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Drivers and Social Effects of the Decision to Turn on One's Camera During Videoconferencing in Groups

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Abstract

With the emergence of the SARS-CoV-2 pandemic, videoconferencing was rapidly adopted. However, individuals frequently decide to keep their cameras off during videoconferences. Currently, the reasons for this are not well modeled, and neither are the social effects this decision has. The present research addresses the question whether camera use can be conceptualized as prosocial behavior. To this end, two preregistered studies (total N = 437) examined how the decision to turn on one's camera is influenced by established situational determinants (group size, social influence, and social tie strength) and dispositional predictors of prosocial behavior (individual communion, agency, and social value orientation), whether individuals prefer meetings in which others turn on their cameras, and whether camera use impacts social perception (communion and agency) by others. As predicted, people were shown to overall prefer meetings in which others turn on their cameras in Study 1 (a factorial survey). Furthermore, situational determinants of prosocial behavior were demonstrated to influence camera use in the hypothesized directions, while findings regarding dispositional predictors of prosocial behavior were mixed. Study 2 conceptually replicated the effect of social influence on camera use in a correlational survey. As predicted, it was also demonstrated that individuals who have their camera on are perceived as higher in agency, but, in contrast to predictions, not higher in communion. Together, the findings indicate that camera use is prosocial in that it benefits others, but that it is not primarily driven by prosocial intent or commonly interpreted as a prosocial act.

Keywords: camera use; prosocial behavior; social perception; social influence; videoconferencing

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Introduction

The use of videoconferencing platforms has been skyrocketing since the beginning of the outbreak of the SARS-CoV-2 pandemic when severe restrictions on in-person meetings were put in place across countries around the world. For instance, the number of daily meeting participants on Zoom, one of the world's largest videoconferencing platforms, grew by 3,000% between December 2019 and April 2020—from 10 million to 300 million (Yuan, 2021). This rapid adoption illustrates the fundamental need of humans to interact in ways that maintain social cues from different modalities. However, both anecdotal and empirical observations revealed that people frequently decide to keep their cameras off (Bedenlier et al., 2021). Why individuals choose to turn their cameras on or off during a videoconference is not well modeled to date, and neither are the social effects this

decision may have. The present research aims at identifying and testing situational determinants and dispositional predictors of camera use during videoconferencing, drawing on theory related to prosocial behavior. Furthermore, it seeks to investigate the impact turning on one's camera has on social perception.

Online communication differs from offline communication in the amount of nonverbal feedback available (Lieberman & Schroeder, 2020), albeit the difference is arguably attenuated for videoconferencing to the degree that attendees turn on their cameras. Generally, nonverbal signals are vital components of social interaction. For instance, speaking in front of strangers triggers a stronger physiological stress response when listeners refrain from providing nonverbal feedback—even compared to when listeners provide negative nonverbal feedback (for a meta-analysis, see Goodman et al., 2017). Furthermore, listeners' nonverbal feedback was demonstrated to improve speaker performance and, in turn, listener understanding (Bavelas et al., 2000; Bavelas & Gerwing, 2011), even for passive listeners (Tolins & Fox Tree, 2016).

While the majority of studies examining the impact of nonverbal feedback were conducted in dyads, visual nonverbal feedback might be even more important in group settings because smooth conversational turn-taking, which heavily relies on nonverbal signals such as eye gaze and gesturing (reviewed in Skantze, 2021), gets increasingly difficult as group size increases (Cooney et al., 2020). Smooth turn-taking is crucial for the perception of good conversational flow, which, in turn, results in more positive social interaction outcomes (Koudenburg et al., 2013; Truong et al., 2020). Notably, even rather minor disruptions of conversational flow such as introducing a short delay have been demonstrated to considerably impact feelings of social belongingness and perceptions of group entitativity (Koudenburg et al., 2013). In addition, prior research suggests that at least in offline interactions, paradoxically, speakers frequently receive decreasing nonverbal feedback as group size increases (Cooney et al., 2020). During videoconferencing, this effect is likely amplified as listeners typically turn off their microphones to avoid noise interferences. Thus, short vocal nonverbal utterances such as "mhm" and "yeah" or laughter are not available to the speaker, arguably rendering receiving visual nonverbal feedback such as nods or smiles even more crucial. Taken together, it seems plausible to predict that group meetings during which others can be seen are preferred by most individuals.

But if visual nonverbal information exchange is beneficial for social interactions, why do many individuals keep their cameras off during group videoconferencing? At least in offline contexts, the reduced willingness to provide nonverbal feedback in groups has been interpreted as social loafing, potentially caused by diffusion of responsibility (Cooney et al., 2020). Indeed, one can argue that providing nonverbal feedback is effortful because it requires staying focused on the interaction. For videoconferences in particular, own camera use has additionally been theorized (Bailenson, 2021) and empirically shown (Shockley et al., 2021) to be fatiguing due to increased self-presentation concerns resulting from (literally) being on display.

Building on the premises that turning on one's camera during videoconferencing is costly to oneself while potentially benefitting the group, the decision of whether to do so or not may be conceptualized as a social dilemma, that is, a mismatch between what is best for the individual and what is best for the group. In social dilemmas, each person is better off individually if they choose not to cooperate. However, if everyone decides not to cooperate, the entire group misses out on the benefit at stake (e.g., Kollock, 1998). In consequence, if turning one's camera on is advantageous for others, doing so would represent a form of prosocial behavior, which is, most broadly, defined as all acts that benefit others (Bolino & Grant, 2016; Hruschka & Henrich, 2015), or, according to common consequentialist definitions, as actions that benefit others but come at an individual cost to the actor.

A plethora of theoretical and empirical work from psychology, biology, and economics has identified determinants of prosocial behavior. In the present work, in addition to investigating whether others' camera use is preferred over their non-use (which would be required for it to be prosocial behavior), we will test whether some of the most well-established determinants of prosocial behavior predict camera use in videoconferencing settings, and whether turning on one's camera results in reputational benefits, as one would predict based on costly signaling theory (Gintis et al., 2001) if it was indeed a form of (intended) prosocial behavior.

As a first important situational determinant of prosocial behavior, the present work focuses on group size. In their seminal empirical (1968) and theoretical work (1970), Latané and Darley proposed that increasing group size results in decreased prosocial behavior due to feelings of diffusion of responsibility, which can, in turn, trigger social loafing (Latané et al., 1979). By now, the phenomenon that larger group size reduces individual willingness to behave prosocially has been repeatedly demonstrated across a wide variety of contexts (reviewed in Karau & Williams, 1995) including social dilemmas (e.g., Brewer & Kramer, 1986; Seijts & Latham, 2000), offline (e.g., Cooney

et al., 2020; Freeman et al., 1975), and online interactions (e.g., Markey, 2000; Martin & North, 2015). Thus, larger group size is expected to result in less camera use if camera use is indeed a form of prosocial behavior.

As a second key situational determinant of prosocial behavior, the present work focuses on social influence in the form of descriptive norms, that is, what most others do (Cialdini et al., 1990). Much like for group size, there is ample empirical evidence that observing others behave prosocially increases one's own likelihood of doing so oneself across social contexts, again including social dilemmas (e.g., Bardsley & Sausgruber, 2005; Cress & Kimmerle, 2007), offline (e.g., Latané & Darley, 1968; Nook et al., 2016), and online settings (e.g., Cress & Kimmerle, 2007; Demarque et al., 2015). Thus, social influence (operationalized as a higher proportion of others turning their cameras on) is expected to lead to more camera use if camera use is indeed a form of prosocial behavior.

Finally, as a third crucial situational determinant of prosocial behavior, the present work focuses on tie strength. Individuals who are connected via stronger social or biological ties are known to more likely help each other in emergency and non-emergency situations (e.g., Burnstein et al., 1994; Graziano et al., 2007), including social dilemma-like scenarios (e.g., Charness & Gneezy, 2008; Krueger et al., 2016). Thus, stronger tie strength is expected to result in more camera use if camera use is indeed a form of prosocial behavior.

Regarding dispositional predictors of prosocial behavior, the present work focuses on individual motivational tendencies for communion and agency (Study 1), and social value orientation (SVO; Study 2). Generally, individuals differ in their likelihood to act prosocially and these differences have been demonstrated to be stable over time and situations (Peysakhovich et al., 2014). The likelihood that a person provides help to others has been linked to the fundamental human motives of communion and agency (Frimer et al., 2011; Walker & Frimer, 2007) and individuals' social value orientation (SVO; Van Lange, 1999), with the latter being one of the strongest and most consistent dispositional predictors of prosocial decision making inside and outside of lab settings (for a meta-analysis, see Thielmann et al., 2020). Therefore, increased individual communion, agency, and SVO are expected to result in more camera use if camera use is indeed a form of (intended) prosocial behavior.

Finally, Study 2 seeks to test whether the decision to turn one's camera on results in reputational benefits, as one would predict based on costly signaling theory (Gintis et al., 2001) if it was indeed a form of (intended) prosocial behavior (Kawamura et al., 2021). According to costly signaling theory, investing in behavior that benefits others while imposing a cost to oneself can results in long-term reputational benefits in terms of being seen as a person with desirable qualities who people might be more willing to interact, collaborate, or share their own resources with in the future (Gintis et al., 2001). The present work focuses on communion and agency as they are not only considered to be fundamental human motives (Frimer et al., 2011), but also the two fundamental dimensions of social perception (Abele & Wojciszke, 2007). In prior research, prosocial behavior was shown to enhance both perceptions of communion and agency (Kawamura et al., 2021). Thus, camera use is expected to lead to higher social perceptions of communion and agency by others if camera use is perceived as a form of (intended) prosocial behavior.

To summarize, the present research seeks to test the predictions that individuals are more likely to turn on their camera with increasing tie strength, decreasing group size, and increasing proportion of other attendees who have their cameras on (Studies 1 and 2). It is additionally predicted that individuals who are higher in communion and agency (Study 1) and SVO (Study 2) are more likely to turn on their camera and that people overall prefer meetings in which a higher proportion of others have their cameras on (Study 1). It is moreover hypothesized that camera use versus non-use impacts social perception in a way that individuals who turn on their cameras are described to be higher in communion and agency (Study 2).

Overall Measures and Procedures

The present research seeks to test the assumption that turning on the camera during a videoconference is a form of prosocial behavior. This is achieved by investigating across two preregistered factorial surveys, each combined with a correlational survey, how the willingness to turn on the camera is influenced by previously established situational determinants and dispositional predictors of prosocial behavior (Studies 1 and 2), whether individuals prefer meetings in which more others have their cameras turned on (Study 1), and whether camera use results in altered social perception (Study 2). In factorial surveys, participants are exposed to a series of so-called vignettes, which are descriptions of hypothetical situations, and asked to indicate on a scale how they would feel or behave in each of these situations. The factors of interest, that is, the experimental conditions, are systematically varied between the vignettes, allowing to single out the causal impact each of those dimensions has on the dependent

variable (Auspurg et al., 2009). While factorial vignette designs are high in experimenter control and thereby in internal validity, allowing to draw causal conclusions, because they are based on responses to hypothetical scenarios, the high internal validity comes at a cost in terms of external validity (i.e., the question to what degree findings can be generalized to real-life settings). To mitigate this shortcoming, in the present research, factorial surveys were combined with classic, correlational surveys assessing experiences in real life situations via self-report.

Openness Statement

Both studies were preregistered (https://osf.io/6fprn and https://osf.io/b6mx2). The pre-data collection plans, study materials, raw data, and analysis scripts are available at https://osf.io/b7xqw/ (Study 1) and https://osf.io/9b7sw/ (Study 2). All deviations from the preregistrations are explicitly highlighted in the paper.

Study 1

Hypotheses

In Study 1, it was specifically predicted that individuals are more likely to turn on their camera with increasing social tie strength (**H1.1**). It was furthermore predicted that individuals are more likely to turn on their camera if a larger percentage of other attendees do so as well (**H1.2a**) and that the effect of others' camera use on one's own camera use is moderated by tie strength in a way that it is stronger with decreasing tie strength (**H1.2b**). Moreover, it was predicted that individuals are more likely to turn on their camera the smaller the group size is (**H1.3a**) and that the effect of group size on camera use is moderated by tie strength in a way that it is stronger the weaker the tie strength is (**H1.3b**). Regarding interindividual differences, it was predicted that individuals who are more likely to turn on their camera score higher on self-reported communion (**H1.4a**), and that the effect predicted in H1.4a is moderated by tie strength in a way that it is more strongly pronounced for weaker tie strengths (**H1.4b**), by social influence in a way that it is more strongly pronounced for situations when less others have their cameras turned on (**H1.4c**), and by group size in a way that it is more strongly pronounced for larger group sizes (**H1.4d**). It was additionally predicted that individuals who are more likely to turn on their camera also score higher on self-reported agency (**H1.5a**). It was also predicted that the effect predicted in H1.5a is moderated by tie strength in a way that it is more strongly pronounced for weaker tie strengths (**H1.5b**), social influence in a way that it is more strongly pronounced for situations when less others have their cameras turned on (**H1.5c**), and group size in a way that it is more strongly pronounced for larger group sizes (**H1.5d**). Finally, it was predicted that individuals prefer meetings in which a higher percentage of others have their cameras turned on (**H1.6**).

Methods

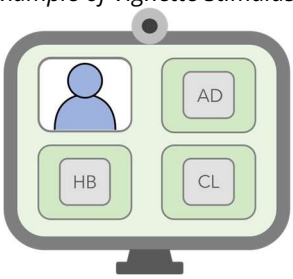
Participants

The planned, preregistered sample size was $N = 210$ (with replacement for exclusions up to a total sample of $N = 240$) as this sample size is sufficient for medium-sized correlations ($\rho = .3$) to stabilize (Schönbrodt & Perugini, 2013) and provides a test power of $1-\beta \geq .99$ for medium-sized effects in two-sided test for all other predicted effects (Faul et al., 2007). A convenience sample of $N = 240$ British participants was recruited through prolific.co in March 2021 to take part in Study 1. Participants received GBP 2 for completing the online study, which took about 15 minutes. Six of these had to be excluded because they withdrew their data upon completion of the study. An additional $n = 6$ participants were excluded because they failed to answer the attention question correctly (preregistered exclusion criteria), resulting in a final sample size of $N = 228$ participants (129 female; 97 male; 2 gender-fluid, non-binary, two-spirit, and/or transgender; age in years: $M = 37.76$; $SD = 13.74$; 108 employed—mostly desk work, 31 employed—mostly manual work, 14 free-lancers—mostly desk work, 6 free-lancers—mostly manual work, 34 students, 12 stay-at-home parents, and 23 unemployed) through accidental oversampling[1]. Information on ethnicity was not assessed. The study procedures were approved by the local Institutional Research Ethics Board (LEK 2021-013).

Measures

Videoconferencing vignettes (factorial survey). Participants who provided informed consent were presented with 18 vignettes and accompanying sketches (see Figure 1 for an example stimulus) describing group videoconferencing situations varying the tie strength between attendees (close friends/family members, acquaintances, strangers) as within-factors (block-wise, randomized order), number of other attendees (4, 8, 12; fully randomized order within each block), and the proportion of other attendees who have their camera turned on (25% and 75% of the respective group size—presented in absolute numbers; fully randomized order within each block). For each of the scenarios, participants indicated the likelihood that they would turn on the camera (5-point Likert scale: 1 = *extremely unlikely* to 5 = *extremely likely*).

Figure 1. *Example of Vignette Stimulus in Study 1.*



Note. Corresponding scenario description: "Please imagine the following situation: You are attending a video call with acquaintances [alternatively: close friends/close family members or strangers]. Four other attendees are already in the call. One of them has their camera turned on. How likely is it that you would turn on your camera in this situation?"

Communion and agency. To assess individual levels of communion and agency, participants completed the 32-item International Personality Item Pool–Interpersonal Circumplex (IPIP-IPC-32; Markey & Markey, 2009; see also Foster et al., 2015). Item scores were aggregated to an overall agency and an overall communion score (Markey & Markey, 2009).

Preferences regarding others' camera use (factorial survey). To assess preferences regarding others' camera use, participants were then presented with three pairs of sketches depicting videoconferencing situations and asked for each of the pairs which type of virtual meeting they would prefer to attend, applying two-alternative force choice tasks. For this, participants were randomly assigned to one of three levels of tie strength (close friends/family members, acquaintances, or strangers) in all hypothetical vignettes to explore whether tie strength played a role in camera preferences. In each of the pairs, participants had the choice between 25% and 75% of others who had their camera turned on, while the group size remained constant within each pair (but was varied between pairs: 4, 8, and 12; viewing order and positions were fully randomized). For exploratory purposes, six additional choices between in-person meetings and virtual meetings with either 25% or 75% of others having their camera turned on were added. Group size again remained constant within each pair but was varied between pairs (4, 8, and 12) and viewing order and positions were fully randomized.

Attention check. Participants were then asked whether the previous question block was about a group of close friends/family members, acquaintances, or strangers (attention check; preregistered exclusion criterion).

General information about videoconferencing use (correlational survey). For exploratory purposes, general information about participants' videoconferencing experience and details about their last videoconferencing call were also assessed. Findings relevant to the present research questions are summarized in Table 1. For a complete list of measures, see https://osf.io/b7xqw/.

Additional measures. Finally, participants completed a pretest for an unrelated research project and a brief survey assessing basic demographics.

Results

Factorial Survey

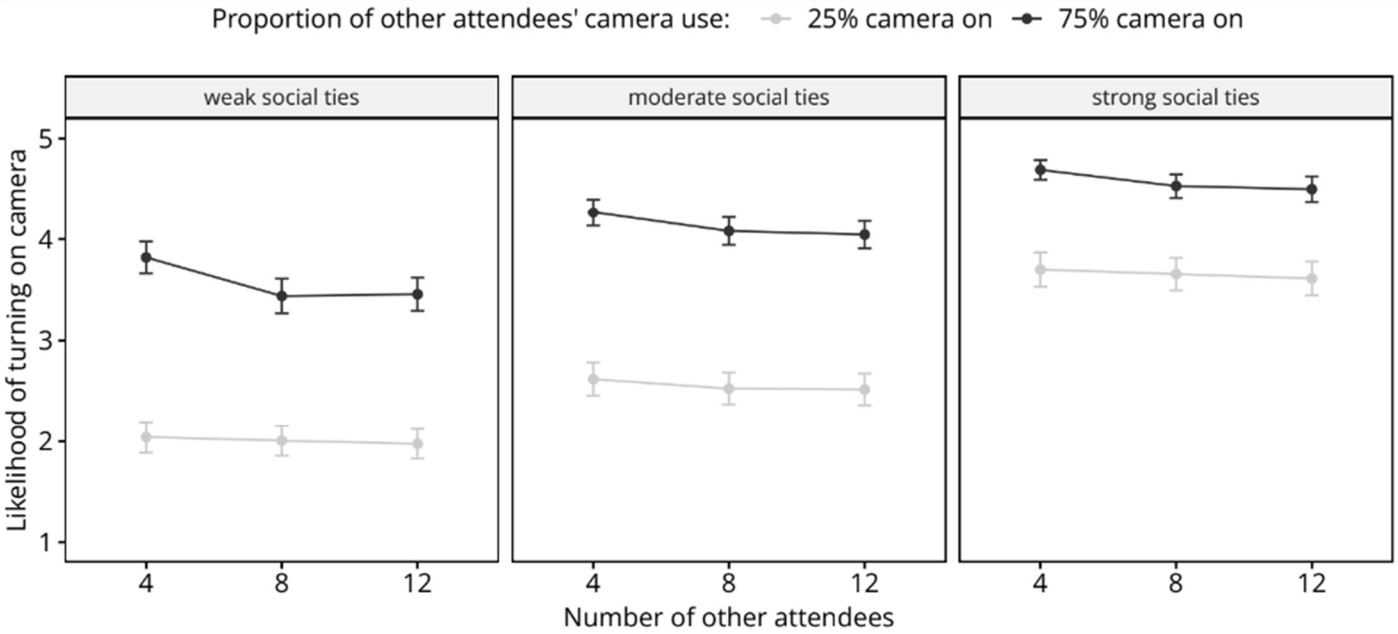
To test the hypotheses regarding situational determinants and dispositional predictors of camera use (H1.1 though H1.5), a mixed analysis of variance (ANOVA) was conducted with the following independent variables: tie strength (within-subject: 3 levels), group size (within-subject: 3 levels), social influence (within-subject: 2 levels), communion (between-subject; continuous), agency (between-subject; continuous), and all interaction terms, and the likelihood to turn on the camera as dependent variable. The analysis revealed significant large main effects of tie strength, $F(1.69, 377.82) = 308.48$, $p < .001$, $\eta_{part.}^2 = .58$, and social influence, $F(1, 223) = 664.18$, $p < .001$, $\eta_{part.}^2 = .75$, and a significant medium-sized main effect of group size, $F(1.73, 386.31) = 26.94$, $p < .001$, $\eta_{part.}^2 = .11$, all in the predicted directions (see Figure 2). Bonferroni-Holm corrected, planned contrasts for the factors with three levels (social tie strength and group size) revealed that strong social ties resulted in more camera use than moderate social tie strength, which in turn resulted in more camera use than weak social ties (all *p*s < .001). In contrast, groups of four attendees resulted in higher camera use than groups of eight or twelve attendees (both *p*s < .001), while camera use did not differ between groups of eight and twelve attendees ($p = .260$). Thus, overall, H1.1 that individuals are more likely to turn on their camera with increasing social tie strength, H1.2a that individuals are more likely to turn on their camera if a larger percentage of other attendees do so as well, and H1.3a that individuals are more likely to turn on their camera the smaller the group size were all supported, even though it should be acknowledged that the latter findings suggested that there might be a threshold when larger group sizes do not further decrease camera use. In line with H1.2b that the effect of others' camera use on one's own camera use was moderated by tie strength in a way that it was stronger with decreasing tie strength, the analysis also revealed a significant two-way interaction between tie strength and proportion of other attendees' camera use, $F(1.67, 372.78) = 60.59$, $p < .001$, $\eta_{part.}^2 = .21$, with stronger effects for weak ($\eta_{part.}^2 = .71$) and moderate ($\eta_{part.}^2 = .7$) compared to strong ties ($\eta_{part.}^2 = .5$; see Figure 2), while in contrast to H2.3b that the effect of group size on camera use was moderated by tie strength in a way that it was stronger the weaker the tie strength, no significant two-way interaction between tie strength and group size was observed, $F(4, 892) = 1.21$, $p = .305$, $\eta_{part.}^2 = .005$. Moreover, the analysis revealed a not explicitly predicted two-way interaction between group size and proportion of other attendees' camera use, $F(2, 446) = 12.06$, $p < .001$, $\eta_{part.}^2 = .05$, and, again not explicitly predicted, a marginally significant three-way interaction between social tie strength, proportion of other attendees' camera use, and group size, $F(3.84, 856.25) = 2.38$, $p = .053$, $\eta_{part.}^2 = .01$ (for details regarding these interaction effects, see Figure 2).

Regarding dispositional predictors, the predicted effect of agency on camera use was observed, $F(1, 223) = 18.08$, $p < .001$, $\eta_{part.}^2 = .08$, supporting hypothesis H1.5a that individuals who are more likely to turn on their camera also score higher on self-reported agency In contrast, there was no effect of communion on camera use, $F(1, 223) = 0.30$, $p = .583$, $\eta_{part.}^2 = .001$, resulting in a rejection of H1.4a that individuals who are more likely to turn on their camera score higher on self-reported communion. The predicted interaction effects between communion and social tie strength (H1.4b), social influence (H1.4c), and group size (H1.4d) on camera use were all small ($\eta_{part.}^2 \leq .013$) and formally not significant ($p \geq .062$), resulting in rejection of all three hypotheses. Similarly, the predicted interaction effects between agency and social tie strength (H1.5b), social influence (H1.5c), and group size (H1.5d) on camera use were all negligibly small in size ($\eta_{part.}^2 \leq .015$), even though the interaction effect between agency and tie strength formally reached the level of statistical significance, $F(1.69, 377.82) = 3.37$, $p = .043$, $\eta_{part.}^2 = .015$ (all other *p*s > .32).

Whether individuals prefer meetings in which more others have their cameras turned on was tested in two steps: To examine whether it was appropriate to aggregate across tie strength groups, a univariate ANOVA was conducted with tie strength (between-subject: 3 levels) as independent variable and aggregated preference scores for others' camera use in videoconferencing calls (averaged across the three group sizes) as dependent variable. The analysis revealed that tie strength was a relevant factor regarding preferences for others' camera use, $F(2, 225) = 12.52$, $p < .001$, $\eta_{part.}^2 = .1$, so separate one-sample t-tests for each of the tie strength groups were conducted to test whether there was a significantly higher likelihood of choosing groups with relatively more camera users over groups with relatively less camera users (one-sided tests; $\mu = .5$; Bonferroni-Holm corrected). For strong social ties and for acquaintances, individuals were shown to prefer meetings in which a higher percentage of others have their cameras turned on; strong social ties: $t(59) = 11.36$, $p < .001$; $M = .91$, 95% CI [.85, inf]; acquaintances: $t(77) = 4.15$, $p < .001$; $M = .71$, 95% CI [.62, inf], while no significant preference for

others' camera use was observed in videoconferencing calls with strangers, $t(89) = 1.26$, $p = .105$; $M = .56$, 95% CI [.48, inf]). Thus, H1.6 was partially supported.

Figure 2. *Situational Determinants of Camera Use (Study 1).*



Note. Self-reported likelihood of turning on one's camera (y-axis; 1 = extremely unlikely to 5 = extremely likely) during a group video call with weak social ties (left), moderate social ties (middle), and strong social ties (right), contingent on number of other attendees (x-axis: 4, 8, or 12) and proportion of other attendees' camera use (gray line: 25% of other attendees have camera on; black line: 75% of other attendees have camera on). Whiskers depict 95% confidence intervals around the respective arithmetic means.

Correlational Survey

In addition to the confirmatory analyses related to the vignettes, bivariate relationships (Spearman correlations) between variables related to participants' last videoconference in Study 1 were explored. As depicted in Table 1, own camera use showed a moderate negative association with number of other attendees and a strong positive association with proportion of other attendees' camera use, lending further support to the conclusion drawn based on the confirmatory analyses. Moreover, both communion and agency showed small positive bivariate associations with own camera use.

Table 1. *Study 1: Bivariate Correlations (Spearman) Between Variables Related to Last Videoconference.*

Variable	1	2	3	4	5
1. Own camera use	—				
2. Number of other attendees	−.36	—			
3. Proportion camera others	.71	−.59	—		
4. Communion	.19	−.02	.18	—	
5. Agency	.14	.08	.10	.08	—

Note. In accordance with recommendations for reporting of exploratory findings (e.g., Nosek & Lakens, 2014), we refrain from reporting *p*-values here due to an otherwise unknown inflation of the alpha level.

Discussion

Results of Study 1 provide initial evidence that as predicted, social influence, group size, and tie strength are important situational determinants of an individual's decision to turn on the camera during videoconferencing. In accordance with predictions, higher individual agency was moreover associated with a higher likelihood of camera use, while—in contrast to predictions—individual communion was not. Finally, individuals overall preferred videoconferences in which a larger proportion of other attendees had their cameras on, especially when they were interacting with strong social ties such as close friends or family members. Findings of an exploratory analysis additionally suggested that own camera use was negatively associated with number of attendees and positively associated with the proportion of other attendees' camera use in a correlational survey as well, further supporting

the conclusion drawn based on the factorial surveys. However, the latter findings had not been explicitly predicted and social tie strength between attendees during the last videoconference had not been assessed in Study 1. In addition, Study 1 did not allow to investigate the predicted effects of camera use on social perception, that is, that individuals who turn on their camera are perceived to be higher in communion and agency. Therefore, a second study was conducted to address these limitations and explicitly test the robustness and external validity of these findings in addition to examining the expected effects of camera use on social perception.

Study 2 was a partial replication and important extension of Study 1. More specifically, it sought to test the robustness and external validity of the findings in a correlational survey. As an arguably more stringent test of whether prosociality-relevant individual dispositions predict camera use, individuals' SVO (Van Lange, 1999) was also assessed and related to their self-reported camera use in their last videoconference. This choice was based on the observation that SVO is one of the most consistent dispositional predictors of prosocial behavior inside and outside of lab settings (for a meta-analysis, see Thielmann et al., 2020). Finally, Study 2 aimed to test whether camera use impacts social perception, again relying on communion and agency as the two fundamental dimensions of social perception (Abele & Wojciszke, 2007; Kawamura et al., 2021), applying an experimental vignette design.

Study 2

Hypotheses

In Study 2, it was specifically predicted that individuals are more likely to turn on their camera with increasing social tie strength (**H2.1**), if a higher proportion of others do so as well (**H2.2**), and the smaller the group size is (**H2.3**). It was furthermore predicted that individuals would be more likely to turn on their camera the more prosocial their social preferences are (**H2.4**). It was also predicted that individuals who choose to turn their camera on in a videoconferencing situation would be rated higher in communion (**H2.5a**) and that the effect predicted in H2.5a will be stronger if most others have their camera turned off (**H2.5b**). Finally, it was predicted that individuals who choose to turn their camera on in a videoconferencing situation will be rated higher in agency than individuals who choose to turn their camera off (**H2.6a**) and that the effect predicted in H2.6a will be stronger if most others have their camera turned off (**H2.6b**).

Methods

Participants

A convenience sample of N = 211 British participants was recruited through prolific.co in June 2021 to take part in Study 2. Participants received GBP 2.10 for completing the study online, which took about 15 minutes. The preregistered sample size was N = 210, which is sufficient to find the hypothesized main effects with a test power of $1-\beta \geq .95$ in one-sided tests assuming that they were at least medium-sized (Faul et al., 2007). Two participants withdrew their data upon completion of the study, resulting in a final sample size of N = 209 (140 female; 61 male; 2 gender-fluid, non-binary, and/ or two-spirit, 1 person did not identify with these categories; age in years: M = 32.81; SD = 11.8; 78 employed—mostly desk work, 19 employed—mostly manual work, 9 free-lancers—mostly desk work, 2 free-lancers—mostly manual work, 55 students, 16 stay-at-home parents, 16 unemployed, 3 retired, 11 other). Information on ethnicity was not assessed. The study procedures were approved by the local Institutional Research Ethics Board (LEK 2021-128).

Measures

Frequency of videoconferencing calls. Upon providing informed consent, participants were asked about the frequency in which they had attended videoconferencing calls in the past year (scale ranging from *Never* to *Several times a day*); all participants reported that they had attended at least one videoconference.

Videoconferencing vignettes (factorial survey). Four group videoconferencing situations were prepared in vignette-form, with accompanying sketches. Each situation involved nine (fictitious) acquainted videoconference attendees including the participant. The participant was described to have the camera on in each of the vignettes.

Participants were randomly assigned to a situation in which two or six of the other eight attendees had the camera turned on. They were then asked to imagine a typical person (the target) who does versus does not (random assignment) turn on the camera in the depicted situation and to think about what they might be like. To assess the participants' social perception of the target, participants were then asked to rate the target using the informant version of the IPIP-IPC-32 (Markey & Markey, 2013). Scores of the 32 items can be aggregated to an overall agency and an overall communion score using the same formulae as for the self-report IPIP-IPC-32 in Study 1.

Last group videoconferencing call (correlational survey). Subsequently, participants were asked to recall their last videoconferencing call in a group (i.e., with at least two other attendees) and report on their own camera use (0 = *never* to 4 = *yes, the entire time*), how well they knew the other attendees (0 = *not at all* to 4 = *very well*), the total number of other attendees, and the total number of other attendees with their camera turned on (used to calculate proportion of others with camera on), in addition to some further videoconferencing-related measures that are not of direct interest to the present research questions (see https://osf.io/9b7sw/ for a complete list of study measures).

Social value orientation. Participants then completed the six primary items of the SVO slider measure (Murphy et al., 2011). For each item, participants were asked to indicate how they would distribute fictitious monetary amounts between themselves and an anonymous other person. Based on these decisions, a person's SVO index is determined by calculating the inverse tangent of the ratio between the mean allocation for themselves minus 50 and the mean allocation for the other person minus 50, following Murphy et al.'s (2011) instructions, that is:

$$\text{SVO} = \arctan\left(\frac{\text{Mean allocation other} - 50}{\text{Mean allocation self} - 50}\right)$$

The resulting angles range between −16.26 degrees and 61.39 degrees; larger angles reflect more prosocial and smaller angles more individualistic preferences. The SVO slider measure assesses SVO continuously, is highly reliable, and shows good convergent and excellent predictive validity (Kinnunen & Windmann, 2013; Murphy et al., 2011).

Additional measures. Finally, participants completed additional questions to assess basic demographics.

Results and Discussion

Correlational Survey

To test hypotheses H2.1 through H2.4 regarding situational and dispositional predictors of camera use, a multiple linear regression analysis was performed in which tie strength, proportion of other attendees with the camera turned on, number of other attendees, and SVO were entered as standardized predictors and own camera use in the last group videoconference as outcome variable. This analysis revealed that proportion of other attendees with the camera turned on was the only significant predictor of own camera use, $\beta_{stand.} = .73$, $p < .001$, providing support for the prediction that individuals are more likely to turn on their camera if a higher proportion of others do so as well (H2.2). All other predicted effects were negligibly small ($\beta_{stand.} < |.06|$) and not statistically significant ($p = .257$), thereby resulting in a formal rejection of the hypotheses that individuals are more likely to turn on their camera with increasing social tie strength (H2.1), smaller group size (H2.3), and the more prosocial their social preferences are (H2.4). It is worthwhile noting though that an exploratory follow-up analysis revealed that tie strength showed a moderate positive bivariate association and number of other attendees a moderate negative association with own camera use in bivariate correlations (see Table 2). Because proportion of others' camera use was a very strong predictor of own camera use and the three predictors were considerably intercorrelated among themselves, one may speculate that the overpowering effect of proportion of others' camera use might have rendered it impossible to investigate potential unique effects of group size and tie strength in a correlational study.

Factorial Survey

To test hypotheses H2.5a that individuals who choose to turn their camera on in a group videoconferencing situation are perceived to be higher in communion and that the effect predicted in H2.5a is stronger when most others have their camera turned off (H2.5b), a two-way ANOVA was conducted in which the target person's camera use (two levels: on versus off) and the non-targets' camera use (two levels: majority camera on versus majority camera off) were entered as between-subjects independent variables and perceived communion of the target

person as dependent variable. As depicted in Figure 3 (and in contrast to hypothesis H2.5a), target persons were not rated higher in communion when they had their camera turned on—instead, they were in fact rated lower in communion, $F(1, 205) = 16.24$, $p < .001$, $\eta_{part.}^2 = .07$. This effect was independent of non-targets' camera use, as shown by a non-significant interaction effect between target's and non-targets' camera use, $F(1, 205) = .05$, $p = .827$, $\eta_{part.}^2 < .001$. It was also observed that target persons were perceived to be higher in communion when more non-targets had their camera on compared to off, $F(1, 205) = 3.65$, $p = .039$, $\eta_{part.}^2 = .02$, but this effect had not been explicitly predicted.

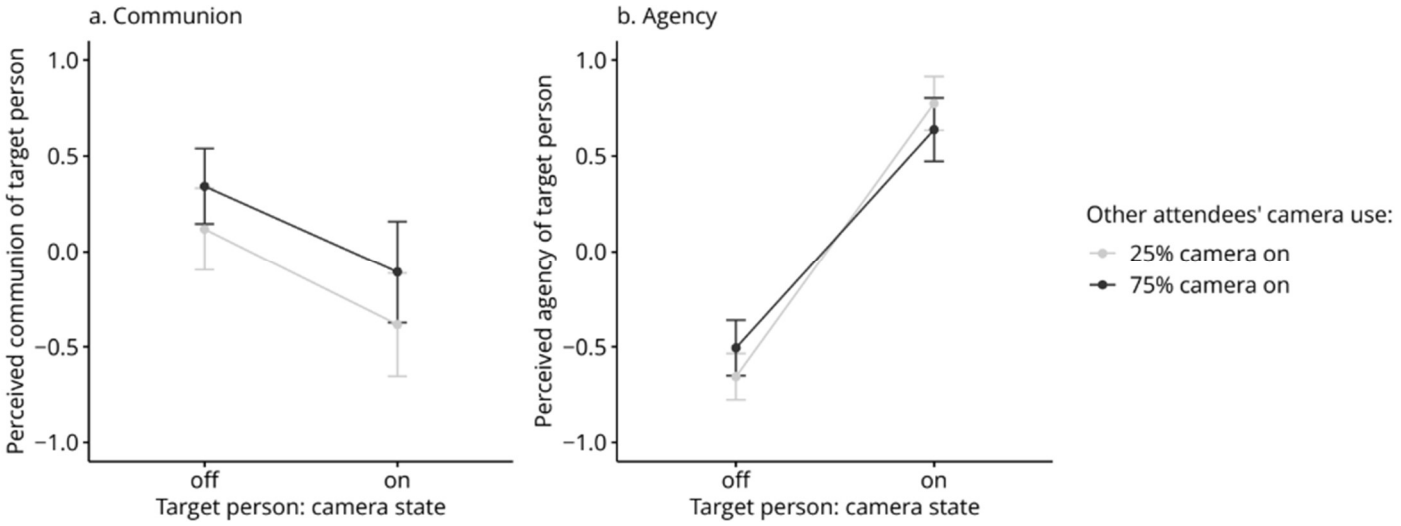
Table 2. *Study 2: Bivariate Correlations (Spearman) Between Variables Related to Last Videoconference.*

Variable	1	2	3	4	5
1. Own camera use	—				
2. Number of other attendees	−.45	—			
3. Proportion camera others	.77	−.52	—		
4. Social tie strength	.32	−.21	.40	—	
5. Social value orientation	.01	.03	.07	.08	—

Note. In accordance with recommendations for reporting of exploratory findings (e.g., Nosek & Lakens, 2014), we again refrain from reporting *p*-values here due to an otherwise unknown inflation of the alpha level.

To test hypotheses H2.6a that individuals who choose to turn their camera on in a videoconferencing situation are perceived to be higher in agency and that the effect predicted in H2.6a is stronger when most others have their camera turned off (H2.6b), an analogous two-way ANOVA was performed, entering agency instead of communion as the dependent variable. As depicted in Figure 3 and in line with the prediction, target persons were rated to be higher in agency when they had their camera turned on, $F(1, 205) = 342.77$, $p < .001$, $\eta_{part.}^2 = .63$. This effect was stronger when the majority of non-targets had their camera turned off, as shown by a significant interaction effect between target's and non-targets' camera use, $F(1, 205) = 4.11$, $p = .044$, $\eta_{part.}^2 = .02$, while the main effect of non-targets' camera use was not significant, $F(1, 205) = 0.07$, $p = .793$, $\eta_{part.}^2 < .001$.

Figure 3. *Social Perception Effects of Camera Use (Study 2).*



Note. Perceived communion (a) and agency (b) of another videoconferencing attendee ("target"), depending on other attendees' camera use (gray line: 25% of other attendees have camera on; black line: 75 of other attendees have camera turned on) and the target's own camera use (x-axis: left: off, right: on). Whiskers depict 95% confidence intervals around the respective arithmetic means.

General Discussion

Drawing on theory related to prosocial behavior, two well-powered, preregistered studies (total $N = 437$) were conducted to identify situational determinants and dispositional predictors of the decision to turn on one's camera during group videoconferencing. It was furthermore examined whether individuals prefer videoconference situations in which other attendees keep their cameras on (Study 1) and whether a person's camera use during group videoconferencing impacts the social impressions others form about them (Study 2).

In line with expectations, individuals were found to prefer videoconferences in which more others turn their camera on, and that other attendees' camera use was a strong and robust determinant of own camera use in both a factorial survey (Study 1) and a correlational survey (Study 2). In the factorial surveys, it was additionally observed that the more individuals attend a videoconference and the weaker the tie strength between attendees is, the less likely individuals decide to turn on the camera, again supporting predictions. Regarding individual dispositions, higher agency positively predicted camera use while higher communion and higher SVO did not (in contrast to predictions). The factorial survey portion of Study 2 furthermore revealed that individuals ascribe higher agency but not higher communion to others who have their camera on (versus off), thereby partially supporting predictions.

The observed findings powerfully demonstrate the crucial role social influence plays for the decision to turn on one's camera during group videoconferencing. Indeed, in both the factorial survey portion of Study 1 and in the correlational survey portions of both Study 1 and Study 2, social influence (i.e., the proportion of other attendees who have their cameras on) was the single most important predictor of camera use, with large effect sizes. From a theoretical perspective, these patterns of results lend support for the crucial importance of social influence in the form of descriptive norms (i.e., what most others do; Cialdini et al., 1990) for social behavior also in the virtual space (for further evidence, see e.g., Cress & Kimmerle, 2007; Demarque et al., 2015).

Relatedly, tie strength positively and group size negatively predicted the likelihood that videoconference attendees would turn on their cameras in the factorial survey, when these factors were manipulated independently of other attendees' camera use (Study 1), and moderate to large bivariate associations between these predictor variables and camera use were observed in the correlational survey of Study 2, while they were no longer relevant predictors of own camera use when partialling out the effect of other attendees' camera use. Again, this supports the interpretation that experimental designs are required to unravel the unique contributions of each predictor of camera use as well as effects of camera use on virtual meeting outcomes.

Findings moreover revealed that dispositional agency is not only a predictor of the individual likelihood to turn on one's camera across situations, but that people also attribute higher dispositional agency to others who have their camera on. Together, this pattern suggests that a person's decision to turn on their camera has at least some predictive validity for judging their agency, in accordance with the available evidence indicating that small samples ("thin slices") of behavior are often sufficient for a fairly accurate assessment of someone else's social dispositions (see Connelly & Ones, 2010 for a meta-analysis on the predictive validity of other-ratings of personality). More generally, the present results indicate that not only perceived direct eye contact and specific camera settings such as camera angle impact fundamental aspects of social perception, as previously shown (Fauville et al., 2022), but that camera use itself does as well.

Addressing the broader question of whether turning on one's camera during videoconferencing is a form of prosocial behavior, the present studies provided mixed support, depending on what definition of prosocial behavior is used. While others' camera use was overall preferred over others' non-use, and while three important situational determinants of prosocial behavior (social influence, tie strength, and group size) predicted camera use, on a dispositional level, only agency, but not communion or social value orientation, predicted the decision to turn on one's camera. So overall it appears that turning on one's camera is prosocial in a sense that it is costly to oneself while benefitting others (in accordance with consequentialist definitions of prosocial behavior), but—in contrast to intentionalist definitions of prosocial behavior (see e.g., Pfattheicher et al., 2022)—not in a sense that it happens out of an intent to help others. In agreement with this interpretation, only one of the predicted reputational effects of camera use was observed: Whereas individuals who turned on their camera were believed to be higher in agency, they were not believed to be higher in communion. In general, when judging whether someone is a "good" person (i.e., whether someone is communal), the perceived intentions underlying this person's action have been shown to be more crucial for observers than the degree to which the action has positive consequences for others (for reviews, see Anderson et al., 2020; Berman & Silver, 2022).

Implications

The present findings have substantial implications for cyberpsychology. First, from an applied point of view, the finding that others' camera use (i.e., social influence) is a crucial determinant of the decision to turn one's own camera on indicates that if the meeting organizer(s) hope for most cameras to be on (or off), they should do their best to ensure that the first attendees do so because chances are that (most) others will follow. If the goal is to

encourage others' camera use, as a minimum this entails having one's own camera on prior to the official meeting start and potentially explicitly asking new attendees to turn on their cameras if they are comfortable with it.

Second, in revealing that especially individuals low in agency report the inclination not to turn on their cameras, maybe resulting from lower self-esteem as has recently been reported for active video conferencing behavior more generally (Reimann et al., 2023), is something meeting organizer(s) should remain mindful of. In practical settings, one should try to find ways to reap the benefits of getting nonverbal signals while reducing the costs especially to individuals with lower agency. One way to do so may be the use of filters or avatars that allow for nonverbals signals such as nodding and smiles to come through without making them feel uncomfortable by feeling on display as much.

Third and more generally, conceptualizing the decision to turn the camera on or off in a video call as a social dilemma and showing that indeed, individuals do overall prefer meetings in which others have their cameras on, makes turning on the camera a form of prosocial behavior by common definitions (e.g., Bolino & Grant, 2016). This is important especially because our findings also indicate that people do not seem to know that turning on their camera benefits others. Raising awareness about this and appealing to people's good-will and / or communal attitudes may therefore be an additional strategy to motivate video call attendees to turn on their cameras at least once in a while, ultimately benefitting the group as an entirety. Furthermore, from a scholars's perspective, conceptualizing camera use as prosocial behavior and thereby embedding it into a larger theoretical framework allows to deduce further determinants and social effects of camera use based on theories related to prosocial behavior, which can then be empirically tested.

Finally, the observations that most assessed videoconferencing-related constructs showed moderate to high bivariate correlations between one another and that especially others' camera use plays such a crucial role for the decision to turn on one's camera furthermore has important implications for interpreting the findings of studies investigating the effects of camera use: They suggest that it may be difficult—if not impossible—to disentangle the effects of own and others' camera use on virtual meeting outcomes in correlational studies. Thereby it challenges prior reports regarding the effects of camera use based on purely correlative study designs. Indeed, correlative studies found no systematic positive or negative effects of camera use (e.g., Bennett et al., 2021), while a detrimental effect of own camera use on virtual meeting outcomes was found in a field experimental design in which own camera use was manipulated independently of others' camera use (Shockley et al., 2021).

Limitations and Future Directions

A limitation of this research is that factorial and correlational surveys were used, which each come with their own shortcomings. While the factorial vignette design allowed to assess the unique contributions of each theorized determinant of camera use during group videoconferencing independently and causally, vignette designs come with an inherently increased risk of reduced external validity because they assess reactions to hypothetical situations. Correlational surveys in contrast have a high external validity (as they refer to individuals' real-life experiences) but prevent from drawing causal conclusions. Combining the two study types may allow to balance their respective benefits and shortcomings. However, future research should ideally attempt to address these limitations within the same study. For instance, the effects of group size and social influence on the decision to turn on one's camera could be tested in a behavioral group experiment in which number of other attendees and their camera use are systematically and independently manipulated before a participant enters the videoconferencing call and decides whether to turn the camera on or off themselves, thereby allowing for causal conclusions in a more life-like setting. In addition, it may be interesting to examine how camera use of attendees with different social roles (e.g., students vs teacher) may differ and differentially impacted by the reported factors.

Conclusion

Social influence—operationalized as other attendees' camera use—was identified as the single most important situational determinant of individuals' camera use in a videoconference across two preregistered and well-powered studies. In addition, it was found that individuals who keep the camera on both describe themselves and are described by others as higher in agency (but not communion). Overall, the observed findings suggest that turning on one's camera is prosocial in a consequentialist sense in that it benefits others, but not in an intentionalist sense in that it does not primarily happen out of an intent to help others. Raising awareness that camera use is beneficial to others may increase the likelihood that people decide to do so. Finally, in revealing

moderate to high bivariate correlations between almost all assessed videoconferencing-related constructs, the present results furthermore highlight the importance of conducting experimental studies when investigating unique contributions of predictors and specific effects of camera use—and videoconference settings and contexts more generally.

Footnotes

[1] The reported findings are not altered qualitatively when only data of the first eligible 210 participants are analysed.

Conflict of Interest

The author has no conflicts of interest to declare.

Author's Contribution

This study was devised and conducted by Christine Anderl.

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