Just sit back and watch: Large disparities between video and face-to-face interview
observers in applicant ratings

D. A. Baker, Devin M. Burns, Clair Reynolds Kueny
Psychological Science, Missouri University of Science and Technology

Declarations of interest: none

Author Note

Correspondence concerning this article should be addressed to Devin M. Burns, 500
W 14th St, Rolla, MO 65409, USA, Email: BurnsDe@mst.edu

Abstract

Video mediated communication (VMC) tools such as Zoom are rapidly being adopted in distance education, telehealth, and for job-related purposes like meetings and interviews. However, how interactions may differ between VMC and face-to-face (FTF) communication is not yet fully understood. In particular, much of the existing literature has explicitly focused on how VMC affects interdependent communication exchange (active) rather than mere observation (passive), and what research does exist on passive observation has focused on recorded (asynchronous) VMC rather than live (synchronous) interactions. Using a mock interview paradigm, we directly compared differences in perceptions of a job applicant between ostensibly synchronous VMC passive and FTF passive participants. VMC passive participants rated the job applicant as less likeable, less hireable, and as having less agency than did FTF passive participants. These large effects (> 1 SD) were partially mediated by lower self-reported attention for VMC participants. These results are discussed in terms of their basic and applied implications for VMC and perceptions of others.

Keywords: Agency, Computer mediated, Zoom, Video mediated, Interview, Attention

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1 Introduction

When cost, time, or distance make face-to-face (FTF) interactions challenging, video mediated communication (VMC) such as videoconferencing may be a convenient alternative. Indeed, VMC can feel intuitively better than other forms of computer mediated communication, such as text-based messaging and audio only interactions, because it affords conveyance of both verbal and nonverbal cues that these other forms of computer mediated communication do not. However, while research suggests VMC may be better than text-based communication in terms of quick and accurate impression formation, how it is situated with respect to other modalities of communication such as audio only and FTF is more nuanced.

For example, Grahe and Bernieri (1999) examined accuracy in judgments of rapport across different communication modalities including transcripts, recorded audio, or recorded audio-video. Participants were asked to evaluate brief dyadic interactions between strangers based on information they received via one of these modalities. Participants in the audio or audio-video condition were more accurate in their judgments of the rapport between the communicators than those who had access to transcripts only, but audio-video was not better than audio only. Here pre-recorded video (i.e., VMC) had a neutral impact on judgments. In a more recent study, Schroeder and Epley (2015) found similar results when they asked evaluators to rate job candidates based on business pitches provided to them as either transcripts, recorded audio, or recorded audio with video. Job candidates were rated more highly in terms of competence, thoughtfulness, and intelligence when listening to the candidate's pitch with audio rather than the transcript, but again they found no advantage to adding video. While research comparing VMC with other forms of computer mediated communication is helpful in terms of understanding their differential impacts on human interactions, contrasting VMC with FTF interactions is also of critical

interest to researchers.

Before considering research comparing VMC to FTF, it is helpful to first make a distinction between two primary temporal modes of VMC. It can be asynchronous, through observation of prerecorded video, or it may take place synchronously via a live video stream. Furthermore, synchronous VMC allows for the possibility of active participation between communicators while asynchronous VMC is typically always a passive experience for the person watching the pre-recorded video. A single event can contain a mix of these modalities: for example, in an online group meeting, there may be some members of the group who watch and listen via a live video-conference stream and who actively engage in a conversation with other attendees (synchronous, active), others members may merely observe and listen to those who are interacting (synchronous, passive), and finally, there may be other group members who watch and listen to a recording of the meeting at later time (asynchronous, passive).

Similarly, FTF communication can also be passive or active in this manner, but is of course always synchronous. While there is much research comparing synchronous *active* VMC to synchronous *active* FTF interactions, there is scant research examining potential differences between synchronous *passive* VMC and synchronous *passive* FTF observations. This gap in knowledge is important to address for a number of reasons. First, VMC restricts or changes the nature of some important non-verbal communication cues, in particular, it precludes direct eye contact and it increases social distance, both of which have been shown to have deleterious effects on impression formation (Larsen & Shackelford, 1996; Bradner & Mark, 2002, respectively). Second, while active VMC interaction may mitigate these shortcomings to some degree (see section 1.1), there is reason to suspect that passive VMC observation, even when it is synchronous, may not be able to overcome them (see section 1.3).

Finally, this gap in knowledge is important from an applied perspective. That is, a number of technological and social changes have made the likelihood of VMC synchronous

passive observers increasingly common. Technological changes that make VMC more broadly available to individual users and organizations include factors such as higher bandwidths for data transfer, webcam incorporation into many base model hardware packages for laptops, PC's, and smart phones, and freely available or inexpensive group video-conferencing software such as Skype, Google Hangouts, and Zoom. Social and organizational factors have led to normative changes in the use of VMC, such as increases in telecommuting work arrangements, telehealth, and online instruction, and an increasing emphasis on diversity hiring which can often require reaching team members outside of the local area (Janghorban, Roudsari, & Taghipour, 2014).

Together, these factors make it likely that VMC group interactions may become large enough that not all synchronous observers will be required or able to actively engage in the conversation taking place. Although passive observers are not actively engaged in the communication exchange, they are still likely to form opinions about those they are observing, and they may also be asked to make judgments grounded in those opinions. For example, at universities that offer course lectures that can be attended in-person or via VMC, whether students actively participate or not, they may be asked to complete teaching evaluations. In other words, as VMC grows in use, more and more students and employees may be thrust into this synchronous passive VMC judgement making role, and very little research has examined whether this uniquely affects attitude formation. In order to tease apart differences between synchronous passive VMC and synchronous passive FTF observation further, it is first useful to review the research examining differences in synchronous active VMC and synchronous active FTF.

1.1 Comparing FTF to VMC with active participants

In technologically developed areas where smartphones, personal computers, and internet connectivity are entrenched, live VMC dyadic conversations have become technologically and socially commonplace. You may know someone over 75 that has a hard

time keeping up with basic computer software and struggles to understand the point of two-factor password authentication, but at the same time, can quite easily initiate an Apple Facetime or Skype video call to see their grandchildren. Webcams come preinstalled with most laptops sold in the US and external webcams could be purchased at time of publication for as little as \$10. Basic software to initiate such calls is generally free to download and use (such as Zoom, Skype, and Facetime at the time of publication). In cases where a person pays for long distance phone calls, these forms of VMC are less expensive than voice calls so long as the user already has an internet connection. Organizations are also able to make use of VMC technology, with applications ranging from job interviewing, on-line synchronous teaching and training, team collaboration, health assessments and telemedicine, and more.

While users of VMC may perceive the technology as a neutral actor in their human-human interactions, research comparing synchronous active VMC with synchronous active FTF interactions have shown mixed effects of VMC on dyadic conversations. For example, Sprecher (2014) examined differences in impression formation between FTF interactions and those that took place via text only, audio only, and audio + video. Sprecher had volunteers participate in a 5-minute unstructured dyadic synchronous, active interaction via one of the four modalities. This was followed by a second 6- or 12-minute Skype interaction at a later date with the same partner. The partners completed impression assessments about one another after each interaction. Across measures of liking, closeness, responsiveness, and general enjoyment of the interaction, VMC did not significantly differ from FTF at either the initial interaction or the second interaction.

Similarly, a study using a job interview paradigm comparing interviews conducted via phone, video, or FTF also showed few differences (Straus, Miles, & Levesque, 2001). Here researchers had participants engage in a 20-minute dyadic interaction as either an interviewer or job applicant. After the interaction interviewers rated job applicants in terms of likeability and job qualifications (including constructs such as intelligence, overall

impression, and communication), and job applicants rated interviewers on likeability. The researchers found no differences between VMC and FTF for interviewer assessments of job applicants, but job applicants rated interviewers significantly less likeable in the VMC condition. They also found that both interviewers and job applicants had more difficulty regulating the conversation and achieving mutual understanding in the VMC condition than the FTF condition.

Fullwood (2007) found stronger evidence for a differential impact of VMC on impression formation compared to FTF. He had participants engage in a mind-reading exercise in which each partner took turns thinking about a word from a predefined list while the other partner tried to guess what the word was. Half of the pairs completed the exercise FTF, while the other half completed the exercise via VMC. Participants then completed a multi-item assessment about their partners, and VMC pairs rated their partners less likeable and less intelligent compared to FTF pairs.

Fullwood suggests that his findings can be explained by differences in the availability of eye gaze cues. In the FTF condition participants could make eye contact, but in the VMC condition the camera set-up did not facilitate eye contact, and instead likely created a sense of gaze avoidance, which has been shown to produce negative impressions (Larsen & Shackelford, 1996). This “cues-filtered-out” argument has been discussed extensively by Walther (1992) with respect to his Social Information Processing Theory (SIPT) and the effects of *text-based* computer mediated communication on impression formation (for an overview, see Walther & Parks, 2002), but has not been fully addressed in the context of VMC. In the next section we discuss SIPT for text-based computer mediated communication and how it may extend to VMC to explain these findings.

1.2 Social Information Processing Theory

Walther’s Social Information Processing Theory (SIPT; 1992), may be helpful in understanding the mixed effects of active VMC discussed so far, and in making a prediction

about passive VMC. Although the theory is specifically directed toward understanding the effects of text-based computer mediated communication, it can be extended to VMC. Early computer mediated communication research initially found that, relative to FTF communication, text-based computer mediated communication produced a number of negative effects such as depersonalization and deindividuation (Lea & Spears, 1991), and negative affect (Kim & Raja, 1991). The causal mechanism for these and other observed negative effects were often argued to be the result of inherent and intractable filtering out of important non-verbal cues (for example, also see Kiesler, Siegel, & McGuire, 1984). However, SIPT also argues that although information conveyed via non-verbal cues may be filtered out in the short term, this information can be conveyed through the exchange of text-based relational messages, given sufficient time and motivation, and in turn the observed negative effects of computer mediated communication can be ameliorated (Walther, 1992). Subsequent research has supported this theory (for reviews see Walther & Parks, 2002; Walther, 2008) and has further demonstrated that certain types of motivated text-based communication can result in interpersonal relationship formation that is even stronger than FTF communication (Antheunis, Schouten, & Walther, 2019; Walther, 1996).

At first glance it may seem that VMC would fully address concerns about the conveyance of non-verbal cues in that, unlike text-based computer mediated communication, VMC allows both visual and auditory signals to be shared. However, although VMC affords conveyance of some non-verbal cues, as Fullwood (2007) pointed out, they are arguably not as complete as the non-verbal cues conveyed FTF. For example, while body motions such as arm crossing or eye rolling can be made available in VMC, direct eye contact and mutually directed gaze are not. In addition, other non-verbal cues may be perceived differently when experienced FTF than when experienced in VMC, for example a “leaning in” motion that occurs during a FTF conversation could in theory, encroach on someone’s personal physical space, but not so for VMC. This could alter the meaning of this non-verbal cue from one modality to the other. Given that VMC may at

least partially filter non-verbal cues, SIPT would then predict that any negative impressions formed between communicators that can be attributed to this filtering could be overcome with further exchange of relational messages (in the case of VMC, this could manifest via audio-video message exchange rather than text-based message exchange).

This extension of SIPT would help explain the pattern of results in Sprecher (2014), Straus et al. (2001), and Fullwood (2007). In cases where a communication partner could solicit and receive relational messages from their partner, perceptions of that partner do not differ from VMC and FTF conditions, but in cases where a communication partner could not solicit or receive relational messages, negative effects of VMC were found. In Sprecher (2014), where communication partners had an open-ended dyadic conversation and therefore both had opportunity for relational message exchange, no differences in VMC and FTF were found after just 6 minutes of interaction. In Straus, et al. (2001), there are different outcomes for the interviewer and interviewee, and these are also synergistic with this extension of SIPT. The interviewer asked questions of the interviewee that afforded responses that were relational (e.g. “What would you describe as your greatest strength?” and “What sets you apart from your peers?”) and here the researchers found the interviewers’ impressions of the interviewees did not differ between VMC and FTF. On the other hand, the interviewees themselves were not given an opportunity to ask questions or receive relational responses from the interviewer, and here the researchers found that interviewees had lower impressions of the interviewers in the VMC condition compared to FTF, even after 20 minutes of interaction. This suggests that receiving relational information from the communication partner is important (not merely engaging in self disclosure of relational information), and when considering 20 minutes was sufficient for interviewers to form similar impression of the interviewees through VMC and FTF, but not vice versa, it also suggests that without this reciprocal exchange, time alone is not sufficient.

This would be in line with text-based computer mediated communication research on

self-disclosure and liking. For example, in an online chat experiment, Kashian, Jang, Shin, Dai, and Walther (2017) found that, while participants liked those who disclosed interpersonal information about themselves, a participant's own disclosure of personal information did not predict the participant's liking of the person to whom they disclosed their information. Finally, in Fullwood (2007), partners engaged in a communication activity that did not include any opportunity for relational message exchange, and here impressions of communication partners were lower in the VMC condition than FTF. Taken together, it would seem that differential effects of impression formation between VMC and FTF for participants actively engaged in synchronous communication may be related to whether there is relational message exchange in the conversation. If that is the case, we would expect that in a fully passive interaction, where someone is observing a communicator, but cannot engage in conversation with them at all, impressions about that communicator would be more negative in VMC than FTF. In the next section we discuss this passive VMC observation further and how this prediction is in line with research related to prerecorded video.

1.3 Comparing FTF to VMC with passive observers

As mentioned previously, VMC enables mixed-media classrooms and meetings where some attendees may be FTF with communicators and others may join synchronously from a remote location via VMC. Not all who attend these types of classes/meetings will actively participate in the conversations taking place and instead may engage in only passive observation (for many reasons, including limitations, personal preferences, or organizational factors). However, these passive observers may still be expected to provide feedback or make assessments about what they heard during their observations. Research has yet to fully examine how perceptions of the communicators might differ when formed from this synchronous passive VMC observation or synchronous passive FTF observation; however differences in synchronous passive FTF and asynchronous passive VMC have been

found. For example, in a study using mock jurors, Landström, Granhag, and Hartwig (2005) found witness testimony was judged as more credible, and the witness as more honest, when the testimony was observed live and in person (synchronous, passive FTF) rather than as a video recording (asynchronous, passive VMC). In subsequent research they also showed that mock jurors who witnessed videotaped child testimony judged the children more negatively and their testimony less convincing than children who testified FTF (Landström, Granhag, & Hartwig, 2007).

As discussed previously in Section 1.2 extending SIPT to VMC, in the absence of certain non-verbal cues, VMC may require the exchange of relational messages in order to form similar impressions of a communicator to those impression formed via FTF interactions. If that is the case, the Landström et al.(2005; 2007) findings are perhaps not surprising because those in the VMC conditions had no opportunity for message exchange to compensate for any non-verbal cues that might have been available to those in the FTF condition. However, assuming that this is also the case with synchronous passive VMC might be premature in that there is a finality to recorded video that does not exist with a live video feed. Not only is there no perceived potential opportunity for two-way interaction with a recording (even if unplanned), there is also no chance that the observer will be there the precise moment a person makes a grand mistake or spontaneous realization. This is not to argue that there is an objective difference in the perceptual cues received from a synchronous vs asynchronous video stream. For example, it likely goes unnoticed that much of what consumers perceive to be “live” content, such as live network television or live radio programs, is not truly synchronous, and instead generally has a few seconds of delay built in to allow for censoring of the occasional, but inevitable, profanity slips. We do argue, however, that the internal belief that something is happening live may influence factors such as arousal, attention, and expectation, and as such, perceptions formed under this different set of beliefs could be affected. Given the relative ease with which synchronous VMC can now be employed, at least in technologically developed areas,

it is important to directly examine whether effects of VMC found with asynchronous observation are the same when the observer believes the VMC interaction is happening live/synchronously.

As mentioned in the previous section, extending SIPT to VMC provides a theoretical reason to expect impressions about a communicator formed through passive VMC to be more negative than passive FTF, because there is, by definition, no opportunity for relational message exchange. Walther (1992) argues that in text-based computer mediated communication impressions and social relationships can develop as they would FTF if sufficiently frequent relational messages are exchanged, and if this exchange happens in a way that allows the communication partners to test assumptions about the impressions they form so that they may adjust their beliefs and interrogation strategies over time (Antheunis et al. 2019; Walther, 1992). Further, Walther (1992) argues that the duration of time required is a function of the rate of message exchange; if the message exchange rate is slow (e.g., weekly emails), more time will be needed than if the message exchange rate is fast (e.g. a live chat). In passive VMC observation, the rate of relational message exchange is zero. Thus, extending SIPT to VMC would mean that providing additional time would not be meaningful. This would be in line with Straus et al. (2001) where 20 minutes was sufficient for interviewers to form similar impressions through VMC and FTF of the interviewees whom they interrogated, but 20 minutes was not sufficient for interviewees to form similar impressions of the interviewers (whom they were not given the opportunity to interrogate) through VMC and FTF. This latter point regarding time is especially relevant in an applied setting where passive VMC and FTF observers attending a meeting synchronously are limited to the same amount of time to observe and form opinions about the communicator. It makes sense then to compare impression formation for passive VMC and passive FTF over an ostensibly synchronous, and therefore equivalent, time-frame.

1.4 VMC and the perception of agency

Investigation into differences between VMC and FTF has mostly focused on qualities such as likeability and competence, but existing research has not investigated whether differences between VMC and FTF may impact perceptions of more central qualities of the human condition itself, such as mind attribution. This section discusses the subjective process of mind attribution, the role of likeability in this process, and how it may differ for VMC and FTF .

Mind attribution or mentalizing is described as the process by which a perceiver comes to believe that an entity possesses a mind or mind like qualities (Frith & Frith, 2003). Mentalizing is thought to be a continuum, that is, perceivers can vary in the degree to which they engage in mind attribution toward an entity (Gomes, Parrott, & Shepherd, 2016; Haslam, Bain, Douge, Lee, & Bastian, 2005; Kozak, Marsh, & Wegner, 2006). Reduced mind attribution toward a person is associated with a number of negative factors including depersonalization and reduced perceptions of competence (Loughnan et al., 2010), objectification (Kellie, Blake, & Brooks, 2019), and discrimination (Moradi, 2013). The process of mind attribution not only varies along a continuum, but is also argued to vary across distinct dimensions. H. M. Gray, Gray, and Wegner (2007) found evidence of a bi-dimensional model of mind perception comprised of experience, which is characterized by beliefs about a being's capacity to sense and feel, and agency, which is characterized by beliefs about a being's capacity to plan and act. Differences in perceptions about these dimensions can influence the degree to which someone believes an actor can experience moral harm (experience dimension) or hold moral responsibility (agency dimension) (K. Gray & Schein, 2012).

Many factors can influence the process of mind attribution (for review see Waytz, Gray, Epley, & Wegner, 2010). For example, Kozak et al. (2006) demonstrated a positive correlation between likeability and mind attribution. In their study participants were randomly assigned to read about a student who either possessed good characteristics (e.g.

volunteers at an animal shelter) or bad characteristics (e.g. cheats on tests). Participants then completed a likeability scale and a mind attribution scale for the student they read about. They found that positive feelings about the target were positively correlated with higher mind attribution toward the target. Similarly, Gray, Gray, and Wegner (2007) asked participants to rate 13 characters (animals, humans, machines, fictional characters) across 18 mental capacities and also found a positive correlation between mind attribution and liking. Because VMC has been shown to have some negative effects on likeability when there is a lack of relational message exchange (Fullwood, 2007; Straus et al., 2001) or missing (Landstrom, Granhag, & Hartwig, 2005, 2007), it is worth considering whether passive VMC may similarly affect mind perception, particularly the agency dimension.

The agency dimension is of particular interest because many of the dependent measures discussed in the previous sections aimed at understanding differences in VMC and FTF impression formation are related to competence and responsibility, such as job ability, conversational skill, responsiveness, intelligence, trustworthiness and credibility (Sprecher, 2013; Straus et al., 2001; Fullwood 2007; Landström et al., 2005, 2007). Broadly speaking these are related to beliefs about a person's mental capacity to plan and act intentionally, and to be held morally responsible for those acts. These types of mind attributions are subsumed under the agency dimension (Gray & Schein, 2012). H. M. Gray et al. (2007) showed that chimps, children, and adults were all rated similarly on the experience dimension of mind perception, but readily distinguished along the agency dimension. Additionally, in a study investigating mind attribution and objectification, K. Gray, Knobe, Sheskin, Bloom, and Barrett (2011) found a relationship between evaluations of professionalism (e.g. "How efficient is this woman?", "How capable is this woman?") and agency, such that perceptions of agency were higher when participants were evaluating professionalism than when they evaluated attractiveness. Because perceptions of agency are related to judgements about a person's competence, responsibility, and likeability, in an experimental paradigm assessing factors related to

hireability, it is worth examining how passive VMC affects mind attribution along this specific dimension. Since reduced likeability has been previously associated with reduced perceptions of agency (Kozak et al. 2006) and since we have previously argued (see section 1.1 and 1.2) that likeability of the communicator when observed through passive VMC will be lower than passive FTF, we then expect perception of communicator agency to also be lower in the passive VMC condition.

1.5 VMC and attentional effort

A final variable that could be relevant in any differences between FTF and VMC is the degree to which observers attend to the communicator. Perception of verbal and non-verbal cues during a conversation will inform impression formation (Choi, Gray, & Ambady, 2012), but attention to those perceptual cues is a prerequisite for processing this information (Cowan, 1988). A number of studies have found visual attention serves as a mediating variable in certain kinds of judgments about a communicator. For example, investigating bias in video-taped evidence, Lassiter, Geers, Handley, Weiland, and Munhall (2002) and Ware, Lassiter, Patterson, and Ransom (2008) both found evidence that visual attention partially mediated the relationship between camera perspective and beliefs about the genuineness and sincerity of a suspect's confession. Differences in attention paid to an interaction can influence which cues are attended to, influencing impression formation. There are a number of reasons to suspect that attention may differ between active vs. passive communication and between VMC vs. FTF communication.

For example, active partners can be expected to pay attention to one another at least enough to manage turn-taking during the interaction and to process enough information to construct appropriate responses. Meanwhile, passive observers do not need to monitor for turn taking, though they may pay attention because they need to learn something from the conversation. As for communication modality (e.g. VMC vs. FTF), VMC and FTF afford different viewing perspectives, where participants assigned to the FTF modality can look

fully about the room in which the interview is taking place, while participants in the VMC modality can only look partially about the interview room, but can look fully about the room in which they are watching the video (potentially distracting from and limiting attention towards the target). Because of the role attention plays in impression formation, and because it may vary as a function of condition it is important to examine its role as a potential mediator.

It is not known whether paying attention to the conversation of others is more or less difficult during FTF communication compared to VMC and whether this influences perceptions of the communicator. Certainly, there may be differences in motivation to pay attention. On one hand, a FTF passive observer has the ability to inadvertently or spontaneously attract the communicator's attention. Awareness of this could motivate the passive observer to pay more attention to the communicator's actions in order to avoid getting caught not paying attention. However, in a typical VMC passive observer setting, this social driver may be diminished as the observer can more easily avoid inadvertent or spontaneous attention of the communicator. This is because in a typical VMC setting a large part of the synchronous VMC observer's body is often off-camera with mostly the head and shoulders visible, so for example, small body position changes are less likely to capture the speaker's attention. Further, in a typical VMC scenario, microphones can be put on mute, and the observer's own video can even be turned off so the communicator can no longer see them. Without this social driver, perception of attentional effort could increase. In other words, without proper motivation, paying attention may be more difficult in VMC.

1.6 Present study

Research has shown that in some cases synchronous active VMC may negatively impact perceptions of a communicator relative to synchronous active FTF interactions, and asynchronous passive VMC may have similar negative effects relative to synchronous

passive FTF interaction. Our research addresses a gap in the literature regarding the impact of VMC on synchronous passive observation. To create a scenario in which the synchronous passive observer role is plausible for both FTF and VMC observers, we employ an interview-observation paradigm. This paradigm is advantageous for a number of reasons: it provides a way for a confederate job applicant to engage in dyadic communication to share explicit information about themselves upon which others can base judgments. It is also a social scenario in which students could reasonably expect to observe and judge an individual across a number of dimensions. Finally, it emulates a likely real-world scenario in which VMC is used that also affords all three conditions we seek to examine. Specifically, we have one member of a hiring committee sitting directly across from the job applicant, asking interview questions (synchronous active, close physical distance, with eye contact), one member of a hiring committee also in the room, but sitting to the side, observing without asking questions (synchronous passive, close physical distance, minimal eye contact) and another member of the hiring committee joining simultaneously via VMC, also not asking questions (synchronous passive, far physical distance, no eye contact).

We hypothesize that participant conditions (active vs. passive and VMC vs. FTF) will influence perceptions of the job applicant such that active FTF participants will have the highest Impressions of the applicant, followed by passive FTF participants, with the passive VMC participants having the lowest Impressions (**H1**). We also expect the same ordering to hold true for perceptions of applicant Agency (**H2**) and self-reported Attention (**H3**).

2 Method

Our experiment was preregistered through the Open Science Foundation, which can be found along with all experimental materials at osf.io/nda7u. The experiment was approved by our Internal Review Board, case #0019.

This experiment was conducted in two phases: first, we filmed 25 mock job interviews with two synchronous FTF participants (one active participant who interviewed the applicant and one passive participant who watched the interview), and second, we showed each of these recorded interviews to two VMC passive participants who were led to believe they were viewing a synchronous or live stream of the interview. The number of interviews (and thus participants) was chosen based on financial constraints and was preregistered before data collection began. In order to standardize job applicant performance, we recruited an actor to serve as the confederate job applicant. Note that our preregistered plan originally called for having half of the VMC participants meet the job applicant briefly and view the interview at the same time as other participants, but after struggling to get all participants to show up at the same time we dropped that additional role, and all of the VMC participants viewed the interview asynchronously, but were led to believe the interview was live/synchronous. A suspicion check was included and is discussed in the Results.

When making the recordings, the confederate job applicant would arrive to the lab after the two FTF participants to not arouse suspicion, and all three were given an informed consent form to sign. The research assistant then used a random number generator to assign one participant to be the active FTF participant interviewing the applicant and the other participant to be the passive FTF observer watching the interview, while pretending to randomly assign the confederate to be the job applicant.

The two participants and confederate were then led to an adjacent room to record the interview. The active FTF participant was provided with a script of questions to ask and was seated at an office table directly across from the job applicant (confederate) such that they were facing one another. Interview questions were based on example questions from Gatewood, Feild, and Barrick (2016) and reflected typical biodata and situational interview questions used commonly in hiring processes.

The passive FTF participant was seated approximately 8 feet away, perpendicular to

the active FTF participant and job applicant such that they had a side view of both individuals in order to observe the interview. The passive FTF participant seating was directly adjacent to a laptop and webcam which were positioned to record the interview from the same point of view. When the interview concluded, the participants (and confederate) were moved to an adjacent room, seated at individual computers with privacy screens, and asked to fill out a survey regarding their impressions of the interview.

After these interviews were recorded, other participants were recruited to watch the recordings. These passive VMC participants were told that the interview they were about to view was happening live via video-stream in an adjacent room. To increase believability and further emulate the experience of the synchronous FTF participants, the research assistant hit play on the video before the VMC participants entered the viewing room. The recordings each included at least one minute of an empty room before the FTF participants had entered. The VMC participants saw an empty interview room and were told to wait until people walked into the room and began the interview. After the FTF participants left the room, VMC participants were told to inform the researcher who then had the VMC participant complete a post-interview survey. VMC participants were given extra questions at the end of the survey asking if they thought the interview was live or prerecorded, and if the latter, when they came to that belief.

2.1 Participants

Our participants came from the introductory psychology participant pool at a technology focused, mid-sized, Midwestern university in the United States. Participants were recruited through flyers and the research credit system, SONA. There were no exclusion criteria for participation. Compensation for the 15 minute experiment consisted of their choice of \$5 or course credit.

Of the 25 interviews recorded, 4 videos suffered from technical glitches where audio was removed, so data from these affected sessions were excluded, leaving 21 sessions for

analysis. No data were excluded for any other reasons, and of the initial 96 participants collected, 84 remained. Of these, 58 reported being male, 23 reported being female, 1 reported other, and 2 chose not to respond. Ages ranged from 18 to 55 with a median of 19. The number of hours worked per week ranged from 0 to 40 with a median of 15, and the number of job interviews they reported participating in ranged from 0 to 50 with a median of 3. None of the participants indicated being friends with the confederate interviewee, and only 3 indicated that they had previously seen him around campus.

2.2 Measures

All participants completed an assessment of the job applicant immediately following the interview. All measures were administered through Qualtrics, and both the full survey file and a word document containing all items are available through the Open Science Foundation at osf.io/nda7u.

Impression. Seven items were adapted from Schroeder and Epley (2015) assessing impressions of the job applicant including likability, competence, and hireability. Each was assessed using an 11-point scale from 0 to 10 with anchors such as “not at all competent” and “extremely competent”.

Participants were also asked to provide five words that best described the job applicant. These were analyzed using the SEANCE sentiment analysis program from Crossley, Kyle, and McNamara (2017). Since participants were asked to choose words to describe the applicant (adjectives) and we were primarily interested in how positive or negative those words were, we used the component scores for positive and negative adjectives as outcome variables. These data were designed to complement the constructed response questions by capturing greater nuance in participants’ impressions and not requiring them to convert their opinions into a numeric scale (Garcia & Sikström, 2012; Kjell, Daukantaitė, Hefferon, & Sikström, 2016).

Rather than taking a simple mean across items, we performed factor analyses using

the psych package in R (Revelle, 2018) to create composite scores and examine their dimensional structure. This was done using the seven impression items and the two semantic analysis scores from SEANCE. Parallel analysis indicated a single dimension was most appropriate, and a solution was obtained using the minimum residual method. All nine items loaded strongly onto the single factor, with all loading values $> .6$. The items had strong internal reliability, with Cronbach's $\alpha = .95$ and all item-to-scale correlations were $> .65$. Factor scores for each participant were used as a composite score of Impression.

Agency. To assess perceptions of agency in the job applicant, eleven items were adapted from H. M. Gray et al. (2007) to assess the degree to which the participant believed the applicant demonstrated agentic capabilities during the interview such as emotion, planning, and communication. These eleven items were those that loaded most strongly onto the dimension of agency ($> .65$) in their analysis. Each question was asked using a five-point scale from “not at all” to “a great deal”.

Factor analysis was performed on the eleven agency items, and a parallel analysis again confirmed a single dimensional structure. Most items loaded strongly onto the single factor, with only one of the agency items having a loading value $< .3$: embarrassment ($-.22$). This item was dropped and the analysis repeated, with the resulting factor scores used as our composite measure of perceived Agency. The remaining items had strong internal reliability, with Cronbach's $\alpha = .86$ and all item-to-scale correlations $> .4$.

It should be noted that the factor scores for Impression and Agency were also highly correlated, $R = .87$, indicating that both may derive from the same latent variable within this experimental context. We conducted an additional factor analysis combining the impression and agency items, and it also demonstrated a single dimensional structure, with all loading values $> .3$, Cronbach's $\alpha = .94$ and all item-to-scale correlations $> .4$. Because Impression and Agency are anticipated to be separate constructs in more general contexts (with more than one applicant, for example), statistical tests were conducted with the two separate factor scores for all analyses. However, all tests were also conducted with the

combined factor, and none of the results differed in a meaningful way; the code for these supplemental tests is included on our OSF page.

Other Items. Participants were asked how much they were able to pay attention to the job applicant on a scale from 0 to 10. They were asked questions about demographics and job interview experience, whether they had met the applicant before, and VMC participants were asked if they had been assigned to the pre-recorded or live video condition as a manipulation check (all were in fact pre-recorded/asynchronous).

3 Results

All analyses were performed using R Team (2014), and our analysis code, original data files, and a full preregistration is available through the Open Science Foundation at osf.io/nda7u.

3.1 Manipulation checks

Prior to hypothesis testing we first examined whether VMC participants believed that the interview was happening live (synchronous) or if they could tell it was prerecorded (asynchronous). Of the 42 VMC participants, 22 reported believing they watched a live interview, 17 believed it to be prerecorded, and three did not respond. We compared the two groups who responded using Welch's independent samples t-test and found no significant difference for Impression scores ($t(26) = 0.02, p = .98, d = .01$), Agency scores ($t(36) = 0.23, p = .82, d = .07$), or Attention ($t(33) < .01, p = 1, d < .01$). Similar tests were conducted to see if the three VMC participants who indicated that they were previously acquainted with the applicant differed from the remaining 39 who did not (none of the FTF participants indicated recognizing the confederate job applicant). This item was also not a significant predictor of Impression scores ($t(2) = 0.57, p = .63, d = .40$), Agency scores ($t(2) = 0.80, p = .50, d = .48$), or Attention ($t(3) = 2.21, p = .11, d = .94$). Further analyses treated all VMC participants as a single group.

Figure 1. Response distributions for the three dependent measures separated by participant condition.

3.2 Descriptive statistics

The score distributions for Impression, Agency, and Attention are shown separated by participant condition in Figure 1. Impression and Agency scores were determined through factor analysis as described above, while attention is a single self-report item which was normalized. These measures were fairly consistent within this data set, as can be seen by the correlations in Table 1.

A graphical representation of the words chosen by FTF participants and VMC participants are shown in Figure 2, with more frequently chosen words displayed in larger font.

3.3 Preregistered hypothesis tests

Although all interviews were conducted with the same actor playing the applicant and using the same script, there was still the potential for variability from session to session, especially since the interviewer reading the scripted questions was a different

	Impression	Agency
Agency	0.86***	
Attention	0.52***	.44***

Table 1

Correlations between the three dependent variables. All tests had $p < .001$.

participant each time. In order to account for this, our preregistration called for using a mixed effects model with participant condition as a fixed effect and a random intercept for session number, allowing for different response averages in different sessions. However, this model was compared to a simple linear model without accounting for session using Akaike's Information Criterion (AIC), and the simple linear model was preferred as a more parsimonious account of Impression, Agency, and Attention scores.

H1: Impression. Welch's one-way ANOVA indicated that condition had a significant effect on Impression, $F(2, 81) = 21.79, p < .001$. Tukey's Honest Significant Difference indicated that the difference in scores between FTF active ($n = 21, \mu = .63, sd = .63$) and FTF passive ($n = 22, \mu = .5, sd = .63$) participants was not significant, $p = .86$, Cohen's $d = 0.20$, 95% CI = $(-.46, .71)$, but there was a large significant difference between FTF passive and VMC passive ($n = 41, \mu = -.59, sd = .94$), $p < .001$, Cohen's $d = 1.36$, 95% CI = $(.58, 1.59)$.

H2: Agency. The impact of condition on Agency was similar; Welch's one-way $F(2, 81) = 13.40, p < .001$. FTF active ($n = 21, \mu = .58, sd = .92$) and FTF passive ($n = 22, \mu = .33, sd = .84$) participants were similar using Tukey's HSD in that they did not significantly differ from each other, $p = .66$, Cohen's $d = 0.25$, 95% CI = $(-.38, .82)$, but again there was a large significant difference between FTF passive and VMC passive participants ($n = 41, \mu = -.48, sd = .76$), $p < .001$, Cohen's $d = 1.02$, 95% CI = $(.29, 1.33)$.

H3: Attention. Participants' self-ratings of attention followed the same pattern; Welch's one-way $F(2, 81) = 16.86, p < .001$. Tukey's HSD showed a medium-sized but not

for these potential mediating effects, we ran exploratory analyses using the mediation package in R (Tingley, Yamamoto, Hirose, Keele, & Imai, 2019).

Comparing the passive VMC participants to the passive FTF participants, the indirect effect of communication modality on Impression (through Attention) was $b = -.25$, 95% CI = $(-.48, -.06)$, $p = .004$, and the direct effect was $b = -.84$, 95% CI = $(-1.29, -.36)$, $p < .001$. Because there was a negative relationship between VMC as the modality and attention, these negative direct and indirect effects indicate that passive VMC participants had a lower impression of the applicant compared to passive FTF participants, which was partially explained through lowered self-reported Attention. The proportion of the effect of condition on Impression mediated by Attention was 22%. There were no significant indirect ($b = .12$, 95% CI = $(-.02, .34)$, $p = .11$) or direct ($b = .003$, 95% CI = $(-.45, .46)$, $p = .98$) effects comparing the active FTF and passive FTF participants (i.e., impact of interaction, holding modality constant) on perceived Impression through Attention.

Figure 3. Attention partially mediates the effect of participant condition (passive VMC versus passive FTF participants) on factor scores for both Agency (left) and Impression (right).

The results concerning Agency scores were similar: there were significant indirect ($b = -.18$, 95% CI = $(-.42, -.01)$, $p = .04$) and direct ($b = -.62$, 95% CI = $(-1.08, -.16)$, $p = .006$) effects of the VMC passive condition, and the proportion of

the effect of condition on Agency that was mediated by Attention was 22%. There were no significant differences between active FTF and passive FTF participants either indirectly ($b = .09$, 95% CI = $(-.02, .25)$, $p = .15$) or directly ($b = .15$, 95% CI = $(-.34, .60)$, $p = .54$).

4 Discussion

As more organizations take advantage of the flexibility video-conferencing has to offer (especially after the drastic effects of health-related pandemics on our workplaces), clearer understanding of the impact VMC can have on impression-formation is critical. As our findings suggest VMC may be problematic as passive VMC participants rated the confederate job applicant substantially more negatively than passive FTF participants watching the same interview.

More specifically, in our preregistration we correctly anticipated that passive VMC participants would provide lower evaluations of the exact same interviews compared to equally passive FTF participants. In addition to lower ratings, sentiment analyses indicated that the most frequently used word FTF participants used to describe the job applicant was thoughtful (followed by experienced and intelligent), while VMC participants were more varied in their perceptions and most frequently described the job applicant as unprepared (in addition to thoughtful and bored).

We had also expected a potential difference between the two FTF conditions (active vs. passive, while holding modality constant), as the active FTF participants conducting the interview were expected to feel closer to the job applicant than the passive FTF participants. We did not find any statistically significant differences, though all three comparisons were in the expected direction with small to medium effect sizes. Rather than collapsing across the two FTF conditions, we decided it was more fair to compare the passive VMC participants to the passive FTF participants, as all VMC participants were also passive. Since active FTF participants provided slightly higher ratings than their passive counterparts, combining these conditions would have artificially inflated the effects

of VMC.

Although we showed asynchronous videos to the purported synchronous VMC participants, we attempted to convince them that it was happening live, and 56% of the participants who responded to our manipulation check question said they believed that the interview stream was live. These participants' responses did not differ significantly from those who reported that the interview was prerecorded. This lack of significant difference may suggest that differences between synchronous and asynchronous communication are small for passive VMC observers, but more explicit investigation of this question is warranted. It is possible that more blatant differences between live and recorded conditions would produce larger differences.

Apart from the important differences between passive communication modalities, it is interesting to note the observed unidimensionality of the response items. Schroeder and Epley (2015) analyzed their seven items that we adapted as separate scales, with a three-item scale of intellect, a three item scale of impression, and a single item of hireability. They conducted a mediation analysis from condition to intellect to impression to hireability, but did not present evidence that these items were meaningfully different from each other. Our factor analysis indicated that these seven items were measuring the same latent, unidimensional construct, which was also strongly related to the agency items and the choice of words to describe the job applicant. An important caveat, however, is that all of our data reflected assessments of the same actor. It is possible (and likely) that assessments of agency, impression, and perhaps the other items would diverge in a broader stimulus set.

Given the practical utility of conducting VMC interviews, it is important to attempt to discern the potential mechanisms which could have contributed to the large differences we found. First we need to consider potential ways in which the measured difference could be partially attributed to the specifics of our experimental methodology, and thus not be expected to generalize to real interview situations. One potential concern is that the VMC

participants watched the interview and responded to our questions in a small, private room, while the FTF participants answered questions together in a larger room with multiple computers. This setup could have granted the VMC participants a greater sense of anonymity which might have made them feel more comfortable rating the interviewee negatively. While this is a potential confounding factor here, it is also a reasonable real-world situation (e.g., participating in video-conferencing from one's private, home office).

One mechanism which could lead VMC participants to have lower impressions could be the amount of attention they paid to the job applicant. Because of the shared space and clear line of sight, even the passive FTF participants may feel social pressure to monitor the applicant's face or head so as not to get caught being inattentive. This pressure is absent in the VMC condition, since the video-link was unidirectional with no camera pointed at the observer. Without these external pressures, VMC observers may pay less attention to the communicator, and lack of attention may affect perception. Analyses did indicate that attention mediated the relationships between the VMC participant role and impression and agency. This mediation was in the expected direction such that the passive VMC participants reported lower attention compared to the passive FTF participants, which resulted in lower impression and agency scores. However, this mediation only accounted for 22% of the effect of VMC on impression and agency scores, suggesting that attention is only one component of the difference. Additionally, it is important to keep in mind that self-reported attention is likely influenced by many factors beyond actual attention paid, and an objective measure such as eye-tracking would be more valid.

Another possibility is that meeting the job applicant FTF establishes a level of empathy that is missing in a video-conference. Perhaps having met an applicant even briefly is enough to establish this connection, and we had originally intended to test this hypothesis in our experiment by having one of the VMC participants fill out their consent forms in the same room as the job applicant and FTF participants before decamping for

their own private room. Unfortunately, we were forced to change our procedure due to scheduling difficulties, and this hypothesis will have to await future experimentation.

With respect to SIPT, as described in Section 1.2, Walther (1992) suggests that communication modalities may differ in the time frame required to form an opinion of someone. In this view it is possible that VMC participants would eventually reach the same opinion as FTF participants, but would require extended time (and active relational-based exchanges) in order to do so. Notably, the experiments used to support this claim used only active communication, and there is reason to believe that passive communication may not follow the same pattern. Regardless, in a job interview situation, passive observers watching the live interview via VMC would likely not have any more time than the FTF active and passive interviewers, so it makes sense to compare impressions in equal time frames. It is possible, however that providing additional time for VMC interview participants could help make up for some of the differences found in this experiment, and future research should investigate this possibility.

An important limitation on our conclusions concerns our participant population, which had a median age of 19, with only three participants over the age of 25. The median participant reported being in just three previous job interviews. It is possible that the differences seen for these participants would not hold for the people who typically conduct such interviews, though we also have no evidence to suggest that they would be any different.

It should be noted that our results *do not* indicate that observing interviews through VMC is *worse* than observing an interview FTF. In order to answer that question, we would need to know which modality better correlates with true interviewee quality: for example, it is possible for FTF ratings to be high uniformly, regardless of quality, with VMC ratings better distinguishing between interviewees. What we *can* say, however, is that it is unfair to compare FTF interviewees to others who are interviewed through VMC, as the latter will be at a distinct disadvantage.

Speculative ideas about how such deficits could be overcome in order to take advantage of the benefits of VMC while ameliorating its detriments include various enhanced virtual reality technologies. It is possible that if passive observers could use VR, such that they could look around the room with natural head movements, this would strengthen the feeling of “being there.” This would require additional and often expensive technology, however, curtailing its utility, especially in a job interview context where the interviewee may “call in” using their private computer. A much easier intervention may be to simply have all observers briefly introduce themselves at the beginning, and perhaps require that a camera be pointed at them as well to increase the perceived social pressure to pay attention and slightly increase the level of interaction or relational exchange.

While much future research is needed, our findings already suggest that caution should be taken when deciding which modalities to use when interviewing job applicants, or in other situations asking for evaluations of an individual (e.g., course evaluations). At the very least, situations where participants are compared against each other should ensure that they use the same modality for all interviewees/evaluations. Future research should also be directed toward understanding whether these effects differentially impact applicants of different genders and ethnicities, and whether such effects extend beyond a job interview paradigm into other computer mediated domains such as education, mental health assessments, counseling, and even dating.

Author Contributions

All authors contributed to the study design, data analysis, and manuscript preparation.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements

The authors thank Matthew Jordan for their assistance collecting the data and Chayne Standage for being our actor.

Author Biographies

D. A. Baker earned her PhD in Human and Social Dimensions of Science and Technology from Arizona State University in 2016. Her research focuses on how decision making and attitudes are affected by the design and application of emerging technologies and smart systems.

Devin Burns earned his PhD in Cognitive Psychology from Indiana University in 2014 with a focus on math modeling. His current interests include sensory augmentation, perception of balance, statistical modeling, and experimental design. He is also involved in the Collaborative Replications and Education Project (CREP) and supports Open Science.

Clair Reynolds Kueny earned her PhD in Industrial/Organizational Psychology from Saint Louis University in 2016. Her research interests include employee perceptions of others' workplace behaviors. Her work has been published in journals including Human Resource Management Review, Journal of Business Ethics, and European Journal of Work and Organizational Psychology.

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