are significant at the 5% level, and the difference on the companionship question is significant at the 1% level.

This result is perhaps somewhat surprising, given existing research showing that people tend to underestimate others' willingness to connect and thus reach out less frequently than optimal (Epley & Schroeder, 2014). One possible explanation for this difference in results is that the pandemic has precipitated a substantial increase in attention and media reporting about the prevalence of isolation and loneliness. The result may be that people perceive loneliness to be more prevalent than it actually is.

4.3.2 Predictions of Treatment Effects

Finally, I assess participants' beliefs about the effects of the social interaction treatment. Participants anticipate that social interaction will have beneficial effects on both well-being and academic performance. However, they tend to predict larger improvements than we observe in the experiment. I display these results visually in Figure 2. The histograms show that, in addition to overestimating the difference in means between the control and treatment groups, participants also overestimated the raw values of the verbal reasoning scores and well-being measures.

Table 9 reports these comparisons formally. Column 1 reports the regression-adjusted treatment-effect estimate and its standard error. Column 2 reports the mean and standard error of participants' predicted treatment effects. Column 3 reports the predicted treatment effect minus the estimated treatment effect, and Column 4 reports the p-value from a test that the two effects are equal. For each outcome, the predicted treatment effect is directionally correct but larger in magnitude than the estimated treatment effect.

Row 1 reports the result for the verbal reasoning test. Participants overestimate the treatment effect by 1.299 points (SE 0.877), a difference that is not significant. Rows 2-4 report the results for well-being. On happiness, participants overestimate the treatment effect by 0.480 points (SE 0.135), a difference that is significant at the 1% level. They predict that the treatment effect on happiness would be on average 0.714 points (SE 0.048), whereas the actual treatment effect is on average 0.234 points (SE 0.126). On life satisfaction, participants overestimate the treatment effect by 0.978 points (SE 0.251), a difference that is also significant at the 1% level. They estimate that the treatment effect on life satisfaction would be on average 1.137 points (SE 0.118), whereas the actual treatment effect is on average 0.159 points (SE 0.221). Finally, for loneliness, they predict a larger decrease in loneliness, but this difference is not significant.

This result is also perhaps somewhat surprising, given existing research showing that people tend to underestimate the positive effects of connecting with others (Epley & Schroeder, 2014). There are several possible explanations for this surprising result. First, it is possible that the heightened media coverage about loneliness during the pandemic has led individuals to *over-*estimate its prevalence. Second, Epley and Schroeder examine the effects of and beliefs about changes in well-being from interacting with a stranger, whereas our treatment involves interact-

ing with someone you already know. It is possible that people may under-estimate the benefits of interacting with a stranger, but over-estimate the benefits of interacting with someone you already know.

5 Conclusion

In this paper, I run a randomized controlled trial where I vary the amount of social interaction that individuals receive over a short span of time. I estimate the effects of this social interaction on participants' well-being and academic performance, and I test the accuracy of participants' beliefs about individuals' baseline loneliness levels and the effects of social interaction.

First, I find positive and significant effects of the social interaction treatment on participants' well-being. This result builds on existing literature regarding interventions to decrease loneliness and improve well-being: most papers on the topic have relied on correlational evidence and have used interventions that increase opportunities for interaction and support from strangers, with mixed results (Masi et al., 2011; S. Cacioppo et al., 2015). In contrast, this paper uses an intervention that increases opportunities for connection among individuals who already have some familiarity with each other, with moderate positive effects on well-being.

Second, I find positive but insignificant effects of the treatment on participants' academic performance. This result diverges from existing literature on the topic, some of which has shown a positive effect of improved well-being (Oswald et al., 2015) and others of which have shown a negative effect on workplace productivity (Coviello, Deserrano, Persico, & Sapienza, 2020). We provide several possible explanations for this divergence in Section 4: for instance, it is possible that the effects of the intervention on well-being are too limited to see effects on academic performance.

Finally, I find that participants' beliefs regarding loneliness and social interaction are inaccurate. Specifically, participants' beliefs are directionally correct, but overestimate the extent to which individuals are lonely and that the social interaction treatment could be beneficial. This result contrasts with some existing literature that showed instead that people tend to underestimate others' willingness to connect as well as the positive effects of connecting (Epley & Schroeder, 2014). One possible explanation for this difference in results is the substantial changes that have

emerged from the pandemic: the increase in loneliness due to the pandemic has also resulted in a substantial increase in media coverage of and attention to loneliness and mental health.

Together, these results tell a rather different narrative from anticipated based on existing literature. I hypothesized that the social interaction treatment would have a positive and significant effect on both individuals' well-being and their academic performance. Furthermore, I hypothesized that participants would underestimate the prevalence of loneliness and the positive effects of social interaction, which would suggest that they may be under-investing in their social interactions. Instead, however, the social interaction treatment had positive effects on well-being and positive but insignificant effects on academic outcomes, while participants tended to overestimate others' loneliness and the benefits of social interaction. These results provide evidence against the hypothesis that underinvestment in social interaction is driven by underestimation of others' loneliness or the returns to interaction. However, it is still possible that other barriers — such as the perceived costs of social interaction — could drive underinvestment.

It is important to note, however, that these results do not necessarily rule out the possibility that social interaction has positive effects on academic performance. In particular, it would be interesting to study the effects of longer-term interventions that increase opportunities for social interaction and strengthen social support. Given the gaps in literature on this topic and the increasing relevance of the topic, further research is still greatly needed.

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A Tables

Table 1: Sample Sizes

	All	Control	Treatment	t-test p-value
	(1)	(2)	(3)	(4)
Began Study	402	-	-	-
Treated	356	183	173	-
Finished Study	339	174	165	-
Fraction Treated Who Finished	0.952 (0.011)	0.951 (0.016)	0.954 (0.016)	0.897

Notes: Table shows the sample size at 3 different points in the study. “Began study” indicates the number of participants who reached the Qualtrics page in which they could invite their study partner. “Treated” indicates the number who were randomized into treatment groups and provided information about their 20-minute task. “Finished study” indicates the number who completed all necessary tasks for the study.

Table 2: Balance Across Treatment Groups

	All Mean & SE (1)	Control Mean & SE (2)	Treatment Mean & SE (3)	Difference Mean & SE (4)	t-test p-value (5)
Age	23.349 (0.213)	23.291 (0.286)	23.409 (0.319)	0.118 (0.427)	0.78
Female	0.648 (0.027)	0.633 (0.038)	0.664 (0.039)	0.032 (0.055)	0.56
Black	0.156 (0.021)	0.133 (0.027)	0.181 (0.032)	0.048 (0.042)	0.25
Citizen	0.798 (0.023)	0.797 (0.032)	0.799 (0.033)	0.001 (0.046)	0.98
College Graduate	0.580 (0.028)	0.582 (0.039)	0.577 (0.041)	-0.005 (0.057)	0.93
Enrolled Student	0.801 (0.023)	0.791 (0.032)	0.812 (0.032)	0.021 (0.046)	0.65
Employed	0.560 (0.028)	0.576 (0.039)	0.544 (0.041)	-0.032 (0.057)	0.57
Baseline Loneliness	7.775 (0.141)	7.759 (0.202)	7.792 (0.196)	0.032 (0.282)	0.91
Observations	307	158	149		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows the averages for each category across treatment groups. Column 1 reports the full-sample mean. Columns 2 and 3 report the means and standard errors for the control and treatment groups, respectively. Column 4 reports the treatment-group mean minus the control-group mean and its standard error. Column 5 reports the p-value from an unpaired t-test comparing Columns 2 and 3.

Table 3: Partner Type by Treatment Group

	All Mean & SE (1)	Control Mean & SE (2)	Treatment Mean & SE (3)	Difference Mean & SE (4)	t-test p-value (5)
Friend	0.663 (0.035)	0.642 (0.049)	0.686 (0.050)	0.044 (0.071)	0.53
Acquaintance	0.094 (0.022)	0.095 (0.030)	0.093 (0.032)	-0.002 (0.044)	0.97
Classmate	0.133 (0.025)	0.137 (0.035)	0.128 (0.036)	-0.009 (0.051)	0.86
Coworker	0.022 (0.011)	0.021 (0.015)	0.023 (0.016)	0.002 (0.022)	0.92
Parent or Child	0.011 (0.008)	0.021 (0.015)	0.000 (0.000)	-0.021 (0.016)	0.18
Sibling	0.066 (0.019)	0.105 (0.032)	0.023 (0.016)	-0.082** (0.037)	0.03
Other Family Member	0.066 (0.019)	0.074 (0.027)	0.058 (0.025)	-0.016 (0.037)	0.68
Other	0.105 (0.023)	0.105 (0.032)	0.105 (0.033)	-0.001 (0.046)	0.99
Observations	181	95	86		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows the fraction of participants who indicated that their partner fell into each category. Table only includes responses from the participants who had *invited* the other person to join the study. Column 1 reports the full-sample mean. Columns 2 and 3 report the means and standard errors for the control and treatment groups, respectively. Column 4 reports the treatment-group mean minus the control-group mean and its standard error. Column 5 reports the p-value from an unpaired t-test comparing Columns 2 and 3. Participants were allowed to indicate that their partner fell into as many categories as were applicable, so the fractions do not sum to 1.

Table 4: Partner Closeness by Treatment Groups

	All Mean & SE (1)	Control Mean & SE (2)	Treatment Mean & SE (3)	Difference Mean & SE (4)	t-test p-value (5)
Not at all	0.077 (0.020)	0.095 (0.030)	0.058 (0.025)	-0.037 (0.040)	0.36
Infrequently	0.343 (0.035)	0.337 (0.049)	0.349 (0.052)	0.012 (0.071)	0.87
Somewhat Infrequently	0.243 (0.032)	0.211 (0.042)	0.279 (0.049)	0.069 (0.064)	0.29
Somewhat Frequently	0.094 (0.022)	0.095 (0.030)	0.093 (0.032)	-0.002 (0.044)	0.97
Frequently	0.055 (0.017)	0.063 (0.025)	0.047 (0.023)	-0.017 (0.034)	0.63
Very Frequently	0.188 (0.029)	0.200 (0.041)	0.174 (0.041)	-0.026 (0.058)	0.66
Observations	181	95	86		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows the fraction of participants who indicated each interaction frequency with their study partner. Table only includes responses from the participants who had *invited* the other person to join the study. We defined “Not at all” as the pair had not interacted at all in the past month, “Infrequently” as having interacted once or twice, “Somewhat infrequently” as having interacted around once every two weeks, “Somewhat frequently” as having interacted around once a week, “Frequently” as having interacted 2-4 times a week, and “Very frequently” as having interacted every day or nearly every day. Column 1 reports the full-sample mean. Columns 2 and 3 report the means and standard errors for the control and treatment groups, respectively. Column 4 reports the treatment-group mean minus the control-group mean and its standard error. Column 5 reports the p-value from an unpaired t-test comparing Columns 2 and 3.

Table 5: Summary of Post-Treatment Outcome Variables

	(1) All Participants	(2) Control	(3) Treatment
Test Score	9.94 (6.82)	9.98 (6.74)	9.90 (6.93)
Well-being	-0.05 (2.11)	-0.27 (2.23)	0.18 (1.94)
Happiness Level	3.13 (1.10)	3.01 (1.16)	3.26 (1.02)
Life Satisfaction Level	6.44 (1.94)	6.38 (2.01)	6.50 (1.86)
Loneliness Level	23.11 (9.73)	24.09 (10.08)	22.05 (9.26)
Observations	327	168	159

Notes: Table shows the mean and standard deviation of the four outcome variables. Verbal reasoning score is out of 25 points. Happiness level is measured on a scale of 1 to 5, where 1 represents “Not at all happy” and 5 represents “Very happy.” Life satisfaction level is measured on a scale of 0 to 10, where 0 represents feeling that you have the worst possible life for yourself and 10 represents feeling that you have the best possible life. Loneliness level is measured on a scale of 0 to 60, aggregated across 20 3-point questions, where 0 represents not at all lonely and 60 represents the most lonely.

Table 6: Effects of Treatment on Well-being

	Well-being Index		Happiness		Life Satisfaction		Loneliness	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	0.456*	0.524**	0.248*	0.234*	0.118	0.159	-2.041	-2.249*
	(0.261)	(0.231)	(0.134)	(0.126)	(0.260)	(0.221)	(1.242)	(1.216)
Age		0.0477		0.0251		0.0441		-0.0232
		(0.0382)		(0.0201)		(0.0401)		(0.199)
Female		-0.133		-0.231*		-0.0513		-0.854
		(0.257)		(0.132)		(0.228)		(1.218)
Black		-0.0435		0.222		-0.0820		3.097*
		(0.419)		(0.181)		(0.354)		(1.622)
College Graduate		-0.550*		-0.138		0.168		4.021***
		(0.308)		(0.150)		(0.330)		(1.396)
Enrolled Student		-0.198		0.00411		0.438		4.692***
		(0.311)		(0.157)		(0.267)		(1.512)
Employed		-0.0416		-0.189		0.316		0.584
		(0.235)		(0.125)		(0.229)		(1.049)
Baseline Loneliness		-0.414***		-0.161***		-0.283***		1.259***
		(0.0513)		(0.0280)		(0.0480)		(0.296)
Constant	-0.272	2.489**	3.012***	3.986***	6.379***	6.990***	24.09***	8.401*
	(0.193)	(1.042)	(0.0985)	(0.550)	(0.183)	(0.919)	(0.884)	(4.724)
Control Mean	-0.272	-0.272	3.012	3.012	6.379	6.379	24.09	24.09
Control SD	2.228	2.228	1.158	1.158	2.012	2.012	10.08	10.08
Observations	293	282	326	314	310	299	308	296

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows the effects of treatment on 3 measures of well-being. "Treatment" is an indicator that equals 1 for being in the treatment group. Columns 1 and 2 report the estimates for the happiness outcome, which is measured on a scale of 5 points, where 1 represents "Not at all happy" and 5 represents "Very happy." Columns 3 and 4 report the estimates for the life satisfaction outcome, which is measured on a scale of 0 to 10, where 0 represents feeling that you have the worst possible life for yourself and 10 represents feeling that you have the best possible life. Columns 5 and 6 represent the estimates for the loneliness outcome, which is measured on a scale of 0 to 60, aggregated across 20 3-point questions, where 0 represents not at all lonely and 60 represents the most lonely. All controls are defined as described in Table 2. Standard errors are robust and clustered at the study pair-level.

Table 7: Effects of Treatment on Test Scores

	Overall Score		Easy Qs		Hard Qs		Read. Comp. Qs		Text Compl. Qs		Sent. Equiv. Qs	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Treatment	-0.0828 (0.942)	0.412 (0.821)	-0.148 (0.586)	0.149 (0.507)	0.0648 (0.409)	0.263 (0.372)	0.245 (0.388)	0.420 (0.358)	-0.350 (0.381)	-0.147 (0.326)	0.0230 (0.259)	0.140 (0.233)
Age		-0.289** (0.146)		-0.178* (0.0907)		-0.111* (0.0625)		-0.0864 (0.0617)		-0.114* (0.0604)		-0.0889** (0.0377)
Female		0.257 (0.775)		0.406 (0.468)		-0.149 (0.364)		-0.203 (0.348)		0.235 (0.297)		0.226 (0.219)
Black		-6.050*** (0.705)		-3.739*** (0.450)		-2.312*** (0.337)		-2.306*** (0.371)		-2.192*** (0.267)		-1.552*** (0.218)
College Graduate		-0.853 (1.100)		-1.046 (0.658)		0.194 (0.510)		0.112 (0.494)		-0.826* (0.419)		-0.139 (0.301)
Enrolled Student		-3.553*** (1.041)		-2.186*** (0.632)		-1.367*** (0.471)		-0.799* (0.468)		-1.848*** (0.430)		-0.906*** (0.313)
Employed		-0.0491 (0.825)		0.0789 (0.494)		-0.128 (0.395)		-0.0880 (0.361)		0.153 (0.331)		-0.114 (0.223)
Baseline Loneliness		0.324** (0.151)		0.214** (0.0973)		0.110* (0.0654)		0.0750 (0.0613)		0.137** (0.0612)		0.112*** (0.0430)
Constant	9.982*** (0.658)	18.06*** (3.943)	6.060*** (0.408)	11.03*** (2.467)	3.923*** (0.288)	7.028*** (1.714)	4.655*** (0.277)	7.092*** (1.671)	3.476*** (0.263)	7.011*** (1.619)	1.851*** (0.179)	3.954*** (1.051)
Control Mean	9.982	9.982	6.060	6.060	3.923	3.923	4.655	4.655	3.476	3.476	1.851	1.851
Control SD	6.745	6.745	4.165	4.165	3.041	3.041	2.910	2.910	2.718	2.718	1.875	1.875
Observations	327	315	327	315	327	315	327	315	327	315	327	315

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows the effects of treatment on the verbal reasoning test score. "Treatment" is an indicator that equals 1 for participants who are in the treatment group. Columns 1 and 2 show the effect on overall test score out of 25 points. Columns 3-6 show the effects on test scores broken down by question difficulty level, where there are 13 easy questions and 12 hard questions. Columns 7-12 show the effects with the test score broken down by question type, where there are 12 reading comprehension questions, 8 text completion questions, and 5 sentence equivalence questions. All controls are defined as described in Table 2. Standard errors are robust and clustered at the study pair-level.

Table 8: Actual v. Predicted Baseline Loneliness

	Actual Level Mean & SE (1)	Predicted Level Mean & SE (2)	Difference Mean & SE (3)	t-test p-value (4)
Aggregate Loneliness	7.816 (0.133)	8.204 (0.126)	0.388*** (0.109)	0.0004
Lacks Companionship	2.564 (0.047)	2.722 (0.042)	0.158*** (0.041)	0.0002
Feels Left Out	2.583 (0.049)	2.677 (0.044)	0.094** (0.045)	0.0375
Feels Isolated	2.667 (0.053)	2.789 (0.047)	0.123** (0.048)	0.0104
Observations	331	331		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table compares participants' actual and predicted baseline loneliness levels, based on the 3 Item UCLA Loneliness Scale. "Aggregate Loneliness" is the overall loneliness score out of 12 points. "Lacks Companionship", "Feels Left Out", and "Feels Isolated" are the scores on the 3 individual questions out of 4 points.

Table 9: Actual v. Predicted Treatment Effects

	Actual Effect Mean & SE (1)	Predicted Effect Mean & SE (2)	Difference Mean & SE (3)	t-test p-value (4)
Verbal Reasoning Score	0.412 (0.821)	1.711 (0.309)	1.299 (0.877)	0.1396
Happiness Level	0.234 (0.126)	0.714 (0.048)	0.480*** (0.135)	0.0004
Life Satisfaction Level	0.159 (0.221)	1.137 (0.118)	0.978*** (0.251)	0.0001
Loneliness Level	-2.249 (1.216)	-3.490 (1.040)	-1.241 (1.600)	0.4386
Observations	296	300		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table compares the estimated and predicted effects of treatment on the four outcome measures. Column 1 reports the regression-adjusted treatment-effect estimate and its standard error. Column 2 reports the mean and standard error of participants' predicted treatment effects. Column 3 reports the predicted treatment effect minus the estimated treatment effect. Column 4 reports the p-value from a test that the predicted and estimated treatment effects are equal. Standard errors for the regression-adjusted treatment effects are robust and clustered at the study-pair level.

B Figures

Figure 1: Distributions of Post-Treatment Outcome Measures.

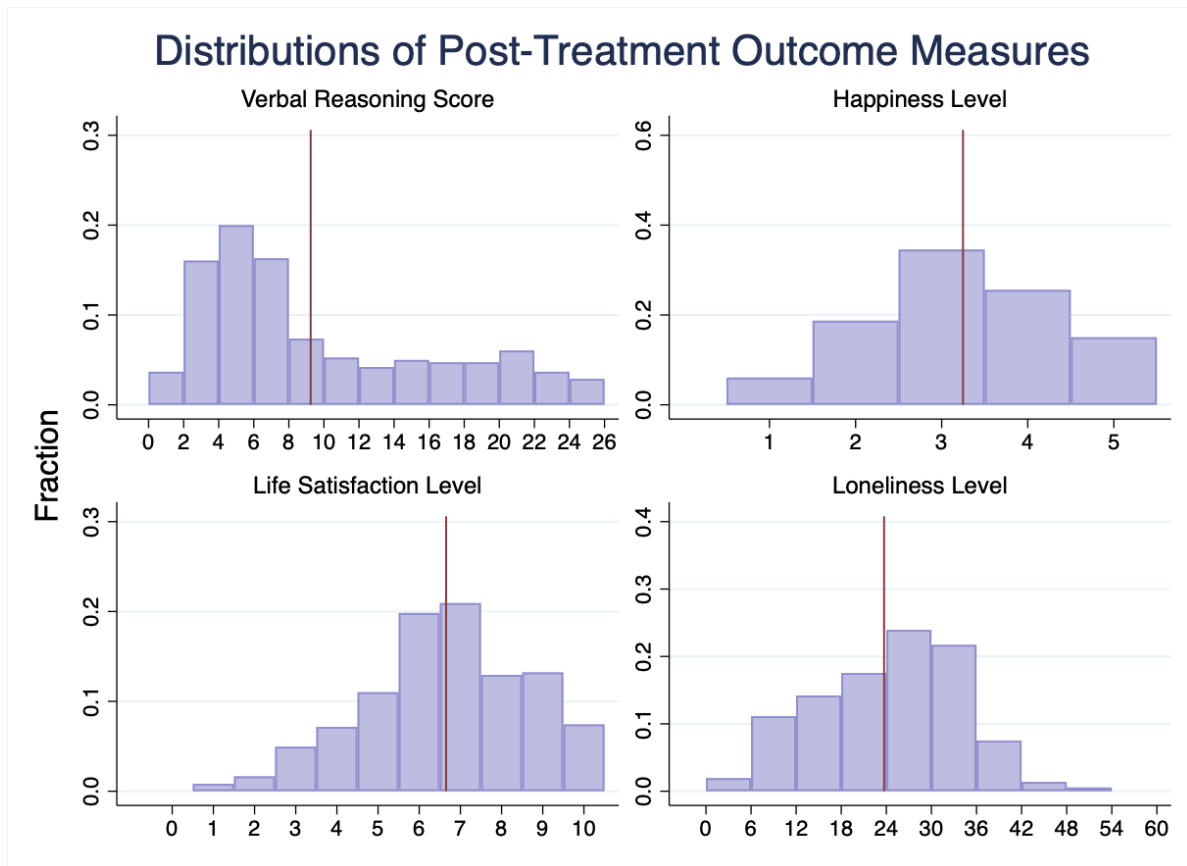
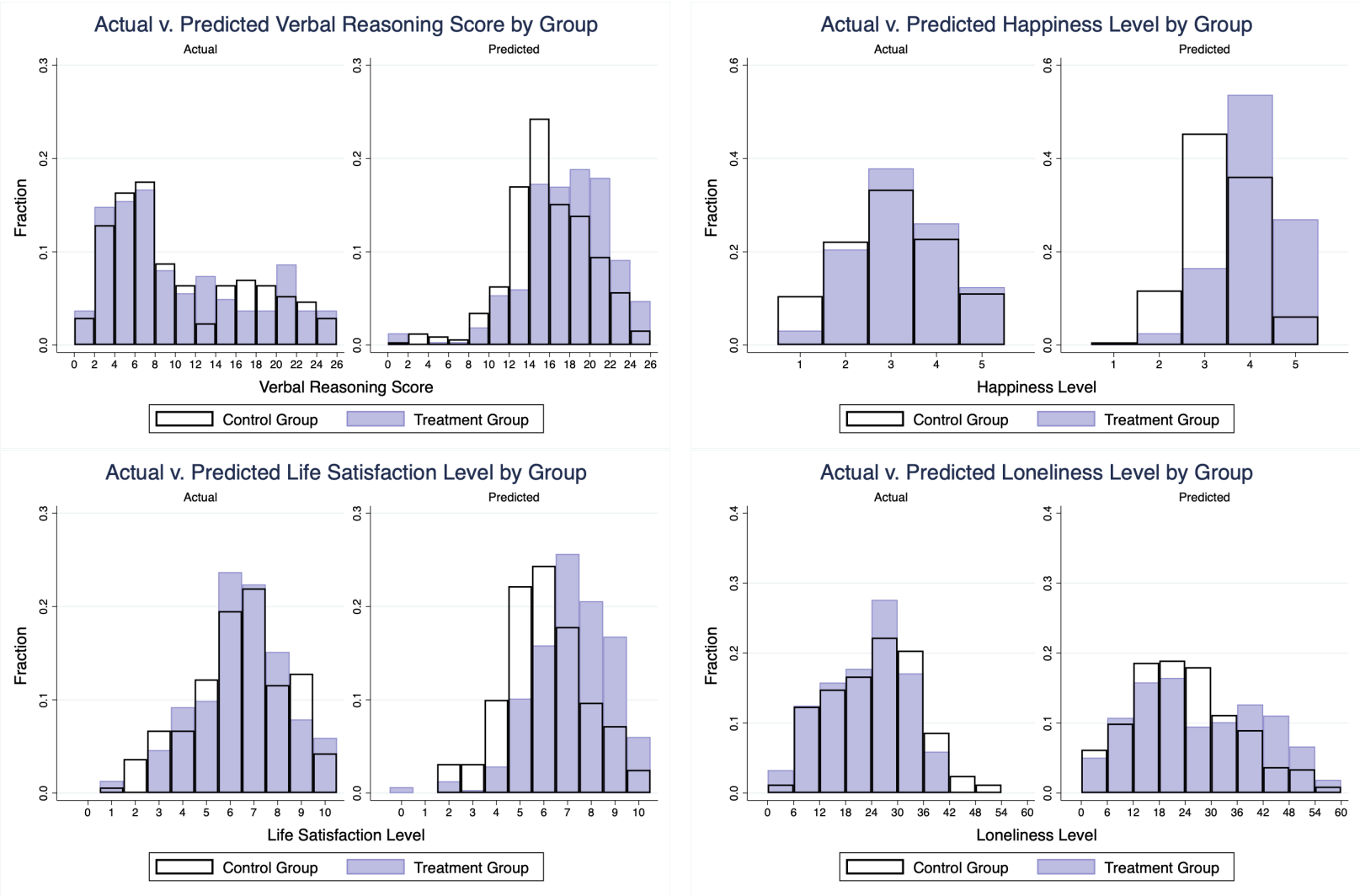
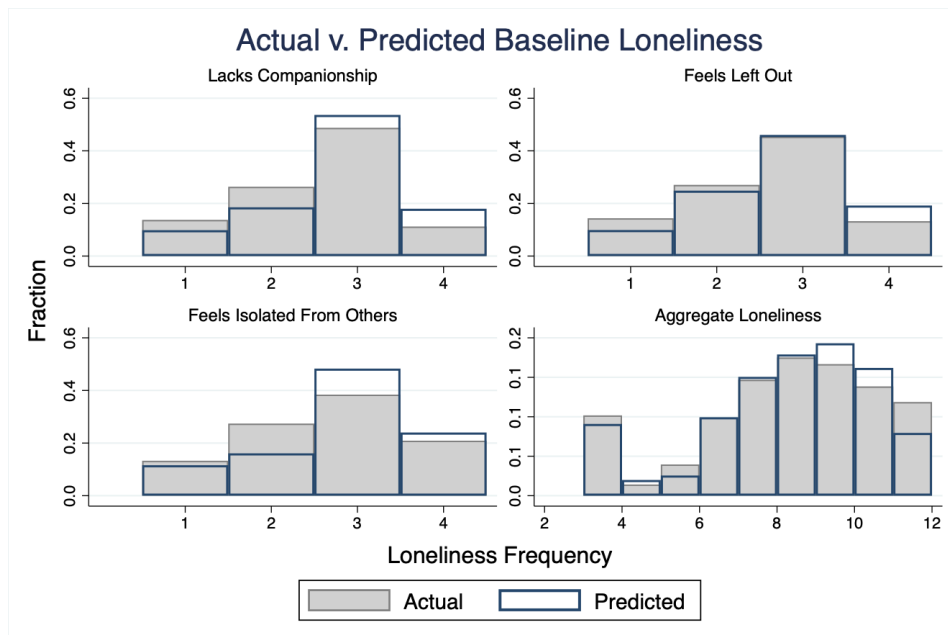


Figure 2: Distributions of Actual and Predicted Outcome Variables



Notes: Figures compare the two groups' actual outcome measures to participants' predictions of the two groups' outcome measures. In each box, the figure on the left displays the actual results and the figure on the right displays the predicted results of the two treatment groups.

Figure 3: Actual and Predicted Baseline Loneliness



Notes: Figure compares actual and predicted loneliness levels. The first 3 figures show the results of a 4-point question, and the last figure shows the aggregated results, i.e. after taking the sum across the first 3 questions.

C Survey Instrument

C.1 Pre-Screen Questions

Prior to beginning the experiment, participants filled out a three-question pre-screen survey.

Participants who were age 18-34, had access to a video calling platform, and resided in the U.S. were eligible to participate in the study.

1. What is your age? _____
2. Do you have the ability to use a video calling platform (including but not limited to Zoom, Skype, or Facetime)?
 - (a) Yes
 - (b) No
3. Where are you currently residing?
 - (a) In the U.S.
 - (b) Outside of the U.S. (please specify): _____

C.2 Baseline Questions

Prior to the treatment period, participants answer three sets of questions: (1) questions about their demographic background and relationship to their study partner, (2) questions about their baseline well-being, and (3) questions for them to predict other participants' baseline well-being.

C.2.1 Demographics and Study Partner Relationship

1. What is your gender?
 - (a) Male
 - (b) Female
 - (c) Non-binary
 - (d) Other (please specify): _____
2. What is your race or ethnicity? (Select all that apply).

- (a) White
 - (b) Black or African American
 - (c) American Indian or Alaska Native
 - (d) Asian
 - (e) Native Hawaiian or Pacific Islander
 - (f) Hispanic or Latino
 - (g) Other (please specify): _____
3. Are you a U.S. citizen or permanent resident?
- (a) No
 - (b) Yes
4. What is the highest degree or level of schooling you have completed?
- (a) Some high school, no diploma
 - (b) High school graduate, diploma, or the equivalent (ex: GED)
 - (c) Some college credit, no degree
 - (d) Associates degree (ex: AA, AS)
 - (e) Bachelor's degree (ex: BA, BS)
 - (f) Master's degree (ex: MA, MS, MEng, MEd, MSW, MBA)
 - (g) Professional degree beyond bachelor's degree (ex: MD, DDS, DVM, LLB, JD)
 - (h) Doctorate degree (ex: PhD, EdD)
 - (i) Other (please specify): _____
5. Are you currently enrolled as a student in a degree-granting program or institution?
- (a) No, I am not currently a student
 - (b) Yes, I am an UNDERGRADUATE student
 - (c) Yes, I am a GRADUATE student
6. What is your relationship to your study partner? (Select all that apply).
- (a) Friend

- (b) Acquaintance
- (c) Classmate
- (d) Coworker
- (e) Parent/child
- (f) Sibling
- (g) Other family member
- (h) Other (please specify): _____

7. Over the past month, how often have you communicated with your study partner?

- (a) Very frequently (every day or nearly every day)
- (b) Frequently (2-4 times a week)
- (c) Somewhat frequently (once a week)
- (d) Somewhat infrequently (once every two weeks)
- (e) Infrequently (once or twice during the month)
- (f) Not at all (zero times)

C.2.2 Baseline Well-being

In this section, we will ask you a series of questions about your personal wellbeing as well as any difficulties you may have experienced as a result of COVID-19.

1. Please indicate how often each of the following statements are true: (1) Never, (2) Hardly ever, (3) Some of the time, or (4) Often.

- i. How often do you feel that you lack companionship?
- ii. How often do you feel left out?
- iii. How often do you feel isolated from others?

2. Please rate your level of agreement with the following statements: (1) Strongly disagree, (2) Somewhat disagree, (3) Neither agree nor disagree, (4) Somewhat agree, or (5) Strongly agree.

- i. General stress related to COVID-19 made it difficult for me to learn or do work.
- ii. Social isolation related to COVID-19 made it difficult for me to learn or do work.

- iii. Financial stresses related to COVID-19 made it difficult for me to learn or do work.
- iv. My own health issues related to COVID-19 made it difficult for me to learn or do work.

C.2.3 Baseline Predictions of Others' Well-being

You will now answer the same set of questions, but regarding your predictions about the wellbeing of other participants within this study. Please answer these questions according to how you believe that the average participant in this study feels.

Note that the pool of study participants consists of individuals of a typical undergraduate- or graduate-student age, i.e. between 18-34 years old. Additionally, approximately half of the study participants are currently enrolled as undergraduate or graduate students, largely from universities in the Cambridge or Boston area, such as MIT, Northeastern, Harvard, Wellesley, and Boston University.

You will be able to earn bonus compensation based on the accuracy of your predictions. If your predictions for at least half of the questions on this page are within 10% of the units of the actual average, then you will receive an additional \$2 of compensation. (For example, given a question asking you to make a prediction on a scale of 5, your answer will be considered correct if it is within 0.5 points above or below the actual average).

1. Please indicate your predictions on how often the following statements are true for the average study participant on a scale of 1 to 4 (where 1 indicates never, 2 indicates hardly ever, 3 indicates some of the time, and 4 indicates often).
 - i. How often does the average study participant feel that they lack companionship?
 - ii. How often does the average study participant feel left out?
 - iii. How often does the average study participant feel isolated from others?
2. Please indicate your predictions on the average study participant's level of agreement with the following statements on a scale of 1 to 5 (where 1 indicates strongly disagree, 3 indicates neither agree nor disagree, and 5 indicates strongly agree).
 - i. General stress related to COVID-19 made it difficult for them to learn or do work.

- ii. Social isolation related to COVID-19 made it difficult for them to learn or do work.
- iii. Financial stresses related to COVID-19 made it difficult for them to learn or do work.
- iv. Their own health issues related to COVID-19 made it difficult for them to learn or do work.

C.3 Post-Treatment Questions

After the treatment period, participants complete a 25-question verbal reasoning test. They then answer several more survey questions regarding their well-being and their predictions of average test scores and well-being levels of the two treatment groups.

C.3.1 Post-Treatment Well-being

In this segment of the study, we will ask you several questions about your current happiness and loneliness levels.

1. At this moment, would you say you are: (1) Not at all happy, (2) A little unhappy, (3) Somewhat happy, (4) Happy, or (5) Very happy?
2. Please imagine a ladder with steps numbered from zero at the bottom to ten at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?
3. Indicate how often each of the statements below is descriptive of you: (0), Never, (1) Rarely, (2) Sometimes, or (3) Often.
 - i. I feel in tune with the people around me.
 - ii. I lack companionship.
 - iii. There is no one I can turn to.
 - iv. I do not feel alone.
 - v. I feel part of a group of friends.
 - vi. I have a lot in common with the people around me.
 - vii. I am no longer close to anyone.

- viii. My interests and ideas are not shared by those around me.
- ix. I am an outgoing person.
- x. There are people I feel close to.
- xi. I feel left out.
- xii. My social relationships are superficial.
- xiii. No one really knows me well.
- xiv. I feel isolated from others.
- xv. I can find companionship when I want it.
- xvi. There are people who really understand me.
- xvii. I am unhappy being so withdrawn.
- xviii. People are around me but not with me.
- xix. There are people I can talk to.
- xx. There are people I can turn to.

C.3.2 Predictions of Treatment Effect

In this section, we will ask you to make a series of predictions about the average academic outcomes, happiness levels, and loneliness levels of participants in the two groups during the study.

As indicated in the introduction of this study, participants were split up into two groups:

1. The conversation group, in which individuals spent 20 minutes talking to an acquaintance, friend, or family member.
2. The break group, in which individuals spent 20 minutes watching YouTube videos online.

After the 20 minutes, all participants took a verbal reasoning test and survey.

Additionally, the pool of study participants consists of individuals of a typical undergraduate- or graduate-student age, i.e. between 18-34 years old. Approximately half of the study participants are currently enrolled as undergraduate or graduate students, largely from

universities in the Cambridge or Boston area, such as MIT, Northeastern, Harvard, Wellesley, and Boston University.

You will be able to earn bonus compensation based on the accuracy of your predictions. If your predictions for at least half of the questions on this page are within 10% of the units of the actual average, then you will receive an additional \$1 of compensation. (For example, given a question asking you to make a prediction on a scale of 25 points, your answer will be considered correct if it is within 2.5 points above or below the actual average).

1. Please predict the average performance of each group on the GRE Verbal Reasoning test section. The test had 25 questions, each worth one point, so please indicate your prediction as a score out of 25 points (where a score of 0 represents the worst possible performance and a score of 25 represents the best possible performance).
2. Please predict the average level of happiness of each group. Happiness was measured on a scale of 1 to 5, where a 1 represents "not at all happy", 2 represents "a little unhappy", 3 represents "somewhat happy", 4 represents "happy", and 5 represents "very happy."
3. Please predict the average level of life satisfaction of each group. Life satisfaction was measured on a scale of 0 to 10, where 0 represents the "bottom of the ladder" (i.e. that the individual is living the worst possible life for themselves) and 10 represents the "top of the ladder" (i.e. that the individual is living the best possible life for themselves).
4. Please predict the average level of loneliness of each group. The loneliness survey had 20 questions, and participants could rate their wellbeing for each question on a scale of 0 to 3, so please indicate your prediction as a score out of 60 points (where a score of 0 represents the worst possible wellbeing and a score of 60 represents the best possible wellbeing).