A Field Experiment on Virtual Social Interactions and Performance of Remote Workers

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Abstract

The Covid-19 pandemic has created a shock to remote work where an unprecedented number of office workers have had to adjust abruptly to work-from-home (WFH) and work-from-anywhere (WFA) arrangements due to shelter-in-place and social distancing restrictions. Although recent evidence suggests that WFH and WFA may offer productivity and work-life satisfaction benefits, managers and social science researchers remain concerned about the loss of informal workplace interactions and implications for individual career outcomes. Prior research has been limited in addressing this issue because employees typically self-select into WFH and WFA, making it difficult to study the causal effects of virtual social interaction on employee outcomes. We report results from a randomized field experiment conducted at a large global organization that sheds light on this question and estimates the effectiveness of informal, social interactions or "virtual water coolers" for remote interns participating in the firm's flagship summer internship program. Findings indicate that interns who had opportunities to interact with senior managers had better weekly performance trends, more positive attitudes towards their remote internship experience, and were significantly more likely to receive a full-time offer to join the firm at the end of their five-week internship. We find that these effects were greater for interns and senior managers who were demographically similar and for interns who had a greater number of opportunities for informal virtual interactions. This study demonstrates that hosting brief virtual water cooler sessions benefits the performance and career outcomes of remote new hires. Our results suggest that during the onboarding process, workers would benefit from opportunities for informal social interactions with senior managers.

Significance Statement

The Covid-19 pandemic has created a dramatic shock to remote work, where office workers have had to adjust abruptly to work-from-home (WFH) and work-from-anywhere (WFA) work arrangements. Early evidence indicates that attitudes towards remote work have shifted and that many firms and employees are planning to adopt some level of WFH and WFA even after the pandemic ends. One primary concern with remote work is the loss of informal social interactions that are often critical for career advancement. To date, there is little causal evidence on the effectiveness of virtual social interactions in a remote workplace. We conducted a randomized controlled trial with a large global organization in their flagship summer internship program. We found that structuring brief virtual social interactions with senior executives substantially improved new hires' performance, attitudes towards virtual internship experience and the likelihood of receiving an offer to become a full-time employee. The effects were strengthened when the interns and senior executives shared demographic attributes and when there were greater number of opportunities for brief social interactions. Our results represent the first set of causal results that demonstrate effectiveness of virtual social interactions in a remote workplace. With the uncertainty of vaccine roll-out schedules across populations, and as organizations prepare to onboard new employees remotely in 2021, insights from our study are of immediate relevance

Introduction

The Covid-19 pandemic has led to a dramatic rise in the adoption of remote work. As Covid-19 spread, governments began to adopt shelter-in-place orders and social distancing restrictions that forced millions of workers globally to adopt work-from-home (WFH) and work-from-anywhere work arrangements (1, 2). Even after the pandemic ends, nearly 30 percent of U.S. employees would like to continue working remotely full-time, and early evidence suggests that employers are poised to offer their workers greater WFH and WFA flexibility (3). There is also a prior literature that suggests that provisioning WFH and WFA leads to productivity increases. A few randomized controlled trials (RCTs) from the pre-Covid era have suggested that remote workers are typically more productive than their office counterparts (4, 5), particularly for workers conducting independent tasks (6). Recent survey evidence from the Covid-19 period supports the notion that WFH and WFA can increase both worker productivity and work-life satisfaction due to reduced commute times and increases in geographic and temporal flexibility (3, 7).

However, it is less well known how longer or permanent shifts to remote work arrangements will affect informal workplace interactions and how a lack of informal social interactions might affect career outcomes of workers. For instance, Microsoft's CEO, Satya Nadella, has cautioned that the onboarding process for new employees might get more difficult in a remote workplace (8). Many CEOs of other large companies have echoed similar sentiments, questioning the effectiveness of serendipitous informal interactions , crucial to managing and mentoring new employees, in a virtual workplace (9). However, we lack any causal evidence on how informal social interactions in a virtual workplace might affect performance and career outcomes of new employees. This paper attempts to fill this gap in the literature and asks whether and how informal social interactions in a remote workplace shape employee performance and career outcomes?

This question has immediate and important implications for firm policies related to adopting remote work practices in the post-Covid-19 era. Social interactions are critical in the workplace and often occur by chance at the "water cooler," hallways and lunchrooms (10). Such unplanned interactions can lead to the formation of new collaborations, learning, creativity, and innovation (4, 11–13). Researchers have shown that the reduction in informal social interactions and rich communication between remote workers is often a primary concern for firms with remote work policies. Telecommuting employees often feel socially isolated (14), have weaker interpersonal relationships with coworkers, and lower commitment and identification with their coworkers and organizations – factors that can have negative consequences for work relationships and career advancement (4, 15). As diversity and inclusion has become a critical issue for firms (16, 17), it is crucial to consider the potential benefits of positive interpersonal contact for improving intergroup relations and attitudes (18–21). Moreover, in the new hire onboarding process, interactions between new hires and firm "insiders" such as peers, supervisors, and mentors (22-25) are often critical in helping newcomers "learn the ropes," as they come to understand the values, abilities, expected behaviors, and social knowledge and become key contributors to their firms (24, 26). However, as the ongoing Covid-19 pandemic continues to spur experimentation and greater adoption of remote work practices (3), firms should continue to support workers who self-select to and are allowed to work remotely even after the pandemic. Hence, it is critical to understand the effectiveness of informal social interactions in remote workplaces.

Here, we report results from a field experiment that provides such a test. We conducted a field experiment on 1,370 remote new summer interns distributed across 18 divisions and 16 program cities in a large global organization to measure the causal effect of virtual "water cooler" (WC) social interactions on the interns' performance, their attitudes towards their remote internship experience and the likelihood of receiving an offer for full-time employment. Our intervention, which focused on exogenously varying the interns' access to different types of virtual WCs, represents the first experimental evidence of how brief virtual social interactions among remote employees can improve job performance and career outcomes.

An attractive feature of our design is the inclusion of a near-term, objective performance outcome that is not directly connected to interns' participation in virtual WCs. In particular, the main performance measure corresponds to the interns' likelihood of receiving a full-time offer, which is supplemented with the interns' weekly performance ratings from their supervisors. One noteworthy innovation in our experimental design is the implementation of panel experiments that exogenously varies the frequency that the interns are invited to attend water cooler (WC) sessions, which enables us to examine differences in treatment "dose" on key performance outcomes of interest (27). Moreover, field experiments or RCTs provide one powerful method for ruling out rival hypotheses, making it a suitable method for our study, given the new and evolving nature of the remote work phenomenon (28, 29).

We tested the effects of two types of WC treatments on the interns' performance. The first type of WC treatment introduced informal WC interactions among small groups of three or four interns (intern-only WC), whereas the second type focused on informal WC interactions between a small group of three or four interns and senior managers at the firm (intern-senior manager WC). In consultation with managers from the organization, we had three control

conditions. The first two control conditions were active controls, an asynchronous Q&A discussion forum, where interns in the condition were exogenously selected to have a senior manager respond to their questions via an online discussion forum (see *SI* Fig. S1 for sample questions and responses),¹ and an intern-group project which randomly assigned interns to small groups that met weekly to work on a research project together. The third and final control condition was a passive control, which was not assigned to any "structured" opportunities for either asynchronous or synchronous social interactions with peers or managers.

Remote Water Cooler Experiment

We partnered with a large global organization in the Summer of 2020 to design and test the effects of virtual WC interactions on individual performance outcomes. The organization scheduled the virtual WC sessions as part of the interns' formal schedule of weekly activities in their remote five-week summer internship. The summer internship program was essential to onboarding new talent into the organization, and according to company executives, as up to 75% of the interns in previous years would typically go on to accept offers to join the firm as a full-time employee after completing their graduate studies (30). It was also the first time the partner offered the internship as a completely remote experience. Our primary goal was to obtain a causal estimate of whether informal social interactions in a virtual workplace have a positive effect on the interns' performance and their likelihood of receiving an offer for full-time employment. A total number of 1,370 interns in the firm's North Americas five-week virtual summer analyst program (18 divisions and 16 program cities) were included in the experiment. The interns spent the first week of the internship in training, whereas weeks 2-5 were spent working on an actual project with the intern's direct team. Interns were randomly assigned to one

¹ Interns were not informed that their questions were selected to receive a response, and their identities were not publicly associated with the responses from senior managers.

of five conditions: three control conditions (two active controls and one passive control) and two treatment conditions which offered opportunities for thirty-minute virtual WCs as part of their scheduled social activities in weeks 2-5 of the internship (Table 1). Random assignment took place within each division, ensuring that interns would always be matched with other interns and senior managers in the same division.² All of the watercooler sessions comprised three or four interns. Within the WC treatments, we leveraged recent methodological developments in panel experiments that exogenously varied the treatment dose for each intern by randomly deciding, for each week, if the intern would be invited to a session that week. The approach has three benefits; first, it allows us to measure how varying the number of WC sessions affects the outcomes; second, it enables us to determine when to host WC; and third, it allows us to test for a contemporaneous performance boost. Another key advantage of using a Bernoulli distribution to exogenously determine the number of WC treatments is that it also provided a within treatment control, where some interns in the WC treatment condition were randomly assigned zero WC opportunities (Table 2).

In the main results, we use ordinary least-squared regressions to estimate overall treatment effects and analyze treatment effect differences depending on the demographic match (gender and ethnicity) between the intern and the senior manager in the intern-senior manager WCs. All regressions control for the interns' characteristics (gender, ethnicity, and returning intern), use division and program city fixed effects, as well as clustered standard errors at the division level. For regressions conducted at the weekly level of analyses, we also control for whether the participant was randomly assigned to a WC treatment in the given week. All regressions use the active asynchronous Q&A discussion forum as the baseline control. We

² Our partner firm grouped smaller divisions together before randomizing interns to conditions.

chose this condition as the baseline because it was an active control group where interns could informally exchange information and advice with senior managers at the firm, but the communication was asynchronous (i.e. *not* face to face on a Zoom call) and hence less rich and impersonal compared to the WC chats (31). We analyze the data on an intent-to-treat basis, which means we analyze data from all participants randomized into a condition, regardless of whether they actually engaged in the activity or conversation (32).

Results

Effects of Virtual WC Treatments on Likelihood of Receiving Offer and Weekly

Performance

The remote intern-senior manager WC had a significant positive effect on the interns' likelihood of receiving an offer, and the effect size was larger when the interns and senior managers shared the same demographic characteristics (gender and ethnicity). We first estimated an ordinary least squares (OLS) regression that considered the interns' likelihood of receiving an offer on the WC treatments. Compared to the baseline control of the asynchronous Q&A discussion forum, the intern-senior manager WC treatment condition was about 5.0 percentage points (p < 0.05) more likely to receive an offer for full-time employment at the end of their five-week internship (Fig. 1*A*). There are no other significant differences. We find consistent results when we perform the analyses by division (*SI* Fig.*S2*).

Next, we consider treatment effect differences on the likelihood of receiving an offer. Examining the demographic similarity between the intern and senior managers for the internsenior manager WCs, we find that the WC treatment increased the likelihood of receiving an offer for full-time employment by 11.4 percentage points for demographically similar pairs (p < 0.01), where demographic similarity was defined on the basis of same gender *and* ethnicity (Fig. 1*B*). Interestingly, although the senior-manager WC treatment was positive for demographically dissimilar pairs, it is not statistically significant. Turning to treatment dose effects, we examine whether being exogenously assigned to a greater number of virtual WCs further increased the likelihood of receiving an offer. Fig. 1*C* indicates that interns in the intern-senior manager WC assigned to three or more WCs are 11.6 percentage points (p < 0.05) more likely to receive an offer.³

We complement the analyses on offers made, which occurred at the end of the five-week internship, with the interns' weekly performance ratings from their direct supervisors in weeks 2-5. We find that individuals randomly assigned to the intern-senior manager WCs perform 0.074 (p < 0.05) points better each week (Fig. 1*D*). While we observe in Fig. 1*D* that the performance trends improve each week in the program after week 2 (week 3: b = 0.08, p < 0.01; week 4: b = 0.193, p < 0.001; week 5: b = 0.32, p < 0.001), it is noteworthy that a thirty-minute WC with a senior manager has roughly the same economic significance as the weekly performance improvement between weeks 2 and 3 of the internship, and roughly two-fifths the effect size of the performance improvement between weeks 2 and 4.

Overall, these results paint a consistent picture of the performance benefits of virtual WCs when they intermix new organizational members with more experienced senior members. Moreover, we find that the benefits of remote social interactions are stronger when the interns and senior managers are demographically similar or when they have more opportunities for chance encounters, suggesting that homophily (33, 34) and more opportunities for informal interactions can have performance benefits for remote workers.

³ We also perform analyses for offers accepted in *SI* Fig. S3. However, we note that the small sample size within each condition and high baseline rate of offers accepted (\sim 84%) limits our ability to detect statistically significant effects of the WC interventions on offers accepted.

Effects of Virtual WC Treatments on Attitudes Towards Remote Work

Although our primary aim was to analyze the effects of the virtual WCs on the interns' performance, we also assessed any potential treatment effects of the WC interactions on the interns' attitudes towards remote work. The organization collected attitudinal data from the interns in the final week of the internship. Paralleling the results on performance, we find a significant positive treatment effect of the intern-senior manager WCs on the interns' satisfaction with their virtual internship experience and that the treatment effects were stronger for interns who attended more WCs with senior managers.

We report the results examining the effects of WC treatments on four primary attitudinal measures. Our first attitudinal measure examined the interns' satisfaction with remote work. Our second and third attitudinal measures examined differences in interns' perceptions of having adequate career enhancing opportunities and adequate opportunities to be mentored. Our fourth and final attitudinal measure examined the extent that the interns perceived that they could easily contact others they need for help. Across all attitudinal measures, we find a positive treatment effect of the intern-senior manager WC on overall satisfaction with remote work (b = 0.32, *p* < 0.01), opportunities for career enhancement (b = 0.27, *p* < 0.05), mentorship opportunities (b = 0.28, *p* < 0.05), and ease of contacting others for help (b = 0.16, *p* < 0.10) (Fig. 2*A*).

We also examine heterogenous treatment effects by the demographic similarity between intern-senior manager pairs, as well as treatment dose. We find that interns who were assigned to demographic dissimilar senior managers had more positive attitudes across all four dimensions: overall satisfaction with remote work (b = 0.33, p < 0.01), opportunities for career enhancement (b = 0.29, p < 0.05), opportunities to be mentored (b = 0.29, p < 0.01), and ease of contacting others for help (b = 0.15. p < 0.10). In contrast, although the treatment effects were positive for

demographically similar pairs, they were not significant (Fig. 2*B*). Together, we interpret these results as signaling that opportunities to interact informally with senior managers had a consistent effect on intern attitudes, regardless of the demographic characteristics of the interns and senior managers.

Turning to the findings on treatment dose effects (Fig. 2*C*), we find significant treatment dose effects on the interns' satisfaction with their remote work experience and mentoring opportunities. Interns who attended three or more intern-only WCs or intern-senior manager WCs were both more likely to be satisfied with their virtual internship experience (intern-only WC: b = 0.49, p < 0.05; intern-senior manager WC: b = 0.56, p < 0.001) and also more likely to perceive that they had adequate opportunities to be mentored (intern-only WC: b = 0.39, p < 0.05; intern-senior manager WC: b = 0.41, p < 0.01).

Taken altogether, these results suggest that relatively brief WCs that pair interns with senior managers at the firm can have a positive effect on their interns' attitudes towards the remote internship experience, by exposing them to career advancement and mentoring opportunities as well as other soft skills, such as asking their coworkers for help when needed.

Discussion

Our field experiment testing the efficacy of virtual WCs offers important new theoretical and applied insights on the effectiveness and how to structure informal, virtual social interactions in the remote workplace. Given that less than 5 percent of the U.S. workforce was remote prior to the current Covid-19 pandemic (3), there have few opportunities in a field setting to study how and when informal, virtual social interactions may enhance employee performance. Most studies have focused on either instrumental interactions among global or distributed teams (35, 36), changes to individual productivity after changes to WFH policies (14, 37) or the experiences of

remote workers who have self-selected into these arrangements (15, 38). Therefore, this research represents the first causal evidence, to the best of our knowledge, of the relationships between virtual informal social interactions and employee performance.

This research sheds light on how the type and structure of virtual WCs may enhance new organizational members' performance and attitudes towards remote work. In particular, our research shows that remote new hires in an organization benefit from exposure to senior managers, and these benefits are greater when they are demographically similar. Our performance findings indicate that brief, informal interactions with senior managers can have consistent benefits for new organizational members' job performance. These results are complemented by our survey measures examining the interns' attitudes towards remote work. The attitudinal measures indicate that the informal interactions with senior managers provided the interns with information about the organization (such as norms and expected behaviors for help-seeking), mentoring, and career advice; these practices have been shown in prior research to improve newcomer learning, socialization and job performance (23–26). Taken altogether, our results provide encouraging news to firms as it suggests that brief interventions can enhance a new employee's socialization to the organization and improve their productivity in a short amount of time.

At the same time, our findings suggest that there are several parallels between how to promote effective interactions in the remote and physical world. Prior work suggests that in a physical workplace, informal interactions with senior organizational members can improve an employee's social assimilation and performance (24, 39, 40) while research on homophily indicates that employees prefer to form interpersonal and advice relations with demographically similar others within their organizations (41, 42). However, we have no prior insights on the

performance effects of informal social interactions in a remote workplace. Our results suggest that scheduling brief, informal social interactions among remote employees can lead to better job performance, particularly when these interactions are between organizational newcomers and experienced, senior members of the organization.

This work is not without limitations. First, we see mostly null effects for the intern-only WC as well as the intern group project – even though past research indicates that peers are often an important source of career and emotional support (24, 25). It is important to understand why these interactions did not have an effect on performance. One potential reason could be that the firm structured many intern-only social activities into the interns' schedules, which may have washed out any effects specific to the intern-only WCs or the intern group projects. Another potential reason is that we focused on a five-week internship experience, whereas information and advice networks tend to depend on trust and therefore require time to develop (43). Due to confidentiality reasons, we had limited insight into the demographic composition of the interns who were grouped together for the WCs and group projects and limited insight into how the WC social interactions may have changed people's behaviors following the interventions. Hence, future research should measure how treatment effects vary by group composition (19, 44) and also measure performance changes over time. Interestingly, in the intern-senior manager WCs, the performance effects were strongest when there was a demographic match between the interns and senior managers, suggesting that there may be some homophily effects (34) – in addition to the information advantage of being exposed to senior managers with significant experience in the industry and/or firm.

Second, while we focused on a completely virtual setting, where all employees were remote, it is likely that after the pandemic ends, firms will implement policies that embrace

hybrid-remote work practices (3). Therefore, future research should aim to examine what types of social interactions will be most likely to benefit workers who work partly in the office and partly remote, and/or remote workers in a hybrid remote workplace (i.e. workplaces where some workers are in-office while others are remote). Third, our research was conducted within a single organization which makes it context specific. We also decided to focus on newcomers to an organization who may have different requirements and needs for social interactions, compared to existing employees who may already have longstanding advice and expressive networks (45, 46). That said, understanding how virtual interactions enhances performance for both newcomers and firm insiders is critical, particularly as organizations shift towards more balanced models of remote and physical workplaces.

In summary, our study presents the first experimental evidence on whether or not virtual informal interactions in a remote workplace improve performance outcomes among organizational newcomers. Our results suggest that small group interactions among peers and mentors can be beneficial for improving performance and attitudes towards coworker relationships, and provides several insights relative to improving the efficacy of virtual social interactions. With the uncertainty of timing in rolling out the vaccine across populations (47), and as firms potentially prepare to onboard interns and new employees remotely in 2021, insights from our study are of immediate-term relevance.

Methods

Overview. We conducted our experiment at a large global organization to examine the effects of informal social interactions via virtual "water coolers" on the performance outcomes of remote new hires. Our sample drew on our partner's annual summer internship program that attracted fresh talent distributed around the globe. Prior to the Covid-19 pandemic and the summer of

2020, the annual internship program brought together up to 3,000 undergraduate and MBA students for 8-10 weeks at one of the firm's offices. The program was a key pipeline of new talent for the firm, with as many as 75% of the interns going on to accept offers to join the firm after completing their studies. The program aimed to introduce interns to the work done at the firm, prepare them for the job, and acquaint them with the firm's culture. The firm's internship program was based on an apprenticeship model that relies on observation-based and hands-on learning and upskilling where interns shadow managers and experienced workers in the industry. Interns also participated in a range of networking and social events throughout their program, such as team lunches, happy hours, firm-wide intern events, and speaker series. Some interns also reached out to other firm employees for informal networking opportunities, alumni groups, or inclusion networks. Throughout the program, interns were assessed by their direct supervisors, and at the close of the program, the firm extended job offers to interns based on their performance and headcount needs.

Due to the Covid-19 pandemic, the firm decided to shift the 2020 internship to a virtual experience, via a condensed, five-week internship format that would leverage new digital platforms and incorporate more structured networking and interactive opportunities into the interns' schedules. The firm was particularly concerned that the interns would lose a sense of rapport and camaraderie with their cohort and miss out on understanding the firm's culture in the virtual experience. Although firm executives agreed that communication technologies had made access to networking activities and senior leaders more equitable across interns, they also wanted to ensure that these opportunities were not dependent on some interns being more likely to take the initiative or leveraging their existing networks. Accordingly, we worked with the firm to

design and structure a randomized control trial examining how different configurations of virtual WC activities could be incorporated into the interns' schedules.

Procedures. The participants in the study were 1,370 summer interns in the firm's North Americas 2020 five-week virtual internship program across 18 divisions and 16 program cities. As part of the regular internship program, all interns were given a formal schedule of networking and socialization events. These included a range of interaction types and group size. For example, round table talks might include ten interns and a senior executive, and interns-only social time included activities such as a scavenger hunt, and intern "buddies" were junior staffers, typically at the Analyst level that could answer the interns' questions and provide advice. In addition to these events, our experiment randomly assigned interns to either a treatment or control group where the treatment group were offered an exogenously determined number of opportunities for different types of virtual WCs with other interns and senior managers in their division during weeks 2-5 of their internship experience. Because our partner wanted to keep social interactions within divisions, we leveraged a stratified (or blocked) randomized experiment (48) whereby interns were randomly assigned to conditions and treatment doses within their respective divisions (*SI* Fig. *S*4).

In the treatment conditions, interns were assigned to either intern-only WCs or internsenior manager WCs with others in the same division. Interns were randomly assigned to a specific week and number of WC chats that took place between weeks 2 and 5 of the program. Within the WC treatments, we leveraged recent methodological developments in panel experiments that exogenously varied the treatment dose for each intern by randomly deciding, for each week, if the intern would be invited to a session that week (Table 1). This meant that each intern in the WC treatments participated between zero and four WC chats over the five

weeks of the internship. We note that interns were only assigned to at most one WC treatment per week. During these WC chats, interns networked and exchanged information and advice, but the contents of their communication was left unstructured.

In the control conditions, interns were randomly assigned to an asynchronous Q&A discussion forum, a passive control condition, or an intern-group project condition. In the asynchronous Q&A discussion forum, interns submitted their questions to senior leaders and executives at the end of the week and were randomly assigned to receive written responses from them on the discussion forum. The question posed to the interns was the same each week: "Every week we will ask you to pose a question that you would ideally like to be answered by someone from [the firm]. The one question I would ideally like to be answered this week is:" Because interns and staff were geographically distributed in their "home" offices, the asynchronous format of the discussion forum control condition enabled the firm to overcome time zone differences. The passive control condition was implicitly offered "unstructured" time where they could informally reach out to other peers and senior managers at the firm. Lastly, the intern group project condition randomly assigned interns into small groups that met each week (four times total) to work on a common group project. The Q&A discussion forum and intern group projects were active "placebo" controls, which offered the interns opportunities for different forms of interactions, but not informal and synchronous, social interactions. Table S1 indicates that the randomization achieved balance across covariates.

Performance Measures. From weeks 2 to 5, all interns received a weekly performance rating from their direct supervisors on a scale from 1 to 3 (1 =outstanding; 2 = satisfactory, 3 = needs improvement), as part of their regular internship performance, and independent of the experiment. We reverse coded the performance ratings so that higher scores reflected better

performance. At the end of week 5, high performing interns were extended an offer to return to the firm as a full-time analyst. These assessments were based on 1-on-1 performance and the firm's hiring needs and were coded as either 0 (no offer extended) or 1 (offer made). Overall, 91.5 percent of interns received a full-time offer to return, and of those extended an offer, 84.1% accepted their offers. Given the high rate of offers made and accepted, we focus our main performance outcome analyses on the offers made decision. In *SI* Fig. *S*3, we report the results of the offers accept analyses.

Attitudinal Measures. At the conclusion of the internship, the firm asked the interns a series of survey questions to measure their attitudes and satisfaction with their remote work experience and relationships with other employees. The content of the surveys were the same across the conditions and asked the interns to indicate how strongly they agreed with each statement, on a scale from 1 to 7. The questions used to examine the interns' satisfaction with remote work were "Overall, I am satisfied with remote work, based on this internship experience," "I do not feel left out of activities that could enhance my career", "I have adequate opportunities to be mentored", "I can easily contact those I need who can help me when I need them." 1,186 or 86.6% of the participants took the final survey at the end of the internship.

Estimating Treatment Effects. We estimated the causal effect of WC treatments on the likelihood of being extended an offer at the final week of the internship with the following OLS model specification:

$$Offer Made_{i} = \beta_{1}(WC Treatment_{i}) + \beta_{2}(X_{i}) + \alpha_{i} + \delta_{i} + \epsilon_{i}, \qquad [1]$$

where $Offer Made_i$ is a dummy variable indicating whether the intern received an offer, $WC Treatment_i$ is a categorical variable corresponding to the intern's WC assignment (i.e., either one of the treatment conditions of intern-only or intern-senior manager WC or one of the control conditions of asynchronous Q&A discussion forum, passive, or intern group project), and X_i is a vector of intern covariates (de-identified gender and ethnicity, as well as whether the participant was a returning intern). Finally, α_i and δ_i are program and city fixed effects and ϵ_t is the error term. We also estimate alternate versions of equation [1] where we replace *WC Treatment*_i with *WC Treatment Match*_i which specifies whether there is a demographic match (or no match) between the intern *i* and senior manager in the intern-senior manager WC, and *WC Treatment Dose*_i which indicates the treatment dose or number of times intern *i* attended the WC sessions (i.e., zero or never attended, once, twice, three or more times) for the intern-only and intern-senior manager WC treatments. Moreover, we use the same model specification in [1] to estimate the causal effect of the WC treatments on the four attitudinal measures, except that we replace the *Offer Made*_i dependent variable with the corresponding attitudinal measure collected at the end of week five of the internship:

Satisfaction with Remote $Work_i$, Opportunities for Career Enhancement_i, Opportunities to be Mentored_i, and Ease of Asking Others for $Help_i$.

For the weekly performance ratings, we estimated the causal effect of the weekly WC treatments on the end-of-week performance ratings with the following OLS model specification: $Performance_{it} = \beta_1(WC Treatment_i) + \beta_2(X_i) + \alpha_i + \delta_i + \omega_{it} + \tau_t + \epsilon_{it},$ [2] where $Performance_{it}$ is the weekly performance rating for intern *i* in week *t* (in weeks 2 through 5). In [2], ω_{it} corresponds to whether intern *i* was randomly assigned to a WC chat in week *t*, and τ_t corresponds to week *t* fixed effects. All analyses were conducted at the intent-totreat basis. We report cluster-robust standard errors at the division level. We note that the experiment was executed by the firm, and all performance, attitudinal and demographic data were anonymized before sharing as observational data.

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Figures and Tables

Table 1. Assignment of Participants to WC Treatments By Internship Week

Condition	Week 2	Week 3	Week 4	Week 5
Intern-only WC	75	82	76	89
Intern-Senior Manager WC	85	89	79	77

Table 2. Assignment of Participants to Water Cooler (WC) Treatment and Control Conditions

Condition	Ν		
Control			
Asynchronous Q&A	223 (16.3%)		
Intern group project	192 (14.0%)		
Passive control	518 (37.8%)		
Treatment			
Intern-only WC	218 (15.9%)		
By relative frequency:			
Never	51 (3.7%)		
One	61 (4.5%)		
Two	42 (3.1%)		
Three or more	45 (3.3%)		
Intern-Senior Manager WC	219 (16.0%)		
By relative frequency:			
Never	45 (3.3%)		
One	74 (5.4%)		
Two	57 (4.2%)		
Three or more	43 (3.1%)		



A. Offer Made and Treatment

B. Offer Made and Treatment

Figure 1. Summary of the intervention's effect on final and weekly performance outcome measures. Final performance outcome is whether the intern received an offer to return, and weekly performance outcome is the intern's performance rating given by direct supervisor. WC treatment effects are estimated from ordinary least-squares regressions predicting the performance outcome measure on the type of WC treatment, division and program city fixed effects, as well as an indicator for gender (anonymized), ethnicity (anonymized), and whether the participant was a returning intern. Error bars reflect 95% confidence intervals.



A. Final Week Attitudes and Treatment





B. Final Week Attitudes and Treatment Match



Figure 2. Summary of the intervention's effect on intern attitudes towards the overall virtual internship experience. Attitudes are collected in the end-of-program survey administered at the end of week five. WC treatment effects are estimated from ordinary least-squares regressions predicting the performance outcome measure on the type of WC treatment, division and program city fixed effects, as well as an indicator for gender (anonymized), ethnicity (anonymized), and whether the participant was a returning intern. Error bars reflect 95% confidence intervals.

Supplementary Information for A Field Experiment on Virtual Social Interactions and Performance of Remote Workers

Table S1.	χ^2 -tests	of rand	omization	check	across	covariates
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Covariate	χ^2 -test statistic
Gender	$0.40 \ (p = 0.98)$
Ethnicity	14.71(p=0.55)
Program City	44.76 (p = 0.93)
Division	81.57 (p = 0.13)
Returning intern	3.77 (p = 0.44)

Controllers Division Intern: What is the best way to learn about all of the firm's franchises?

Executive Office Managing Director: One of the most effective ways to learn about our franchises is to speak directly to the people who do the work every day and ask them about their responsibilities and their stakeholders. Our people take pride in connecting and building relationships across functions and divisions, so I would leverage the network of those on your team and ask to be introduced to colleagues in our businesses. A lot can be learned during a 20-minute virtual catch up!

In order to make the best out of each conversation, I would use the many online resources to do my homework ahead of time and try to develop a base-level understanding of the business. Anyone from outside the firm is able to check out the Goldman Sachs YouTube channel, which hosts videos from some of our senior leaders on the current and future states of our businesses. On our internal site, the Understanding our Businesses videos features people in many areas of the firm discussing their day-to-day and the overall objective of their functions. And the Daily Media Briefing is a quick read for all of the news about Goldman Sachs and the industry.

Be curious. Ask questions. You will learn a lot - quickly!

Global Markets Intern: From a markets perspective, what is the outlook in terms of growth in the Global Markets Division, specifically Commodities?

Global Markets Partner: Global Markets has been performing well with the increased volatility and associated client activity. With a number of macro events on the horizon (economic recovery, inflation concerns, the USD, US election, etc.), we expect Global Markets clients to remain engaged in the second half of this year due to these uncertain events.

For Commodities specifically, I think it is one of the more exciting FICC businesses as we consider our forward plan. Goldman's commodities business has served as an industry leading, differentiating product group. We've had the longest continuous presence of any major bank in the commodities space.

To continue this trajectory, we have invested in automation and electronic market making to build scale and efficiency in our business. We want to be the primary source of liquidity in the market place through automation of the derivative business.

This goes hand in hand with utilizing our people and resources to focus on opportunities such as Renewable Power. Growth in Renewable Power and Sustainable Energy generation will lead to exponential increase in imbalances between supply and demand in terms of volume, time of delivery and location. Price and supply risk management of these imbalances is exactly where GS can add value to our clients.

Compliance Intern: How does the process of moving between offices in different regions work? Are there opportunities for this kind of mobility?

Human Capital Management Managing Director: In order to retain and develop our talent, we believe that mobility, whether across divisions or regions, is critical. We have an entire team, Global Mobility Services, dedicated to working closely with our professionals to advise on mobility, including tax and immigration implications. If you look at the leadership of the firm, many have moved in different positions across the firm and across the globe.

Figure S1. Examples of Asynchronous Conversations between Interns and Senior Managers (30).



Figure S2. Summary of the intervention's effects on offers made by division. WC treatment effects are estimated from ordinary least-squares regressions predicting offers made on the type of WC treatment, program city fixed effects, as well as an indicator for gender (anonymized), ethnicity (anonymized), and whether the participant was a returning intern. Point estimates are for 17 of the 18 divisions where there were at least two summer interns. Error bars reflect 95% confidence intervals.



Figure S3. Summary of the intervention's effects on offers accepted. WC treatment effects are estimated from a Heckman selection model predicting offers accepted on the type of WC treatment, division fixed effects, as well as an indicator for gender (anonymized), ethnicity (anonymized), and whether the participant was a returning intern. The first stage model first estimates the probability of receiving an offer as a function of the original variables and an identifying variable, week two's performance. The sample is restricted to interns who were randomly assigned to WC treatments in weeks three to five, and for divisions where less than 100% of interns received an offer (N = 1,038). Error bars reflect 95% confidence intervals.



Figure S4. Summary of randomization of participants by division, condition and treatment sequence.