

**Contextualizing Meaningful Social Interactions and Momentary Well-Being  
in Everyday Life**

Mahnaz Roshanaei<sup>1\*</sup>, Sumer S. Vaid<sup>1</sup>, Andrea L. Courtney<sup>2</sup>, Serena J. Soh<sup>1</sup>,  
Jamil Zaki<sup>2</sup> & Gabriella M. Harari<sup>1</sup>

<sup>1</sup>Department of Communication, Stanford University

<sup>2</sup>Department of Psychology, Stanford University

**Author Note**

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\*Correspondence concerning this article should be addressed to: Dr. Mahnaz Roshanaei, Department of Communication, Stanford University, CA. Email: [mroshana@stanford.edu](mailto:mroshana@stanford.edu)



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**Abstract**

Characteristics of a rich social life have been linked to positive well-being outcomes. Yet, the benefits of engaging in meaningful social interactions in the different contexts of daily life remain understudied. Using three large-scale longitudinal datasets collected from a cohort of university students over the span of 3 years ( N = 5,649 participants; ecological momentary assessments = 215,209), we examined the extent to which engagement in subjectively meaningful social interactions was associated with improvements in subsequent momentary well-being across contexts. We found that people reported experiencing less momentary stress, loneliness, and greater affective well-being after engaging in meaningful social interaction, but less benefits socializing in certain contexts (e.g., with strangers, computer-mediated channels, in public places, while dining, during the first year of the COVID-19 pandemic). These findings support the idea that the people, communication channels, places, activities, and timing of meaningful social interactions matter for subsequent momentary well-being.

*Keywords:* Social Interaction, Well-Being, Context, Experience Sampling

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### **Introduction**

A rich social life is associated with a variety of benefits to people's well-being (e.g., Cohen & Wills, 1985; Siedlecki et al., 2014). A strong social support network (Webster et al., 2021) and social interactions with both strong and weak ties (e.g., Sandstrom & Dunn, 2014) have been associated with greater social and affective well-being. But individual social interactions can vary in terms of how they are experienced by those involved - some interactions are considered meaningful, and some are not perceived so. Yet, few studies have specifically investigated the role of engaging in subjectively meaningful social interactions on well-being in the context of daily life.

A few studies have used a combination of experience sampling surveys and the Electronically Activated Recorder method to assess the quality of social interactions in daily life settings (e.g., Mehl et al., 2010;). For example, engaging in social interactions characterized by conversational (conversational depth and self-disclosure) and relational quality (knowing and liking one's interaction partners) has been associated with greater well-being (e.g., feelings of social connection, happiness) (e.g., Sun et al., 2020). Other studies have similarly found that engaging in substantive conversations has been associated with greater well-being (e.g., life satisfaction), as compared to small talk (e.g., Milek et al., 2018). Thus, past research suggests that social interactions' influence on well-being tends to differ based on quality-related aspects of the interaction. But given that social interactions do not need to be substantive to be considered meaningful to the people involved, accounting for the subjective perceptions of meaning (vs. more objective quality-related features) may provide new insight about the beneficial effects of social interactions for well-being.

Social interactions occur with a variety of interaction partners and via multiple communication channels that may influence their relationship to well-being outcomes. Recent research focused on the moderating effects of interaction partner and communication

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channel in particular (Kroencke et al., 2022), found that interactions with people considered to be close ties (e.g., peers and family members) were associated with higher well-being in the moment, compared to interactions with weak ties (e.g., classmates, strangers; Kroencke et al., 2022). Similar findings have been documented in other studies on strong and weak tie interactions in daily life settings (e.g., Quoidbach et al., 2019; Sandstrom & Dunn, 2014). Across communication channels, face-to-face and mixed interactions (e.g., a combination of face-to-face and computer-mediated interactions) have been found to confer greater benefits to positive affect in the moment, compared to not engaging in social interaction or solely having computer-mediated interactions (Kroencke et al., 2022). Whether the well-being benefits of engaging with certain interaction partners and communication channels hold when a social interaction is deemed to be subjectively meaningful remains unclear.

Social interactions also naturally occur in contexts that represent micro and macro-level factors of relevance to social life and well-being. At the micro-level, social interactions occur in moments when people are spending time in different places (e.g. home, public places) and while people are simultaneously engaged in other activities (e.g., resting, working). At the macro-level, social interactions occur within communities that experience shared societal events (e.g., years before or during the COVID-19 pandemic). Why might such contexts influence the relationship between meaningful social interactions and well-being? Past studies have shown that the places people spend time in (e.g., Müller et al., 2020; Sandstrom et al., 2017), activities they engage in (e.g., Brajša-Žganec et al., 2011; Han & Patterson, 2007), and events such as the COVID-19 pandemic (e.g., Zacher & Rudolph, 2021) are all independently associated with various well-being outcomes. Given these findings, it seems likely that micro and macro contexts can modulate the relationship between meaningful social interactions and momentary well-being.

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In this paper, we used three large-scale intensive longitudinal datasets collected over three years (2019, 2020, and 2021) from partially overlapping samples of young adults to investigate the following research questions: (RQ1) Does engaging in (a) meaningful social interactions, with certain (b) interaction partners, and via certain (c) the communication channels lead to improvements in subsequent stress, loneliness, and affective well-being? (RQ2) Is the relationship between meaningful social interactions and momentary well-being moderated by the (a) places and (b) co-occurring activities surrounding the interaction? (RQ3) Are the moderating effects of micro contexts on the relationship between meaningful social interactions and well-being, affected by the macro context of the COVID-19 pandemic years?

We build upon past work on social interactions and well-being in two ways. First, we examine the effect of engaging in meaningful social interactions on a broad range of momentary outcomes across well-being domains, namely stress, loneliness, and affective well-being. Most studies about the effects of social interactions have focused on either social well-being outcomes (e.g., loneliness: Sun et al., 2020) or psychological well-being (e.g., life satisfaction: Milek et al., 2018) independently whereas few studies have focused on multiple well-being outcomes simultaneously. Second, we provide the most comprehensive examination of meaningful social interactions in context by focusing on both micro and macro-level contextual factors in daily life settings. Specifically, we examine the momentary (e.g., interaction partner, channel, place, co-occurring activity) and enduring contextual factors (e.g., years in relation to the COVID-19 pandemic) in which meaningful social interactions occur to determine whether they are consequential for strengthening or weakening subsequent changes in well-being. Given the societal effects of the different phases of the COVID-19 pandemic years on people's everyday lives, we considered the macro-context in terms of a pre-pandemic year (2019), the first year of the pandemic (2020),

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and the second year of the pandemic (2021) for a cohort of young adults within the same university community.

### **Method**

#### **Participants and Procedure**

Participants were undergraduate students at a university on the West Coast of the United States (total N = 4,432). Participants were recruited via emails sent to the entire undergraduate student body, which invited students to participate in a longitudinal project about social relationships and well-being in exchange for monetary compensation. Students who consented to participate in the study were asked to complete various survey-based assessments 2 or 3 times during the academic year (during the Fall, Winter, and Spring quarters). Each year, undergraduate students were recruited to participate via email, and were permitted to participate more than once during their undergraduate career. Thus, some participants only participated once, while others participated multiple times over the years.

For the purposes of the study presented here, we focused our research on subsets of the data that were collected during the Fall quarter in three consecutive years: Study 1 (S1; N = 876) was conducted in 2019 before the COVID-19 pandemic, Study 2 (S2; N = 1,421) was conducted in 2020 during the first year of the pandemic when the campus was on lockdown and students were living off-campus, and Study 3 (S3; N = 2,135) was conducted in 2021 during the second year of the pandemic when the campus had re-opened and students were living on-campus once again.

During the Fall quarters of 2019, 2020 and 2021, the samples recruited included 12%, 21% and 27% of the undergraduate population, respectively. The participants were generally representative of the undergraduate students at the university. As shown in Table 1, most of the participants identified as women, about 40% identified as being White or Asian, and 20% identified as being Black or Hispanic. There was a range of family income levels reported,

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with about 20% of participants reporting annual incomes below 60k on the lower end and 27% reporting annual incomes above 180k on the higher end. From Table 1, approximately 28% of our participants were of first-generation college students and were on average 18-19 years old at the time of participation.

**Table 1**

*Demographic Statistics for Three Samples Before Data Processing*

	<b>S1 (2019)</b>	<b>S2 (2020)</b>	<b>S3 (2021)</b>
Sample size	876	1,421	2,135
Number of EMA observations	34,218	77,012	103,979
<b>Gender</b>			
Woman	52.96%	49.60%	48.65%
Man	33.70%	31.48%	32.52%
<b>Race</b>			
White or Caucasian	19.10%	18.76%	16.88%
Black or African American	7.5%	6.8%	5%
East Asian	17.65%	20.33%	15.42%
South Asian	6.6%	6.5%	4.81%
Southeast Asian	0%	10.57%	7.83%
Middle Eastern	1.35%	1%	< 1%
Native American	< 1%	< 1%	< 1%
Hispanic or Latino	10.42%	10.33%	10.56%
Pacific Islander	< 1%	< 1%	< 1%
Two or more races	20%	18.77%	18.97%
<b>Family Income Level</b>			
Less than 60k	19.87%	27.4%	26%
60k to120k	26.38%	21%	18.43%
120k to180k	12.45%	10.77%	9.96%
More than180k	26.67%	26%	8%

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**First Gen Status**

First Gen	28.11%	27.76%	28.14%
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**Age**

Mean	18.51	18.74	19.62
(SD)	(0.94)	(1.02)	(5.4)

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*Note.* The percentages within each major category do not add up to 100 because not all participants responded to each question and some questions allowed participants to select more than one response option.

The data collected during the Fall quarters included one-time self-report surveys collected through Qualtrics (e.g., demographic background, personality traits, social network nominations) and repeated ecological momentary assessments (EMAs) collected through a custom mobile app, called WellPing (e.g., about their interactions and momentary-well-being). In the present research, we focus on the EMA data and do not report on the one-time self-report survey data.

To participate in the EMA component of the study, participants downloaded our app, called WellPing (a customized version of the Beiwe research platform; (Onnela et al., 2021), that runs on both Android and iOS smartphones. WellPing was used to deliver survey notifications (e.g., pings) to complete EMAs asking participants to report on their meaningful social interactions, momentary well-being, and surrounding context. This component of the study lasted three weeks, and participants received four pings per day at randomly selected times between 9:00 AM and 11:00PM. Each ping remained available for two hours, during which time participants could complete the EMAs. After two hours, the ping for the EMA associated with that time block would expire if not completed. Participants could complete up to 84 EMAs during the study. For the EMA component of the study, participants were compensated \$0.75 per EMA completed and a bonus of \$7 per week if they completed more

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than 85% (of the 28 possible pings) per week. In total, 876, 1421 and 2135 participants downloaded WellPing onto their phone during Fall 2019, 2020 and 2021, respectively (see Table1). These participants provided a total of 34,218, 77,012, and 103,979 EMA observations for Fall 2019, 2020 and 2021 respectively. On average, participants completed 50.70 EMAs in S1 ( $SD = 17.16$ ), 64.01 EMAS in S2 ( $SD = 15.89$ ), and 63.15 EMAs in S3 ( $SD = 18.09$ ).

**Data Processing.** We employed several exclusion and filtering steps on the EMA datasets as part of our data processing prior to analysis. First, we excluded all individual EMA observations with extremely high or low response times (e.g., all that fell outside of the 95% confidence interval around the mean response time of 148 seconds in S1, 126 in S2, and 101 in S3). Second, we excluded those participants in each study who completed less than 5 EMA observations. As shown in Table 2, these exclusion criteria decreased our sample sizes (by approximately 5.8% in S1, 3.66% in S2, and 8.33% in S3) and the number of observations analyzed across all samples (by approximately 16.8% in S1, 7.9% in S2, and 3% in S3).

To answer our research questions, we also created subsets of the datasets for each year by filtering out unique and repeated participants. Specifically, to answer RQ1 (about the main effects of meaningful social interactions on momentary well-being) and RQ2 (about the moderating effects of micro contexts), we sought to keep the samples across the studies independent. So, we created a subset of the data collected in S1-S3 that included only the unique participants for each year to ensure there were no participants overlapping across the three samples. As Table 2 shows, 825 unique participants completed experience sampling data collection in 2019 (S1), 916 unique participants in 2020 (S2), and 1155 unique participants in 2021 (S3). In contrast, to answer RQ3 (about the moderating effects of macro contexts), we sought to use data from the participants who had provided data across each of

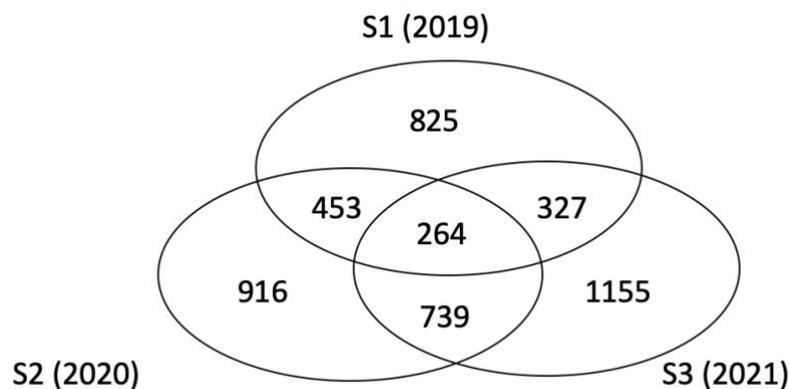
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the three years of data collection. So, we created a subset of the data collected in S1-S3 that consisted of only those participants who repeated their participation each year (see Table 2).

As Figure 1 shows, 264 participants completed all three years of experience sampling data collection.

**Figure 1**

*Venn Diagram of Participants Across Three Samples*



**Table 2**

*Number of Participants and EMA Observations Across Three Samples After Data Processing*

	S1 (2019)	S2 (2020)	S3 (2021)
<b>Processed Data</b>			
Sample size	825	1369	1957
Number of EMA observations	28447	70939	100835
<b>Unique Participants</b>			
Sample size	825	916	1155
Number of EMA observations	28447	47505	55450
<b>Repeated Participants</b>			

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Sample size	264	264	264
Number of EMA observations	11201	15382	15370

## Measures

For the repeated EMA questions, participants were asked to report on their momentary well-being, meaningful social interactions, and contexts during the past hour.

### *Momentary Well-Being*

For the momentary well-being questions, participants provided ratings on stress, anxiety, loneliness, happiness, sadness, anger, and fear using a scale bar from 0 to 100 (“Please use the slider bars to indicate how you feel right now.”). Affective well-being was calculated based on an average of four items: Happy, Sad (reverse coded), Angry (reverse coded), Anxious (reverse coded). Negative items were reverse coded so that higher values on the affective well-being measure would correspond to “better” well-being.

### *Meaningful Social Interactions and Micro Contexts*

Participants were also asked about whether they had engaged in a meaningful social interaction (“Please nominate the university undergraduate(s) you had the most meaningful interactions with within the past hour. (max 3)?”). If participants indicated they had engaged in a meaningful social interaction, they were asked follow up questions about the interaction(s), which included questions about their interaction partner and communication channel. Participants could also indicate that they had not had a meaningful social interaction.

**Interaction Partner.** Participants were asked about the people they had interacted with (“How would you best describe your relationship to **\*\*TARGET\*\***?”), with response options including 1: Significant other, 2: Dormmate/Roommate, 3: Friend, 4: Teammate (athletic / extracurricular), 5: Classmate, 6: Co-worker, 7: House staff, 8: Stranger. We created three categories from these response options: Strong Ties (included any interactions with a significant other, dormmate/roommate, or friend), Weak Ties (included any

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interactions with a teammate, classmate, or co-worker), and University Staff/Strangers (included any interactions with a House staff or Strangers).

**Communication Channel.** Participants were also asked about the communication channels they had used for the interaction (*“How did the interaction with \*\*TARGET\*\* take place?”*), with response options including 1: In-person, 2: Phone, 3: Video call, 4: Direct messaging, 5: Social media. We created two categories: FtF (included any in-person interactions) and CMC (included any computer-mediated communication interactions via phone, video call, direct messaging, or social media).

**Places.** Participants were also asked about the places they were spending time in (*“During the past hour, what was your primary location?”*), with response options including 1 = Home, 2= Cafe/Restaurant/Bar, 3 = Other’s House, 4 = Gym, 5 = Store/Mall, 6 = Library, 7= Classroom / Lecture Hall, 8 = Work, 9 = Outdoors. We created four categories: Home, Social/Public Places (included any observations in a cafe/restaurant/bar, other’s house, gym, or store/mall), Study/Work Places (included any observations in a Library, Classroom / Lecture Hall or at Work), and Outdoors.

**Activities.** Participants were also asked about the activities they were engaged in (*“During the past hour, what was your primary activity?”*), with response options including 1 = Sleeping/Resting, 2 = Attending classes/Meetings, 3 = Studying, 4 = Working, 5 = Eating/Drinking, 6 = Exercising, 7 = Digital Entertainment, 8 = Social media (e.g., internet / apps), 9= Browsing the internet / apps. We created five categories: Resting, Studying/Working (included any observations of attending classes/meetings, studying, or working), Dining, Exercising, Consuming Media (included any observations of digital entertainment, social media or browsing the internet).

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**Analytic Strategy**

The research presented here is generally exploratory in nature, but we followed a pre-registered analytic plan. We initially explored two of our research questions (RQ1 and RQ2) in S1, and then sought to replicate the findings as confirmatory hypotheses to be tested in S2. We pre-registered our initial analytic plan (see [https://osf.io/7dxb6/?view\\_only=aeb434a8c28748b6af637520238df99a](https://osf.io/7dxb6/?view_only=aeb434a8c28748b6af637520238df99a)) noting that we would also consider additional exploratory analyses to examine the role of the pandemic on meaningful social interactions and well-being. Notably, only the findings for RQ1 replicated in our confirmatory analyses using the S2 dataset, which were those corresponding to the main effects of engaging in meaningful social interactions on momentary well-being. The hypotheses for RQ2 about the moderating effect of micro contexts failed to replicate in S2, so we conducted additional exploratory analyses to examine whether the macro context of the COVID-19 pandemic onset in 2020 might help explain this pattern of findings.

Naturally, we observed changes in our participant's meaningful social interactions and everyday micro contexts, when comparing S1 (collected in 2019) and S2 (collected during the first year of the pandemic when the campus was on lockdown). The supplemental materials include tables showing these differences over the years (see Table S4, supplemental materials). So, we used a third dataset (S3, collected during the second year of the pandemic) to further examine the relationship between meaningful social interactions and well-being in context. As part of these additional analyses, we conducted the same analyses as outlined in our original pre-registration and found that several of our initial hypotheses for RQ1 and RQ2 (derived from S1) had replicated in S3 when participants had returned to campus (see Table S4, supplemental materials). However, given the inclusion of a third sample and our exploratory analyses of the pandemic years as a macro context, we ultimately decided to report on findings from a mega-analysis, pooling all the datasets across the three studies for

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parsimony and to increase statistical power (Scheibehenne et al., 2016; see also Curran & Hussong, 2009).

Due to the nested structure of our data, we used frequentist multilevel models to answer our research questions, using the lme4 package (Bates et al., 2015). in R version 4.4.1(R Core Team, 2018). We fit models with momentary context data (Level 1) nested within individuals (Level 2). We included a random intercept for each participant (Tables S1-S3 in the supplemental materials presents the ICCs showing the degree of between person variability in our dependent variables). We included a number of control variables in our models, including lagged well-being (the standardized average of the participant's well-being the previous day), and the time of day (morning [9:00 AM to 12:00 PM], afternoon [12:00 PM to 6:00 PM], evening [6:00 PM to 9:00 PM], night [9:00 PM to 1:00 AM] at Level 1, and the number of observations (the total number of EMAs completed by each participant) and gender at Level 2.

Furthermore, we observed that the relationship between lagged affective well-being, social interaction and momentary affective well-being varied significantly across people (Figure S1-S3, supplemental materials). Based on these observations, we decided to include a random slope for lagged well-being (operationalized as the average of the previous days reported well-being) and social interactions (within previous hour) to assess this within-person variability.

We followed recommendations for multilevel models with regard to centering and standardizing variables (Curran & Bauer, 2011; Yaremych et al., 2021). Specifically, repeated-measures continuous and categorical variables that were used as independent and control variables in the models were person-mean centered, whereas between-person variables were sample-mean centered and standardized (Cowan et al., 2019). Following recommendation for multilevel modeling, we did not center or standardize dependent

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variables. Finally, following recommendation from lme4, we normalized all independent variables prior to analysis to facilitate model convergence (Bates et al., 2015).

To examine the main effects of meaningful social interactions in RQ1, we modeled the relationships between each of the momentary well-being outcomes (as dependent variables) from dummy variables representing whether participants had (1a) engaged in a meaningful social interaction (vs. had not engaged in a meaningful social interaction):

$$Wellbeing_{tj} = \beta_{0i} + \beta_{1j}TimeOfDay_{ti} + \beta_{2j}laggedWellbeing_{ti} + \beta_{3j}MSI_{ti} + e_{ti}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}gender_i + \gamma_{02}NoOfObs_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

$$\beta_{3i} = \gamma_{30} + u_{3i}$$

To examine the main effects of (1b) interaction partners and (1c) communication channels, we only analyzed observations in which meaningful social interactions had been reported because these questions were conditionally collected based on participant's response to the social interaction question, therefore there is no random slope for meaningful social interaction:

$$Wellbeing_{ti} = \beta_{0i} + \beta_{1i}TimeOfDay_{ti} + \beta_{2i}laggedWellbeing_{ti} + \beta_{3i}People_{ti} + e_{ti}$$

$$Wellbeing_{ti} = \beta_{0j} + \beta_{1i}TimeOfDay_{ti} + \beta_{2j}laggedWellbeing_{ti} + \beta_{3j}Channel_{ti} + e_{ti}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}gender_i + \gamma_{02}NoOfObs_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

$$\beta_{3i} = \gamma_{30}$$

To examine the moderating role of micro contexts in RQ2, we modeled the relationships between each of the momentary well-being outcomes (as dependent variables) from the interaction terms between engagement in meaningful social interactions (vs. not) and (2a) places or (2b) activities:

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$$\begin{aligned} Wellbeing_{ti} = & \beta_{0i} + \beta_{1i}TimeOfDay_{ti} + \beta_{2i}laggedWellbeing_{ti} + \beta_{3i}MSI_{ti} \\ & + \beta_{4i}Place_{ti} + \beta_{5i}MSI_{ti} \times Place_{ti} + e_{ti} \end{aligned}$$

$$\begin{aligned} Wellbeing_{ti} = & \beta_{0i} + \beta_{1i}TimeOfDay_{ti} + \beta_{2i}laggedWellbeing_{ti} + \beta_{3i}MSI_{ti} + \\ & \beta_{4i}Activity_{ti} + \beta_{5i}MSI_{ti} \times Activity_{ti} + e_{ti} \end{aligned}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}gender_i + \gamma_{02}NoOfObs_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

$$\beta_{3i} = \gamma_{30} + u_{3i}$$

$$\beta_{4i} = \gamma_{40}$$

$$\beta_{5i} = \gamma_{50}$$

To examine the moderating role of the macro context of the pandemic years in RQ3, we modeled the relationships between each of the momentary well-being outcomes (as dependent variables) from (3a) two-way interaction terms between engagement in meaningful social interactions (vs. not) and the year (2019-2021), and three-way interaction terms between engagement in meaningful social interactions (vs. not), micro contexts (3b) places or (3c) activities, and the year (2019-2021):

$$\begin{aligned} Wellbeing_{ti} = & \beta_{0i} + \beta_{1i}TimeOfDay_{ti} + \beta_{2i}laggedWellbeing_{ti} + \beta_{3i}MSI_{ti} + \beta_{4i}Year_{ti} \\ & + \beta_{5i}MSI_{ti} \times Year_{ti} + e_{ti} \end{aligned}$$

$$\begin{aligned} Wellbeing_{ti} = & \beta_{0i} + \beta_{1i}TimeOfDay_{ti} + \beta_{2i}laggedWellbeing_{ti} + \beta_{3i}MSI_{ti} + \beta_{4i}Year_{ti} \\ & + \beta_{5i}Place_{ti} + \beta_{6i}MSI_{ti} \times Year_{ti} \times Place_{ti} + e_{ti} \end{aligned}$$

$$\begin{aligned} Wellbeing_{ti} = & \beta_{0i} + \beta_{1i}TimeOfDay_{ti} + \beta_{2i}laggedWellbeing_{ti} + \beta_{3i}MSI_{ti} + \beta_{4i}Year_{ti} \\ & + \beta_{5i}Activity_{ti} + \beta_{6i}MSI_{ti} \times Year_{ti} \times Activity_{ti} + e_{ti} \end{aligned}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}gender_i + \gamma_{02}NoOfObs_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

$$\beta_{3i} = \gamma_{30} + u_{3i}$$

$$\beta_{4i} = \gamma_{40}$$

$$\beta_{5i} = \gamma_{50}$$

$$\beta_{6i} = \gamma_{60}$$

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The Supplemental Materials include additional analyses of the main effect of the pandemic years on participant's well-being (see Table S6, supplemental materials), meaningful social interactions (see Table S6, supplemental materials), and micro contexts (see Table S6, supplemental materials). Overall, these additional analyses showed that participants reported greater stress and loneliness, and lower affective well-being during 2020, but lower stress, loneliness and affective well-being during 2021. Participants also reported more meaningful social interactions during 2020 vs less during 2021.

Our finding also shows more interactions occurring over computer-mediated channel, but fewer interactions with weak ties and university staff (see Table S6, supplemental materials). In addition, participants reported less time spent in different places (e.g., social and public places), and less time spent engaging in certain activities (e.g., dining).

### Results

#### Meaningful Social Interactions and Momentary Well-Being

As shown in Table 3, we found that engaging in meaningful social interactions was associated with lower momentary stress (pooled:  $b = -0.015$ ,  $p < 0.001$ ), lower momentary loneliness (pooled:  $b = -0.042$ ,  $p < 0.001$ ), and greater momentary affective well-being (pooled:  $b = 0.025$ ,  $p < 0.01$ ).

Notably, the beneficial associations between engagement in meaningful social interactions and momentary loneliness and affective well-being replicated across all three samples. However, the beneficial associations between meaningful social interactions and momentary stress did not replicate in S2, during the first year of the pandemic. Interested readers can find these sample specific findings presented in Supplemental Table S4.

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**Table 3**

*Results From Multilevel Models Examining the Main Effects of Meaningful Social Interactions, Interaction Partners, and Communication Channels on Well-Being*

	Stress	Loneliness	Affective well-being
<i>Meaningful Social Interaction (MSI)</i>			
Engaged in MSI	<b>-0.015***</b> [-0.019, -0.011]	<b>-0.042***</b> [-0.046, -0.038]	<b>0.025***</b> [0.023, 0.028]
<i>Interaction Partners</i>			
University Staff / Stranger	0.003 [-0.015, 0.020]	<b>0.018*</b> [0.002, 0.033]	-0.003 [-0.015, 0.009]
Weak Ties	0.002 [-0.002, 0.007]	<b>-0.005*</b> [-0.009, -0.001]	-0.001 [-0.003, 0.003]
<i>Communication Channels</i>			
CMC	0.004 [-0.001, 0.009]	<b>0.010***</b> [0.006, 0.013]	<b>-0.005***</b> [-0.008, -0.002]

*Note.* The analysis in this table is based on pooled unique participants across three samples.

The reference category for Meaningful Social Interactions (MSI) is No MSI, for interaction partners is Strong Ties and for communication channels is FtF. All models control for the time of day (morning, afternoon, evening, night), lagged well-being, gender and number of pings. The light gray shading indicates that the findings replicated across S1, S2, and S3; Dark gray shading indicates that findings replicated in S1 and S3, \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $< 0.001$

### ***Meaningful Social Interactions with Different People***

As shown in Table 3, we found that engaging in meaningful social interactions with different interaction partners was associated with momentary loneliness, but not momentary stress or affective well-being. Specifically, engaging in meaningful social interactions with

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university staff or strangers was associated with greater momentary loneliness, compared to having such interactions with peers who were strong ties (pooled:  $b = 0.018, p < 0.05$ ). In contrast, we found that engaging in meaningful social interactions with peers who were weak ties was associated with lower momentary loneliness, compared to having such interactions with peers who were strong ties (pooled:  $b = -0.005, p < 0.05$ ). These findings indicate that compared to having meaningful social interactions with strong ties, participants reported increases in loneliness when engaged with university staff or strangers and decreases in loneliness after having meaningful social interactions with weak ties.

### *Meaningful Social Interactions Across Communication Channels*

As shown in Table 3, engaging in meaningful social interactions via computer-mediated channels (as compared to face-to-face interactions) was associated with greater momentary loneliness (pooled:  $b = 0.010, p < 0.001$ , Table 3) and lower affective well-being (pooled:  $b = -0.005, p < 0.01$ ), but was not associated with momentary stress. These findings indicate that compared to having meaningful social interactions face-to-face, participants reported increases in loneliness and decreases in affective well-being after having such interactions via computer-mediated channels.

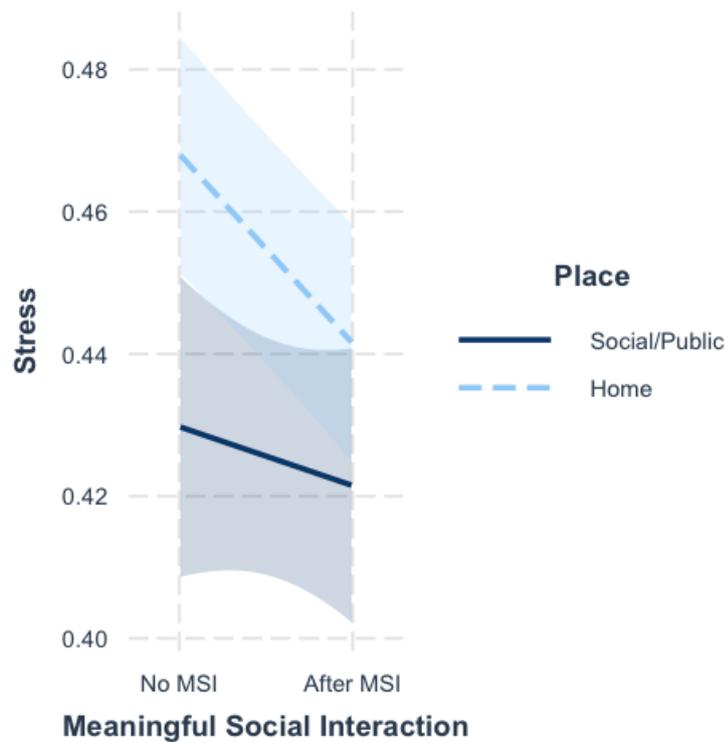
### **Meaningful Social Interactions and Well-Being in Context**

#### *Meaningful Social Interactions in Different Places*

Next, we examined the extent to which places moderated the relationships between engagement in meaningful social interactions and the momentary well-being outcomes.

As shown in Table 4, we found that participants reported weaker decreases in stress after engaging in meaningful social interactions in social or public places, as compared to engaging in meaningful social interactions at home (pooled:  $b = 0.013, p < 0.05$ , see Figure 2).

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**Figure 2***Moderation Effect of Social/Public Places for Meaningful Social Interactions and Stress***Table 4***Results From Multilevel Models Examining Moderation Effects of Places and Activities*

<b>Socializing while...</b>	<b>Stress</b>	<b>Loneliness</b>	<b>Affective well-being</b>
<b>Places</b>			
Being outdoors	-0.003 [-0.019, 0.012]	-0.013 [-0.027, 0.001]	0.006 [-0.005, 0.016]
Being at a social/public location	<b>0.013*</b> [0.001, 0.025]	-0.001 [-0.012, 0.011]	-0.007 [-0.015, 0.002]
Being at a study/work location	0.004 [-0.011, 0.020]	0.010 [-0.004, 0.024]	-0.009 [-0.020, 0.001]
<b>Co-Occurring Activities</b>			
Dining	<b>0.023 ***</b> [0.009, 0.036]	0.011 [-0.001, 0.023]	<b>-0.019***</b> [-0.028, -0.010]
Exercising	0.010 [-0.009, 0.029]	0.003 [-0.014, 0.020]	-0.002 [-0.015, 0.011]

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Consuming Media	0.001 [-0.013, 0.015]	-0.001 [-0.013, 0.012]	-0.009 [-0.018, 0.001]
Studying/ Working	<b>0.009</b> * [0.001, 0.017]	<b>0.008</b> * [0.001, 0.015]	<b>-0.012</b> *** [-0.017, -0.006]

*Note.* The analysis in this table is based on pooled unique participants across three samples.

The reference category for Meaningful Social Interactions (MSI) is No MSI, for places is Home, for activities is Resting. All models control for the time of day (morning, afternoon, evening, night), lagged well-being, gender and number of pings. The light gray shading indicates that the findings replicated across S1, S2, and S3; Dark gray shading indicates that findings replicated in S1 and S3, \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

### *Meaningful Social Interactions During Different Activities*

We then examined the extent to which co-occurring activities moderated the relationship between engagement in meaningful social interactions and the momentary well-being outcomes.

As shown in Table 4, we found that participants reported weaker decreases in stress (pooled:  $b = 0.023$ ,  $p < 0.001$ ; Figure 3a) and weaker increases in affective well-being (pooled:  $b = -0.019$ ,  $p < 0.001$ ; Figure 5.a) after engaging in meaningful social interaction while dining, as compared to while resting.

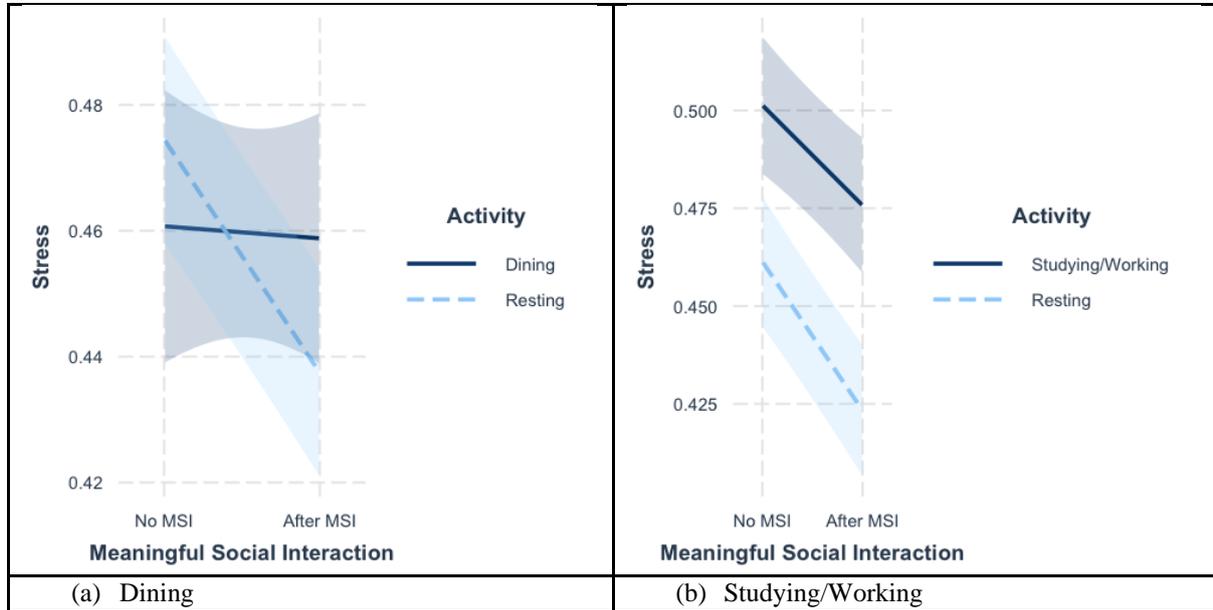
Participants also reported weaker decreases in their stress (pooled:  $b = 0.009$ ,  $p < 0.05$ ; Figure 3.b) and loneliness (pooled:  $b = 0.008$ ,  $p < 0.05$ , Figure 4) and weaker increases in their affective well-being (pooled:  $b = -0.012$ ,  $p < 0.001$ , Figure 5.b) after engaging in meaningful social interactions while they were studying or working, as compared to when they were resting.

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**Figure 3**

*Moderation Effect of Engaging in Different Activities vs Resting in Meaningful Social*

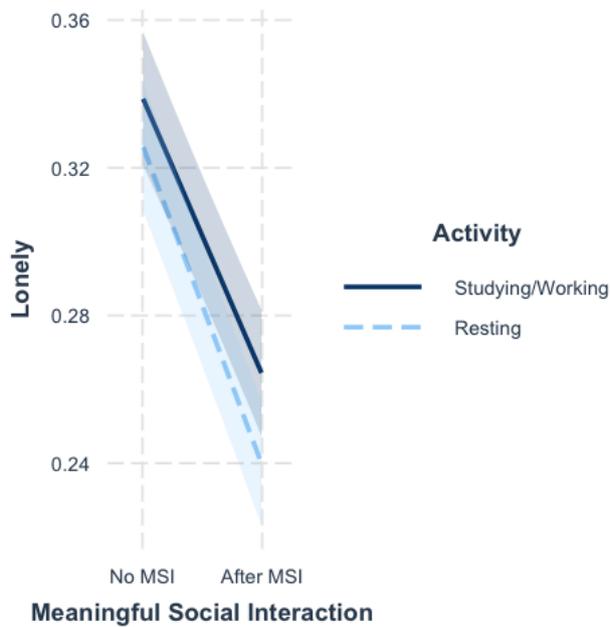
*Interactions and Stress a) Dining b) Studying/Working*



**Figure 4**

*Moderation Effect of Engaging in Studying/Working vs Resting in Meaningful Social*

*Interactions and Loneliness*

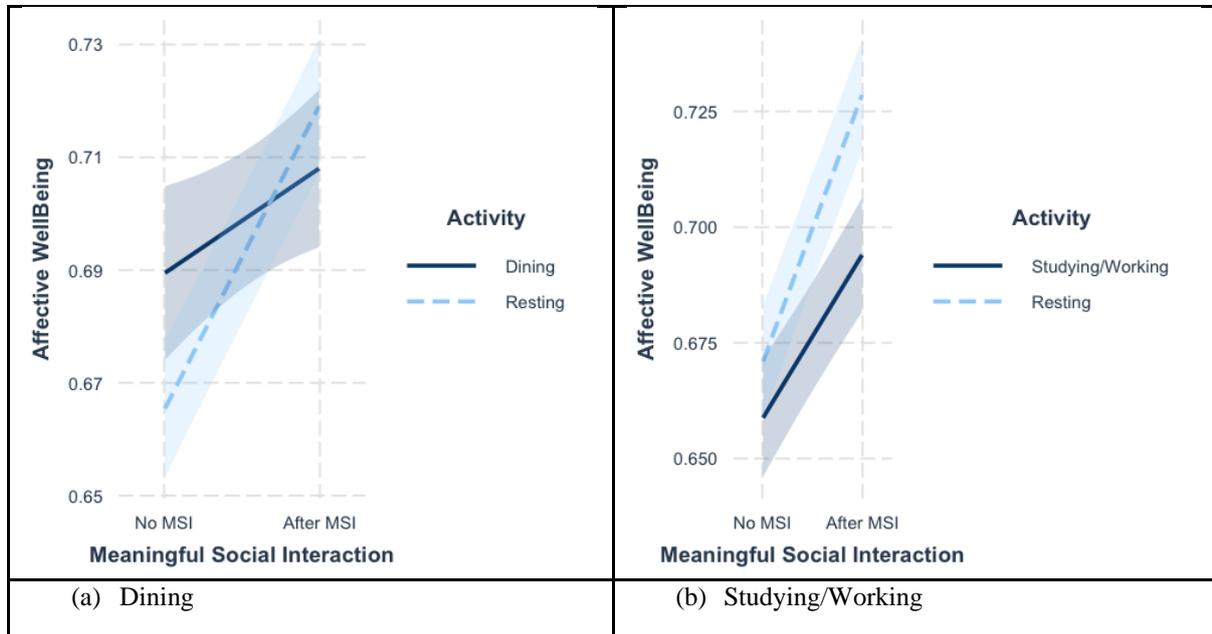


## CONTEXTUALIZING MEANINGFUL SOCIAL INTERACTIONS

**Figure 5**

*Moderation Effect of Engaging in Different Activities vs Resting in Meaningful Social*

*Interactions and Affective well-being a) Dining b) Studying/Working*



### Meaningful Social Interactions During the Pandemic Years

To what extent did the pandemic years moderate the relationship between meaningful social interactions and well-being? From Table 5, we can observe that stress has been impacted by the macro context of the COVID-19 pandemic years. Our data suggests that the relationship between meaningful social interactions and stress was negative in 2019 pre-pandemic year ( $b = -0.021, p < 0.001$ ) (e.g., people reported less stress after meaningful social interactions), but this relationship became weaker during the pandemic, year 2020 ( $b = 0.021, p < 0.05$ , Figure 6). That is, engaging in meaningful social interactions did not have a similarly strong buffering effect against stress in 2020.

## CONTEXTUALIZING MEANINGFUL SOCIAL INTERACTIONS

**Table 5**

*Results From Multilevel Models Examining Main Effects of Meaningful Social Interaction in Well-Being Moderated by Macro Contexts of Pandemic Years*

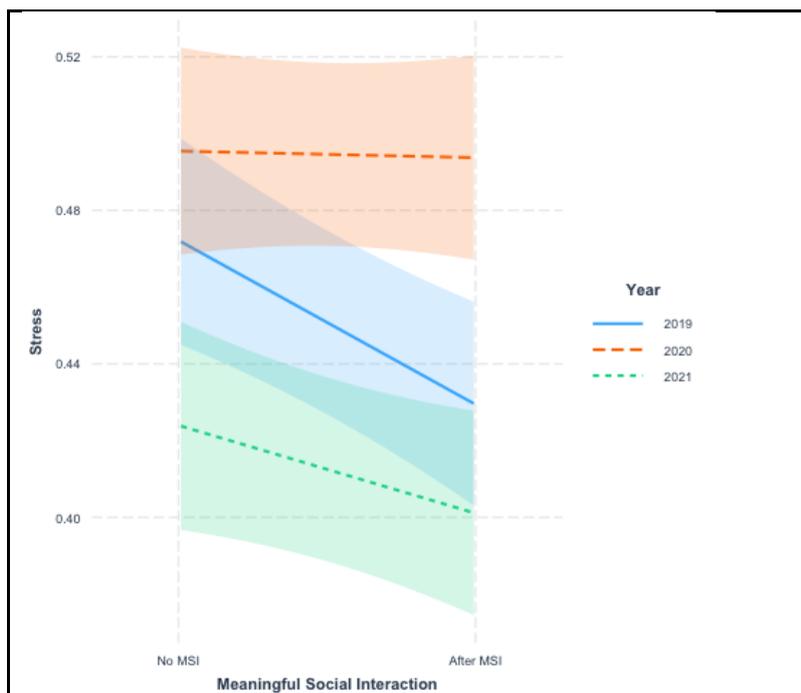
	<b>Stress</b>	<b>Loneliness</b>	<b>Affective Well-Being</b>
MSI × year 2019	<b>-0.021***</b> [-0.033, -0.009]	<b>-0.046***</b> [-0.057, -0.035]	<b>0.024***</b> [0.017, 0.032]
MSI × year 2020	<b>0.021*</b> [0.004, 0.037]	0.011 [-0.003, 0.026]	-0.006 [-0.017, 0.004]
MSI × year 2021	0.010 [-0.006, 0.026]	0.001 [-0.014, 0.014]	-0.007 [-0.018, 0.003]

*Note.* The analysis in this table is based on pooled repeated participants across three samples.

The reference category for Meaningful Social Interactions (MSI) is No MSI. All models control for the time of day (morning, afternoon, evening, night), lagged well-being, gender and number of pings, \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Figure 6**

*Moderating Effect of Pandemic Years in Meaningful Social Interactions and Stress*



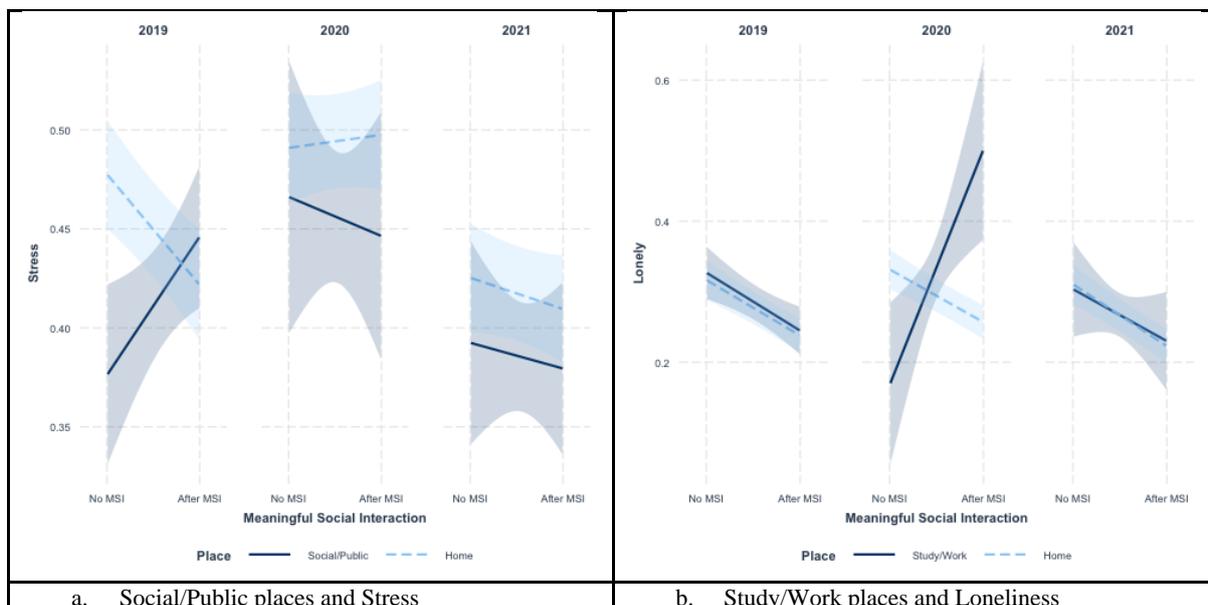
### Meaningful Social Interactions in Different Places Over the Years

To test how the pandemic moderated the three-way relationship between meaningful social interactions, momentary places and well-being outcomes, we tested three-way interactions, meaningful social interaction  $\times$  place  $\times$  pandemic years. As shown in Table 6, we found a significant three-way interaction between meaningful social interactions, different places and feelings of stress and loneliness. Specifically, in 2019, engaging in meaningful social interactions at social or public places (vs. at home) was associated with an increase in momentary stress ( $b = 0.060, p < 0.001$ , Figure 7.a), but was associated with a decrease in momentary stress in 2020 ( $b = -0.089, p < 0.05$ ; Figure 7.a)

Furthermore, from Table 6 engaging in meaningful social interactions at study or work places (vs. at home) was associated with a decrease in loneliness in 2019 and 2021, but was associated with an increase in loneliness during the COVID-19 lockdown in 2020 ( $b = 0.192, p < 0.01$ ; Figure 7b).

### Figure 7

*Three-way Interactions of Meaningful Social Interaction  $\times$  Places  $\times$  Years for Well-Being*



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**Table 6**

*Results From Multilevel Models Examining the Three-way Interactions of Meaningful Social Interaction × Micro Contexts × Pandemic Years for Well-Being*

	Places			Activities			
	Outdoor	Social & Public	Study & Work	Dining	Exercising	Consuming Media	Studying & Working
<b>Stress</b>							
MSI ×							
Context× year 2019	0.039 [-0.013, 0.091]	<b>0.060***</b> [0.026, 0.094]	0.018 [-0.014, 0.051]	<b>0.077***</b> [0. 036, 0.119]	<b>0.077*</b> [0.018, 0.136]	<b>0.045*</b> [0.001, 0.090]	<b>0.056***</b> [0.029, 0.083]
MSI ×							
Context× year 2020	-0.066 [-0.166, 0.033]	<b>-0.089*</b> [-0.17, - 0.009]	0.073 [-0.064, 0.209]	<b>-0.089*</b> [-0.16, - 0.019]	<b>-0.115*</b> [-0.219, - 0.012]	<b>-0.071*</b> [-0.135, - 0.007]	<b>-0.080***</b> [-0.120, - 0.040]
MSI ×							
Context× year 2021	-0.048 [-0.115, 0.020]	-0.053 [-0.107, 0.001]	-0.029 [-0.110, 0.051]	<b>-0.071*</b> [-0.128, - 0.014]	-0.074 [-0.160, 0.012]	<b>-0.079*</b> [-0.140, - 0.018]	<b>-0.061**</b> [-0.099, - 0.023]
<b>Loneliness</b>							
MSI ×							
Context× year 2019	0.015 [-0.029, 0.059]	-0.001 [-0.030, 0.029]	-0.001 [-0.028, 0.028]	0.004 [-0.032, 0.040]	0.026 [-0.025, 0.076]	0.004 [-0.035, 0.042]	0.002 [-0.022, 0.025]
MSI ×							
Context× year 2020	-0.078 [-0.164, 0.008]	-0.034 [-0.103, 0.035]	<b>0.192**</b> [0.073, 0.311]	-0.028 [-0.088, 0.033]	-0.053 [-0.142, 0.037]	-0.024 [-0.079, 0.032]	-0.011 [-0.045, 0.023]
MSI ×							
Context× year 2021	0.016 [-0.042, 0.074]	0.016 [-0.031, 0.062]	0.014 [-0.056, 0.084]	0.014 [-0.036, 0.064]	0.022 [-0.052, 0.097]	0.004 [-0.048, 0.057]	0.003 [-0.030, 0.036]
<b>Affective well-being</b>							
MSI ×							
Context× year 2019	-0.017 [-0.049, 0.015]	<b>-0.025*</b> [-0.047, - 0.004]	-0.003 [-0.023, 0.017]	<b>-0.043**</b> [- 0.069, - 0.017]	-0.008 [-0.045, 0.029]	<b>-0.036*</b> [-0.063, - 0.008]	<b>-0.027**</b> [-0.043, - 0.010]

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MSI ×							
Context×	0.032	0.025	-0.077	0.041	0.006	<b>0.045*</b>	0.021
year 2020	[-0.031, 0.095]	[-0.025, 0.075]	[-0.164, 0.010]	[-0.003, 0.085]	[-0.060, 0.071]	[0.005, 0.085]	[-0.004, 0.046]
MSI ×							
Context×	0.014	0.011	-0.014	0.020	-0.012	<b>0.041*</b>	0.006
year 2021	[-0.028, 0.056]	[-0.023, 0.044]	[-0.065, 0.037]	[-0.016, 0.056]	[-0.066, 0.043]	[0.003, 0.079]	[-0.018, 0.030]

*Note.* The analysis in this table is based on pooled repeated participants across three samples.

The reference category for Meaningful Social Interactions (MSI) is No MSI, for places is Home, for activities is Resting. All models control for the time of day (morning, afternoon, evening, night), lagged well-being, gender and number of pings, \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $< 0.001$

### Meaningful Social Interaction During Different Activities Over the Years.

Engaging in meaningful social interactions while performing different activities was associated with differential well-being outcomes during different years of the pandemic. As shown in Table 6, our results suggest that before the pandemic engaging in meaningful social interactions while dining ( $b = 0.077, p < 0.001$ ; Figure 9.a), exercising ( $b = 0.077, p < 0.05$ ; Figure 8.b), consuming media ( $b = 0.045, p < 0.05$ ; Figure 8.c), or studying or working ( $b = 0.056, p < 0.001$ ; Figure 8.d) was associated with an increase in stress as compared to engaging in meaningful social interactions while resting. The onset of the pandemic lockdown measures in 2020 reversed these associations: engaging in meaningful social interactions while dining ( $b = -0.089, p < 0.05$ ; Figure 8.a), exercising ( $b = -0.015, p < 0.05$ ; Figure 8.b), consuming media ( $b = -0.071, p < 0.05$ ; Figure 8.c), or studying/working ( $b = -0.080, p < 0.001$ ; Figure 8.d) were all associated with decreased stress outcomes as compared to engaging in meaningful social interactions while resting. These changes were still in place in 2021, such that engaging in

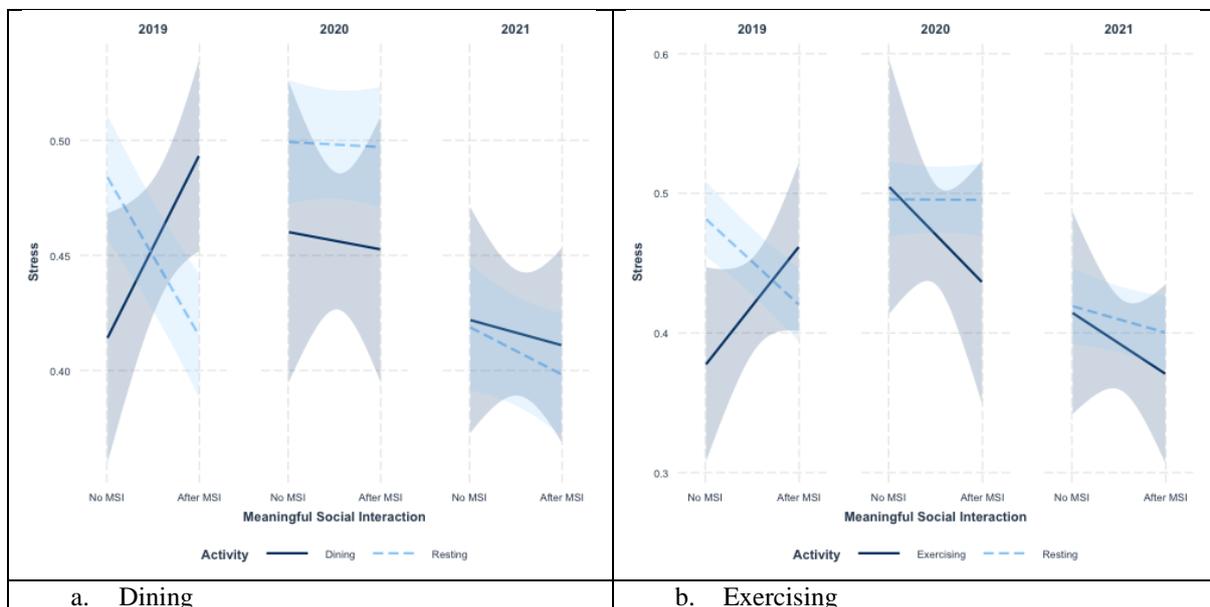
## CONTEXTUALIZING MEANINGFUL SOCIAL INTERACTIONS

meaningful social interactions along with other co-occurring activities was associated with decreased stress outcomes.

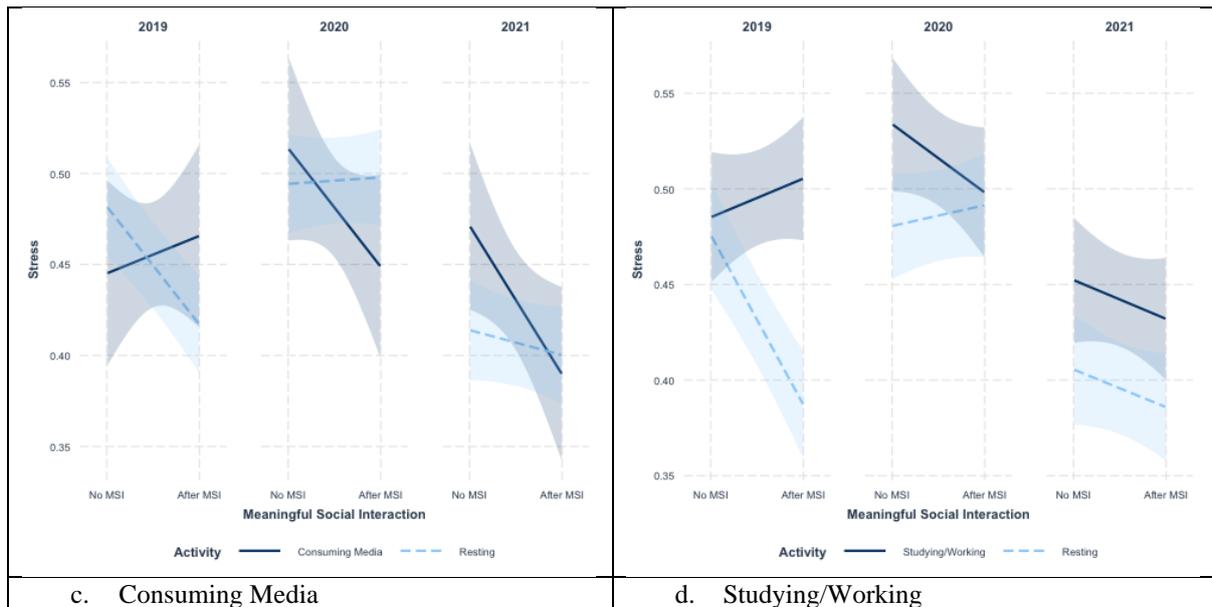
The same pattern of results was observed for engaging in meaningful social interactions while consuming media (vs. resting) for affective well-being. Specifically, engaging in meaningful social interactions while consuming media was associated with negative affective well-being outcomes in 2019 ( $b = -0.036, p < 0.05$ ), but this effect reversed in 2020 ( $b = 0.045, p < 0.05$ ) and 2021 ( $b = 0.041, p < 0.05$ ), suggesting that engaging in meaningful social interactions while consuming media was associated with increased affective well-being (see Figure 9).

### Figure 8

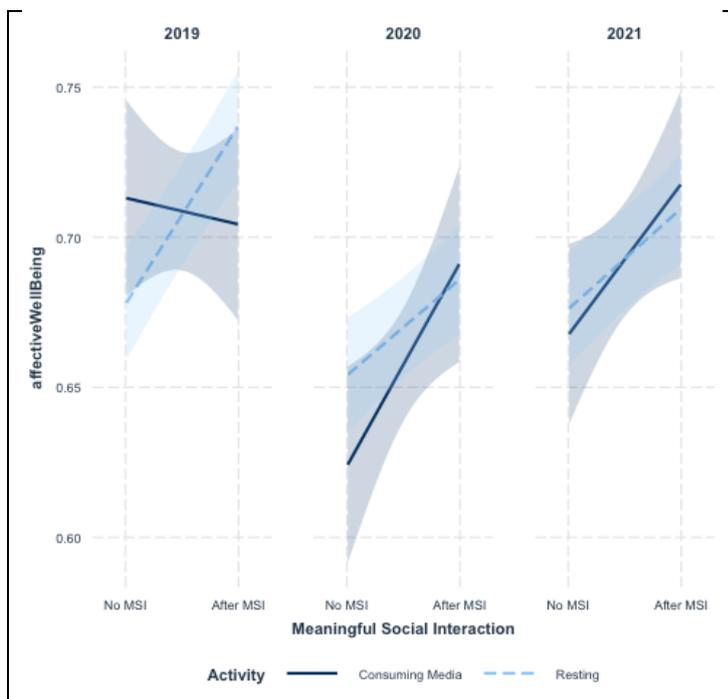
*Three-way Interactions of Meaningful Social Interaction × Activities × Pandemic Years in Stress*



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**Figure 9**

*Three-way Interactions of Meaningful Social Interaction × Consuming Media × Pandemic Years in Affective well-being*

**Discussion**

Using three intensive longitudinal datasets, we examined the relationship between engaging in meaningful social interactions and momentary well-being outcomes across a

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range of different micro and macro contexts. Our results corroborate findings from past research on social interactions and well-being in daily life settings (Choi et al., 2017; Kroencke et al., 2022; Mehl et al., 2010; Milek et al., 2018; Quoidbach et al., 2019). For example, we found that meaningful social interactions with university staff or strangers was associated with subsequent greater feelings of loneliness, when compared to such interactions occurring with strong ties (e.g., significant others, roommates, or friends). However, meaningful social interactions with weak ties (e.g., teammates, classmates, co-workers) were associated with subsequent lower feelings of loneliness, when compared to such interactions occurring with strong ties. These findings are in line with much of the past work underscoring the benefits conferred in engaging with strong and weak ties (Granovetter, 1973; Moreton et al., n.d.; Sandstrom & Dunn, 2014), but add new insight in terms of the relative value of interactions with different kinds of weak ties based on whether they are familiar or unfamiliar interaction partners.

In addition, when meaningful social interactions occurred via computer-mediated channels (e.g., phone calls, video calls, messaging, social media) they were associated with subsequent greater feelings of loneliness and lower affective well-being, compared to when such interactions occurred in person. These findings support past research on the relationship between different kinds of computer-mediated communication, face-to-face interactions, and well-being (e.g., Ruppel et al., 2016; Vlahovic et al., 2012; Kim et al., 2007). Notably, we focused here on computer-mediated communication that people had deemed to be meaningful social interactions. As such, our findings underscore the relative value of face-to-face communication for momentary well-being when socializing with others. Nonetheless, we focused specifically on hedonic conceptualizations of well-being, so it is unclear to what extent, and in what contexts, meaningful social interactions (e.g., with weak and strong ties, face-to-face) also promote other kinds of well-being (e.g., eudemonic conceptualizations of

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well-being, which include personal growth, self-acceptance, and positive relationships among other things; Deci & Ryan, 2008).

Our results for the moderating effect of micro contexts suggest that meaningful social interactions occurring in social and public places were associated with weaker decreases in stress, compared to those occurring while at home. These findings contribute to research that emphasizes the important role of the physical environment, especially the home and social or public places, in modulating the effects of specific behaviors, such as social interactions, on feelings of wellness (Farber et al., 2014; Graham et al., 2015; Meagher, 2020) (Oldenburg, 1999; Purnell, 2015). Similarly, meaningful social interactions occurring while studying or working, and dining were associated with weaker decreases in stress and weaker increases in affective well-being, compared to meaningful social interactions that occurred while resting. These findings suggest that the positive effects of meaningful social interactions on momentary well-being may be reduced when socializing is not the primary focal activity, but instead is co-occurring alongside other activities that demand attention. Past research about the negative well-being outcomes associated with multitasking behavior supports this possibility, especially those findings pertaining to the negative outcomes associated with media multitasking (e.g., engaging in computer-mediated social interactions while doing other things; (van der Schuur et al., 2015). Cumulatively, our findings suggest that the co-occurring activities people engage in while having meaningful social interactions may be more relevant for momentary well-being outcomes, as compared to the places in which the meaningful social interactions occur. However, given the present research was conducted from 2019-2021, the pattern of results might be driven to some degree by pandemic-induced changes to the places and activities that people encountered in their daily lives. For many people, the onset of the pandemic likely homogenized the physical environments in which meaningful social interactions took place (e.g., the home, outdoors), but may have also

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heterogenized the activities that people engaged in while having such interactions (e.g., playing games online; having virtual dinners).ing games online; having virtual dinners).

With regard to the macro context of the COVID-19 pandemic years, we found that meaningful social interactions conferred the greatest benefit to well-being outcomes when people enacted them at home, in-person, and while they were resting in 2019. However, these relationships reversed during 2020, such that engaging in meaningful social interactions was beneficial for well-being outcomes, especially when people enacted them at social or public places, over computer-mediated channels, and while engaging in various activities (e.g., dining, consuming media). By 2021, nearly all meaningful social interactions (regardless of the micro contexts in which they occurred) were associated with positive well-being outcomes. Generally, such patterns suggest that the pre-pandemic relationship between meaningful social interactions and momentary well-being varied across different contexts. The onset of the pandemic lockdowns homogenized the effect of contexts on social interactions and wellbeing, such that meaningful social interactions in all contexts were associated with increased wellbeing outcomes. Moreover, this homogenization persisted through the lifting of lockdowns in 2021, suggesting a possible enduring change in people's momentary well-being in response to meaningful social interaction experiences.

Our findings should be considered with three main limitations in mind. First, we examined our research questions using longitudinal datasets and correlational statistical methods, hence we cannot disentangle the causal associations between our variables of interest. Future studies using large-scale field experiments could facilitate the discernment of causal relationships between engagement in meaningful social interactions in different contexts and well-being. Second, our samples were recruited in the particular cultural context of a university community in the United States, so future studies should aim to recruit participants from other countries and cultures to test the external validity of our findings.

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Given that cultural factors have been linked to patterns of social behavior (Oishi et al., 2008), it is plausible that the extent to which the well-being effects of socializing are moderated by contextual variables that are more broadly shaped by the culture in which people are socializing. Third, we did not include subjective perceptions of the contexts in which the social interactions occurred. Instead, we used self-report methods to assess relatively objective contextual information (e.g., where the interactions occurred, who was involved), instead of asking people to report on their subjective perceptions of the surrounding context (e.g., situational characteristics; Rauthmann et al., 2015). One promising future direction lies in better understanding how subjective perceptions of the situations in which meaningful social interactions occur relates to momentary well-being outcomes.

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