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How Internet Habits Influence Social Cognitive Research: Theoretical and Methodological Considerations in the Era of Social Media

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Abstract. *This study provides researchers, who are considering internet-based social cognitive research, with a general overview of the theoretical and methodological considerations that must be considered for implementing best practices. It covers theoretical discussions of the ways in which the internet has affected socialisation and cognitive processes (including memory and attention), the balance between ecological validity and experimental control for internet-based social cognitive research (including the effect of digital researcher presence), and group membership (including discussions of group composition, identity misrepresentation, and communication through memes). It also covers methodological discussions and best practices to account for the effects of internet use on social cognition, exploring avenues for increasing experimental control without sacrificing ecological validity, and decisions pertaining to participant recruitment issues, when recruiting from internet-based community groups.*
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1. INTRODUCTION

The internet revolution has opened new doors for psychological research by overcoming many of the inherent issues related to laboratory-based testing [60, 70, 72]. The avenues for accurate and replicable data collection have proportionately widened with advancements in technology - from basic surveys in the 1990s, to increasingly complex experiments [72, 98] such as eye tracking studies with webcams [43, 78] and virtual reality [18, 54]. Over time, continued dialogue on best practices for internet-based research has provided a solid, but general, foundation of knowledge [47, 70, 72] upon which domain-specific best practices must now be defined. This study presents the specific considerations for undertaking internet-based social cognitive research. Social cognition is a vital domain, where this knowledge needs to be built, as the internet has been found to influence social and cognitive processing in real and virtual spaces [29, 30, 67, 85]. Moreover, researchers and clinicians examining social cognition are increasingly turning to internet-based examinations.

Social cognition can be understood as the emotional and cognitive processes involved in our perceptions, judgements, and memories related to social stimuli. These processes allow us to perceive and understand others' emotional and mental states, and to modify our own behaviour based on this understanding [27, 80]. Internet-based social cognitive research has historically relied on quantitative approaches, especially surveys and forced choice experimentation [67]. Over time, mixed method approaches - interviewing, journaling, group-work, and/or passive observational approaches (examining social media posts by members of specific groups) - have become more popular [9, 25, 33, 58, 90]. The general requirements related to these approaches have been discussed in literature ([17, 47, 61, 72] provide general reviews of undertaking experimentation via the internet). This study focuses on the theoretical and methodological considerations related to undertaking social cognitive research via the internet. These considerations also hold relevance more widely, especially for social, cognitive, and health psychology.

In the following sections we present experimental considerations relevant for social cognitive researchers. These discussions are split into two sections: theory including the discussions on the internet, socialisation, and cognitive processing, on the complexities of designing culturally appropriate research, as well as the balance between ecological validity and experimental control; and methodology, focusing on discussions pertaining to controlling the effects of internet use, considerations related to multitasking, and digital laboratory creation. These discussions are kept relatively broad, as there is a great wealth of approaches to experimentation within social cognition, and the relevance of certain topics may vary depending on the reader. We

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encourage researchers who feel a particular topic may be important for them to look more deeply into these topics.

2. THEORETICAL CONSIDERATIONS

2.1 *The Internet, Socialisation, and Cognitive Processing*

Arguably, the internet's primary function is to facilitate the near-instantaneous communication of information in several ways (advertisements, emails, message boards, video and audio calls, messenger services, etc.), along with providing avenues for leisure, business, and research activities [67, 68]. This has led to the internet becoming a key source of socialisation in the digital era, with most people at least emailing or messaging their contacts in their lives. The combination of social communication and technological capability have resulted in internet-based psychological research primarily being undertaken by social and cognitive psychologists [51, 73]. However, the way internet has been used directly impacts cognitive, including social cognitive, processes [29, 30, 67, 85]. It is therefore essential for researchers examining social cognition to consider the impact that internet-based socialisation effects will have on their specific participant sample(s).

The discussion of the role of internet on social cognition arose in the early 2000s, focusing on the differences in cognition between "digital immigrants" - those who adopted the internet later in life - and "digital natives" - those born in the internet era [69]. These groups use the internet differently, as digital natives used the internet for longer, and for various purposes, than digital immigrants. These differences have exposed digital natives to an increased risk of internet use disorders compared to digital immigrants, among other factors [56]. However, these generational differences are only part of the big picture. Significant individual differences have been found in all age groups in the amount of time spent on the internet, and how that time was used – including the exact amount of time spent on each specific website/app/service [29, 30]. A digital native might therefore use the internet in the style associated with typical digital immigrants, and vice versa. The distinction between digital natives and digital immigrants is complicated further by observable differences in the way young Millenials, Generation Z, and Generation Alpha use the internet [99].

2.1.1 *Internet-based Socialisation*

When considering internet-based socialisation, the exact nature of communication is important. Digital technology allows for communication approaches that mirror real-life one-to-one (direct messaging), one-to-many (a company's advertisements being shown to users on LinkedIn), many-to-one (users creating and signing petitions on official government websites), and many- to-many (collective editing and reading of entries on Wikipedia) communication [41, 66]. However, digital communication is often affected by site-specific algorithms, which can be defined as rulesets "behind the scenes" on a website that determine the specific information individuals are shown. This includes social media algorithms, which have been found to significantly alter the information we receive and retain [13, 100], in turn impacting on social beliefs and behaviours [42]. Brady et al. [13] stated that social media algorithms affect social perception by exploiting our existing biases - namely, posts involving PRIME (prestigious, in-group, moral, and emotional) social information are promoted, while those involving non-PRIME social information are suppressed. These strong social biases keep users focused and engaged with social media longer (therefore making social media companies more money from advertising revenue), but over time alter users perceptions, beliefs, and actions. For example, incorrect PRIME information is presented far more commonly (and to a wider audience) than correct non-PRIME information [13, 100]. This may lead to false information being increasingly accepted as truth [100]. Social media algorithms can then affect personal and social identities by creating "filter bubbles" [63] in which homogenous, confirmatory, information is presented that matches existing personal and in- group beliefs. Indeed, "filter bubbles" may create "echo chambers" by amplifying certain beliefs and creating confirmation biases [63]. This is much more common with individuals who hold "news-finds-me" beliefs – that is, individuals who more readily accept information that is algorithmically presented to them – especially when the information aligns with their political beliefs [100]. Over time this influences how users perceive the importance of different social groups, leading to increased social segregation even among groups that are not in active conflict [26]. This may lead to individuals' social identities crystallising around the algorithmically boosted in-group, resulting in them abandoning groups that they had earlier belonged to, resulting in heightened tension between groups. This increased tension and segregation in turn heightens social misperceptions and intergroup conflicts [13]. In relation to health, a recent review of literature on social media use [88] determined that high levels of social media use – and likely therefore engagement with algorithmically promoted content – was associated with eight major psychological effects (anxiety, depression, loneliness, eating disorders, low self-esteem, low life satisfaction, insomnia, and stress) and three major physiological effects (physiological stress, change in physical brain structure, and affective experience state [increased anxiety, emotional valence, physiological arousal, and sustained attention]). Further, Walla and Zheng [96] determined that the P300 effect - related to attentional brain functions - was suppressed in those who watch four or more hours of short-form video content on social media sites/apps per week. These algorithmic shifts can have positive effects too; positive information is interacted with more frequently, leading social media algorithms to promote positive posts more often [8]. These positive posts include individuals acting in prosocial and civic-minded ways. Algorithmic promotion leads to these posts being seen, and reacted to positively, more often than would be the case otherwise [42]. This increases the likelihood of both the poster and postees (those who saw the post) repeating the prosocial action [42]. As such, it is important for researchers to determine how

different social media algorithms work, and how they may be manipulated to reduce negative outcomes and enhance positive outcomes. This is a complicated topic as different social media websites use different algorithms, and host different kinds of postings (Bluesky for short-form communication, Facebook for longer-form communication and group membership, Tiktok and Instagram for short-form video communication, etc.), preventing a "one size fits all" solution.

Even though the specifics of what socialisation involves differs depending on whether it occurs via the internet or in real life, we treat all forms of socialisation as a unified system [29, 30]. This is based on the assumption that internet-based social networks almost perfectly replicate real-life socio-cognitive processes and social network structures. As an example, acceptance and rejection universally activate the same areas of the brain regardless of whether they occur digitally or in-person [1, 22], but are communicated differently in real-life (by body language) and internet spaces (by interactions with user posts). Social media algorithms come into play with these processes as well, as more interactions on promoted posts may artificially initiate feelings of acceptance, and fewer interactions on suppressed posts may initiate feelings of rejection [5, 37]. A person may therefore experience the cognitive impacts of social rejection from algorithmic suppression rather than true rejection. This may cause further issues such as, perceiving themselves as socially rejected and damaging their social reputation by lashing out at their friends.

Another recent development is the popularity of commercial social virtual reality experiences, such as VRChat, allowing for the examination of new social microcosms [18, 54]. These environments allow users to select and/or design avatars to represent themselves, and to communicate in real-time with others. Users commonly choose avatars that align with their self- perceptions and, when doing so, experience a heightened sense of presence and attachment compared to other avatar choices [32, 48]. For all avatars, research has determined that users experience "virtual embodiment", which occurs when factors that are true for the avatar are accepted by the user as being, to some degree, true for themselves. For example, using an avatar associated with an individuals' outgroup has been found to significantly reduce associated negative biases, while women using male avatars were able to avoid gender-based stereotype threat [4, 57, 65]. Others' avatars are also accepted as true representations of them, and activate social cognitive effects associated with being around others [92, 95]. Interestingly, social dynamics can present in new ways based on program-specific elements. For example, VRChat implemented a "trust system", where users could rate each others' trustworthiness, as an attempt to reduce bad behaviour [18]. Studies have indicated that it was instead treated as an indicator of social rank, with stereotyping and intergroup conflict occurring between the "ranks" [18]. As such, while social virtual reality has the potential to allow researchers to control social scenarios than many real-life approaches, such as examining the interactions of globally distributed cultural diaspora (such as Romani), when provided with an avenue for easier embodied interactions, researchers must be careful in considering whether any elements unique to the simulated environment and its systems may impact their experiment.

2.1.2 *Memory and Attention*

Two core processes affected by internet use are memory and attention. The way internet has affected memory is related to the centralisation of information on the internet, increasing the ease with which information can be found compared to what was available pre-internet. This increase in the findability of information has reduced the quantum that individuals need to personally remember, moving aspects of social memory processes from semantic to transactive memory [29, 30, 67, 85]. Semantic memory - the explicit conscious long-term form of memory relating to meaning, understanding, and conceptualisation of facts built over the course of our lives, including social knowledge [77] has declined significantly since the advent of the internet, as the ability to quickly look up information undermines the necessity for memorisation [30]. Indeed, individuals familiar with the internet are significantly more likely to remember where to *find* information rather than to remember the information itself [86], although this is moderated by self-efficacy. Individuals high in self-efficacy are resistant to this shift as they more commonly adopt learning strategies that lead to long-term knowledge creation [97]. Transactive memory - the process by which information storage is outsourced to others in our community [30] – in this case treats the internet as a single hyper-knowledgeable individual. This centralises transactive knowledge by reducing the need for other humans to be involved [30]. As a result, traditional communally-held social knowledge may give way to internet-guided, globally standardised, social knowledge. This risks the loss of traditional knowledge that is not archived on the internet.

The way internet has affected attentional capability is related to the way information is conveyed via the internet, with current research focusing on the impact of social media. Research has determined that the amount of time an individual spends interacting with social media directly correlates with their attention span, with increased time inversely correlated with attentional ability and academic performance [64, 93]. Social media companies benefit financially from keeping people engaged; they therefore employ tactics to encourage users' entering "flow states" where individuals' spend copious amounts of time scrolling through the website without realising the time spent [75]. There are differences in the degree to which this is successful, even for similar social media sites. For example, while posts on both Instagram and TikTok are short-form video content, TikTok users are more likely to enter, enjoy, and remain in these flow states for a longer time [75]. If time spent engaging with social media is truly correlated with attention span, it is likely that individuals who engage heavily with TikTok are likely to have lower attentional capability than others who engage heavily with Instagram, with both being significantly worse than

those who avoid social media. These findings are significant for research in social cognition, as impaired attentional ability may impact social cognition by interfering with or preventing the activation of appropriate social knowledge, therefore impacting stereotype creation and maintenance processes [40]. Individuals with lowered attention spans may fail to activate social stereotypes when interacting with others, and therefore may act differently. Other researchers have suggested that personality traits drive social media use [20, 49], with extraversion, openness to experience and, for men, emotional instability correlated with social media use [20], and with introversion, conscientiousness, agreeableness, and neuroticism correlated with problematic social media use [49]. As such, it is possible that individuals with these personality traits may also have lower attention spans. This raises the question of whether personality factors truly account for these attentional differences, or whether - while they may account for an individual engaging with social media in the first place – attentional degradation does occur. Future research may elucidate attentional degradation longitudinally, with these personality traits used as potential control variables.

2.1.3 *Multitasking*

The way the internet is used has led to multitasking behaviours becoming far more common [29]. Multitasking can be defined as the sequential (in order) and/or parallel (simultaneous) undertaking of two or more tasks in a fluid manner [28, 31]. Sequential multitasking commonly involves active tasks that require concentration and attention, while parallel multitasking commonly involves a passive task occurring alongside one or more active tasks [28]. Sequential multitasking occurs more frequently than simultaneous multitasking [28], but they are not mutually exclusive and often occur together [31]. For example, someone sequentially working on a series of tasks may, passively and in parallel, listen to music in the background. Studies on media-based parallel multitasking has determined that participants who frequently engage in parallel multitasking perform better in task-switching paradigms than those who infrequently multitask, with both groups performing equally well in dual-task paradigms (cite61). Fischer and Plessow [31] posited that research in multitasking has often focused on sequential and parallel multitasking in isolation, and that there is a need to examine both in combination during successful multitasking. Gaining a more accurate image of multitasking is especially important for internet-based experimentation, as nearly 60% of respondents to an internet-based questionnaire were found to lose concentration and/or to swap browser tabs away from the experiment [79].

2.1.4 *Summary*

To summarise, social and cognitive researchers must be aware that internet use significantly affects social cognition directly and through changes in memory and attentional processes, and that these changes affect social cognition in both digital and physical spaces. Furthermore, social and cognitive researchers should consider the potential impact of habitual multitasking activity, due to the high percentage of participants in internet-based studies showing evidence of multitasking and the potential of those who habitually multitask to have improved performance on specific kind of tasks. While understanding these changes is important for all social and cognitive research, it is especially important for internet- based studies that focus on cultures and/or communication, such as research examining social media [13, 25, 100] and social virtual reality [18, 54]. The considerations relating to internet use and the consequences of changes in memory and attention are addressed in the Methodology section.

2.2 *Ecological Validity and Experimental Control*

A core consideration of internet-based experimentation is the counterbalance between ecological validity and experimental control. Ecological validity refers to the degree to which individuals' responses are in line with how they would respond in a naturalistic (real-world) setting, with high ecological validity associated with high levels of realism and familiarity, and with low cognitive load. This definition differs from the Brunswikian tradition [15], which holds that ecological validity refers specifically to the degree to which perceptual cues and the states/traits of a stimulus correlate. While the Brunswikian tradition sees ecological validity as separate from external validity (the degree to which findings are generalisable to the real world), it has been argued that the two definitions of ecological validity overlap as the perceptual cues in an experiment play a role in determining the ecological validity of the experiment overall [46]. Experimental control refers to the ability of researchers to minimize the impact of irrelevant factors, experiences, and environmental variables on the results of a given experiment [45]. Experimental control is heightened by controlling the facets of an experiment, which are kept identical for all participants. High ecological validity provides researchers with greater confidence that the results reflect participants' real-world beliefs and behaviours, while high experimental control allows researchers to be confident that external factors have not biased participants' responses to the experiment [47, 87].

Ecological validity is perceived to be higher in internet-based experimentation as participants can undertake the experiment in a location they are familiar with, and at a time that suits their needs. Indeed, research on virtual reality has elucidated that digitised environments (delivered both remotely and in laboratory settings) can improve ecological validity above traditional laboratory-based measurement [50, 81]. This is significant for social cognitive research, as many measures of social cognition have low inherent ecological validity [39, 62], and therefore may benefit significantly from internet-based experimentation. Experimental control is generally lower in internet-based experimentation as there are fewer elements of participants' actions during the experimental process that researchers have control over. This is reflected in the level of experimental noise associated with laboratory and internet-based experiments. Experimental

noise refers to differences in participants' datasets based on non-experimental factors. Hardware (computers, phones) and software (experimental instruments, browsers, and even software versions) may influence the specific data recorded. In laboratory settings, each participant undertakes the experiment with the same hardware and software, and thus any existing bias is systematic, while research conducted via the internet is affected by variations caused by differences in hardware and software between participants. Historically, response time noise has been a topic of concern, although more recent studies have shown that internet-based instruments are now sufficiently advanced that this is a minimal concern [3, 47]. Social cognitive researchers therefore need to decide the specific balance of ecological validity and experimental control that is appropriate for their experiment. Few options for increasing experimental control without seriously impacting ecological validity are discussed in the Methodology section.

2.3 *Group Membership*

When examining social groups via the internet, it is vital to ensure that actual group members are examined/recruited. The nature of socialisation on the internet complicates this in three ways. First irregularities in group membership; second, potential misrepresentation enabled by anonymity; and third, the nature of in-group communication.

In relation to irregularities in group membership, a group that is initially set up on social media to cater to the needs of a specific cultural or social group (e.g., members of an Iwi [Māori tribe] designing a Facebook group as a space to discuss important topics) may allow group members to add those outside this society/culture (such as friends and family) to the group. This complicates stakeholder consultation; if a post in a culture-specific Facebook group asked for respondents to give feedback on a proposed line of research without specifying that responses are invited only from members of that culture, well- meaning individuals outside of the culture of interest may respond, influencing the consultation process. If these suggestions were relied upon more than those of the culture under examination, it may be that experimental decisions are made that are culturally inappropriate. This may lead to low participation rates and/or data interpretation issues.

In relation to potential misrepresentation via anonymity, the anonymity available on many social media sites/apps allows motivated individuals to mask their own social and cultural identities, and to adopt that of others. Researchers wishing to work with minority social groups must be aware of phenomena such as digital blackface (e.g., [84, 94]), wherein bad actors hiding behind anonymous accounts pretend to be members of a minority group and will then act in a manner as to harm the reputation of the group and, in extreme cases, to court real- world harm on minority group members. While these individuals may post separately from the group, it is possible that they will seek to join the group to harm it from the inside. These individuals have the potential to impact research, especially research examining the content of social media posts, due to their desire to harm the group they are pretending to be members of.

Finally, in relation to in-group communication, the way that group members discuss important matters is often not purely linguistic. For example, culturally-specific memes allow group members to easily share their beliefs in concise, easy to share, and often visually attractive formats [38, 74]. This allows for the reinforcement of in-group and outgroup beliefs, easier recruitment of new members, and mobilisation of the group to obtain shared goals [38]. While this can be used for prosocial ends, antisocial groups have their own "languages". Indeed, Hakokõngäs et al. [38], examined how Finnish far- right groups used memes and determined that their communication revolved around themes of history, humor, mythology, symbols, news, and mottoes, and allowed group members to construct a positive mythological past for their group, encouraging feelings of nationalistic superiority. This in turn offered a justification for feelings of moral anger and hatred towards refugee groups, and increased group members' willingness to engage in physical altercations. We discuss potential avenues for controlling these concerns in the Methodology section.

3. METHODOLOGY

3.1 *Consequences of Changes in Social Cognition for Internet-based Experimentation*

3.1.1 *Controlling for the Effects of Internet Use*

In order to accurately assess the effects of internet use on social cognition, researchers must develop precise measures of how individuals spend their time on the internet. This includes an examination of the impact that different activities and websites have on wellbeing and social cognition [7] - both positively (activities/websites that increase attentional ability and/or semantic memory) and negatively (activities/websites that decrease attentional ability and/or semantic memory). This is a complex topic, and researchers must be mindful of connected issues that may confound these examinations, such as underlying differences in the populations that naturalistically choose specific activities/devices/etc. For example, older research examining users' preferred personal-computer technology [16] identified Apple users as being more educated and having higher openness than PC users, pointing to cultural dynamics at that time – Apple computers were primarily used by those in artistic industries, which often required university degrees. More recent research into users' preferred smartphone technology determined that personality factors did not influence smartphone choice [36], but internet use did [34]. Specifically, iPhone users generated the most web traffic per user, followed by Android users, and with users of other internet-enabled smartphones generating the least amount of traffic per user. Further, the very nature of conducting research via the internet may introduce bias. Those who spend more time on the internet are more likely to be willing to participate than those who spend little time on it. Experiments are therefore likely to be subject to self-selection bias, undermining the generalisability of the results obtained [11, 14, 71]. This is an issue for internet-focused

research, as the method of collection is also the topic of examination. The participant pool is therefore likely to be skewed towards individuals with higher internet-use rates than is truly representative [14, 71]. Researchers therefore need to select recruitment approaches that ensure an equal number of participants are recruited for each category of interest and, when undertaking internet-based research, should consider inclusion of internet usage rates as one of these categories. This purposive sampling approach minimizes the impact of self-selection bias, and equal recruitment into each category allows for the results to be generalisable even when the population recruited from is not normally distributed [12, 76]. While this increases the complexity of examinations into positive and negative effects of different websites and activities, it is not a wasted effort as it greatly increases the nuances of the knowledge gained around the activities/websites examined. Until the conclusion of the study, researchers may consider controlling for the effects of internet use by employing purposive sampling and including questions that accurately profile their participants. For example, how participants split their time between activities (social media use, emails, information searching, recreational activities, etc.), or how the time spent on social media use is split between different social media sites. This will likely require more participants to be recruited for each experiment to maintain comparable sample sizes between categories of interest, or for deselecting participants while pruning uncommon categories (e.g., if only one participant uses Lemon8 for more than 4 hours a week, and they use no other social media sites/apps, removing both the participant's responses and the Lemon8 category from analysis). Depending on the requirements of the experiment, researchers therefore need to consider whether the tradeoff between reduced experimental noise and an increase in the complexity of the experiment (including the number of required participants) makes sense for them, or whether to focus on subsets of the community (e.g., those who use social media for less than four hours a week).

Beyond merely controlling for internet use as a whole, there is a need to control for participants' engagement with algorithmically-curated content. For example, individuals who actively seek out political information on social media (those who look to traditional sources and those who look to friends and family) are more likely to be able to identify disinformation and avoid echo chambers than those who passively receive news via their social media feeds [24]. They may also engage less with algorithmically-promoted content. Interestingly, aggravation with social media algorithms has driven the creation of certain browser- based plugins, such as Facebook Purity, that remove algorithmic influence. When these plugins are used, all posts by followees (individuals the user follows) and groups the individual is a member of are shown in reverse chronological order (newest posts first). As such, even though an individual may be on social media for many hours a week, the level to which they engage with the algorithm may be quite low. Conversely, as individuals with "news-finds-me" beliefs are quick to accept algorithmically-promoted content as true [100], individuals who may be on social media very sparingly may still engage with the algorithm quite highly. As such, researchers should consider how best to implement some measure of algorithmic interaction - both for participant selection and for use as a sliding-scale control variable. This may be quite complex, as the lack of transparency around social media algorithms suggest that participants are unlikely to know how often they are actively engaging with it. As such, these measures should focus on questions participants *can* easily answer, such as asking them (1) to estimate how much of their time on social media they spend interacting within familiar groups, (2) the level to which they actively seek information and check facts, and/or (3) the degree to which they enter *a flow state* while using social media (indicating the success of the algorithm in keeping them engaged). Further, the success of browser-based plugins that alter social media algorithms offers at least two interesting paths for research. First, researchers may explore the impact of social media *without* algorithmic influence on social perception and behaviour. Second, researchers may explore alternative "replacement algorithms" as controlled environments (researchers would have the needed transparency) and as an avenue for investigating the effect and effectiveness of algorithms designed to promote positive outcomes. For example, a "replacement" algorithm that suppresses posts reinforcing negative outgroup beliefs and, in line with Jung et al. [42], promotes posts showing prosocial behaviour.

It is also important to consider how to address potential multitasking issues. As mentioned earlier, 60% of respondents to a questionnaire study were found to have sequentially multitasked at least once during the experiment [79]. Parallel multitasking is also likely to impact responses, although the specific nature of this is unclear. For example, there has long been a debate on the effect of background music on cognition. On the one hand, background music has been found to be cognitively demanding during task performance [35, 53, 82, 83]. People are less likely to listen to music while engaging with complex tasks [35], finding lyrics more cognitively distracting than instrumental music [82], and finding music they enjoy more distracting than that they find less enjoyable [83]. Furthermore, it is easier to enter a flow state during task performance without music [53]. On the other hand, music can improve cognitive performance [19, 53, 82]. For example, positive music has been linked to increasing mood, which in turn boosts cognitive ability during task performance [53, 82]. Researchers wishing to control for sequential multitasking may, in line with Sendelbah [79], examine paradata, taking long delays and switching away from the experiment as proof of multitasking, but parallel multitasking is much more difficult to control for. Furthermore, the role of simultaneous sequential and parallel multitasking must also be considered [31]. This highlights three key aspects for researchers. First, research should examine whether multitasking experience is useful for experimental paradigms not yet identified. Second, research should examine the ways in which multitasking experience may interfere with responses to experimental paradigms

not yet identified. For example, it may lead to earlier onset of response fatigue. In order to examine these key issues, researchers need to include measures of participants' experience with both sequential and parallel multitasking, either using an evaluation task (testing executive functions), or a self-reported questionnaire. The latter may not always be informative, as participants have been found to be inaccurate in self-reporting their multitasking behaviours [79]. This leads to the third key point: when researchers are not able to include a direct measure of multitasking, they should take special care to stress the importance of avoiding external distractions such as music [47].

3.1.2 *Considerations Related to Memory*

The shift from culturally-relevant semantic memory towards a globally standardised transactive memory with increasing internet use is likely to lead to issues in two ways. First, the general cultural knowledge of individuals is likely to decrease, potentially requiring certain experimental paradigms that have previously been normed for use with a specific group to require being normed again before they can be used. Second, the acceptance of globally standardised information includes information that, purposefully ("fake news" [6]) or accidentally (journalists' factual reports including personal/cultural bias), is not aligned with the traditional cultural norms of a group. For example, if a US based social media site uses an algorithm that boosts posts in line with US cultural norms and suppresses posts in line with Norwegian cultural norms, then over time Norwegians who extensively use that social media site may begin to perceive US cultural norms as more socially appropriate than Norwegian norms. Research suggests that there have been purposeful attempts to use the nature of the internet to rewrite remembered history in specific ways [21, 44, 74]. For example, the widespread use of historical memes by far-right groups has been linked to conspiratorial beliefs in an "alternative history" [21, 74]. This includes swapping the roles of Bosnians and Serbians in the Bosnian Genocide, remembering it instead as a "white genocide" carried out by the Bosnians [74]. While many "memory changes" are likely to be less extreme, and less purposeful, than these examples, less controversial "alternative histories" may be harder to notice and challenge, before they have become generally accepted as truth. Conversely, social media also allows for the spreading of historical and cultural knowledge and practice that traditional communication approaches may sanitise [10, 55]. For example, Liebermann [55] identified peer-to-peer memory practices within digital networks - which therefore keep transactive memory between individuals - as a mechanism that defends the cultural histories and beliefs of minority groups against institutional hegemonic cultural histories and beliefs, allowing for culturally specific memories and beliefs to be communicated transnationally and transculturally. Researchers should consider including some measure of memory, whether that be a measure of the level to which participants rely on internet-supported transactive memory, or the level to which they have accepted or rejected revisionist histories.

3.1.3 *Considerations Related to Attention*

Reductions in attentional capacity are of serious concern for social cognitive research, as it may affect complexity and length an experiment may have, before participants lose focus and/or drop out. Indeed, this may lead to those who excessively use the internet to produce more errors in their responses than those with low or regular internet use, as they may find it harder to keep their focus on the experiment. It follows, then, that many considerations related to attention may be addressed by controlling for internet use. However, as discussed earlier, it is possible that personality traits also play a role in attentional differences, increasing the likelihood of certain individuals to engage with social media, leading to a feedback loop where their attention is more affected and they become increasingly likely to engage with social media. As such, future research may explore the effect of the interplay between personality traits and attentional shifts over time in relation to social media use.

3.2 *Increasing Experimental Control*

3.2.1 *Digital Laboratory Creation*

In line with the discussion of ecological validity and experimental control, setting up an internet-based experiment on a centralised platform may serve as a starting point for consideration. There are a variety of factors that must be considered, with three key sources of experimental noise: software, hardware, and experimental instrument [47, 72]. Software refers to not just the experimental software, but to all programs running during an experiment. Internet browser - and browser version - are easily detectable [3, 59], but background programs are harder to detect. Hardware refers to the specific make and model of computer/smartphone/tablet, the participant is using to respond. These often differ between participants, but researchers may request the participants to provide their system information. This may, however, require that the researcher provides instructions to do so, with different instructions based on the hardware they are using. Experimental instrument(s) refers to the specific psychological instruments that data was collected within, with different instruments having different measurement accuracy and precision [47]. When designing and/or using a digital laboratory, one must therefore consider the degree to which the laboratory minimises these sources of noise. For example, a browser-based platform, such as Harvard's Digital Laboratory for the Social Sciences (https://dlabss.harvard.edu/), increases experimental control in relation to the experimental instrument aspect; participants accessing the laboratory are shown a standardised formal template, with collection of survey data occurring via an embedded Qualtrics widget. A similar laboratory that wishes to allow for both survey and cognitive experimental data may look to embed instruments that allow for both types of testing, such as PsyToolkit [89], while one wishing to incorporate digital interviewing might look to embed a video conferencing option. A more complex alternative might be the creation of a partially or entirely stand-alone platform, where participants either download and run experiments locally on their

computer, or download a client through which the experiments are run. This would remove experimental noise related to differences between browsers and browser versions [72]. Indeed, if participants provided the platform permissions, it could record what other software are running and their versions. However, the creation of a stand-alone platform would require significant time and resources to create and maintain.

3.2.2 *Digital Researcher Presence*

Digital researcher presence, as a part of a digital laboratory or a stand-alone experiment, is another path forward for increasing experimental control. Researchers in social cognition have explored its efficacy across different experimental protocols and found promising results [9, 52]. For example, Leong et al. [52] examined whether Remote Guided Testing (RGT) - the digital presence of a researcher - improved data quality in internet-based response time experimentation. This was a between-participant experiment that built on previous research which determined that certain internet-based instruments do not entirely replicate response time data obtained in the laboratory [65]. Participants responded to experiments conducted in CANTAB, Inquisit, and i-ABC in either a laboratory (with a researcher physically present) or via the internet (with a researcher digitally present). Both groups were of equal age, with similar gender, ethnicity, education, and income distributions. Laboratory testing involved a 3.5 hour testing session where participants first completed demographic questionnaires, and then undertook the battery of cognitive tasks in the presence of the researcher. RGT was administered via a video conference platform, with participants first undertaking a 30 minute software task (installation, resolving technical issues, completing demographic questionnaires) followed by a 3.5 hour testing session involving the same cognitive tasks as the laboratory group, and with the researcher digitally present. Data quality was assessed using trial-level measures (missed trials, outlying and excluded responses, and response times) as well as participant task performance. Leong et al. [52] observed that participants in both samples produced statistically equivalent responses for most measures, however RGT participants' verbal intelligence was significantly higher than that of participants in the lab. The authors interpreted this finding as an indication of RGT participants having higher ecological validity than laboratory-based participants. This suggests that digital researcher presence may be beneficial if incorporated into a digital laboratory platform, reducing noise related to the interaction between the browser and video platform used. However, digital researcher presence requires time effort of the researcher, removing that as a benefit of internet-based experimentation, and may not always be relevant or appropriate for a given experiment to implement. One potential solution is the use of AI-controlled avatars as the "present" agent [23, 91]. Recent research in telepresence has indicated that AI-controlled avatars provide the benefits of researcher presence while improving participants' performance on cognitive relational-reasoning tasks, even beyond those obtained with a researcher digitally present [91]. Indeed, an AI agent is not required to be overly attentive as - regardless of whether the AI agent or a researcher was present - inattentive presence was found to improve accuracy, while attentive presence improved response times. While this point is based on just one study, it highlights promising methodological avenues for future research.

3.3 *Addressing Concerns Related to Group Membership*

In order to prevent individuals from outside of the cultures of interest, well-meaning respondents from different social groups and individuals maliciously misrepresenting their true identity, social cognitive researchers need to adopt screening measures. For well- meaning respondents, this is simple enough. Experimental approaches may specify in advertisements and screening questions which group(s) are under examination and, if examining regular social media posts from groups of interest, must utilise approaches to identify and remove statements from outsiders to these groups. If these affiliated outsiders are involved in deeper discussions with the group, researchers may undertake secondary analysis of these interactions. In contrast, for malicious outsiders using digital blackface, this is more complicated; these individuals are unlikely to take part in responsive experiments due to reduced anonymity (for studies using webcams) and high time requirements, but frequently post on social media; social cognitive researchers, especially those examining normal social media posts, must therefore take all reasonable steps to exclude statements from these individuals during analysis. It is therefore necessary for researchers, especially those examining minority groups, to learn to identify dog-whistling and bad-faith arguments of those engaging in digital blackface often indulge in. This is an area where community consultation may be very helpful, as individuals who are truly members of a social group are likely to be familiar with the approaches that others - especially those attempting to harm their community - use to misrepresent their community.

4. CONCLUSION

The internet has provided researchers and scholars examining social cognition with several possibilities, including rapid data collection from cultures that are at great geographic and/or cultural distance from the researcher. This study aimed to provide researchers considering internet-based social cognitive research with an overview of the theoretical and methodological considerations that must be considered for implementing best practices. The internet has changed social cognition, and it is essential for social cognitive researchers to incorporate new measures (of internet use and/or cultural memory) and tailored instructions (to avoid distractions such as background music). It is also important for researchers examining social cognition to consider the tradeoffs between ecological validity and experimental control, and whether increasing experimental control via the creation of a digital laboratory space, and/or the use of digital researcher presence, is worth any associated resource costs and/ or reduction in ecological validity. Finally,

Table I. Methodological guidance and future research directions based on this study.

Methodological Guidance	Future Research Direction
Social VR	
Carefully consider whether any elements (both system-based and in the virtual environment) may impact participants' experiences (and thus responses)	Examine VR-supported interactions between members of globally distributed cultural diaspora
Internet use & social media algorithm effects	
Control for the effects of internet and social media use by employing purposive sampling and control questions (internet/social media use, information searching behaviours, frequency of flow-state activation, etc.)	Using plugin-based "replacement algorithms", examine the impact of (A) social media *without* algorithmic influence, (B) transparent experimenter-controlled algorithms, and (C) algorithms designed to promote positive outcomes
	Examine the role that different activities and websites have on wellbeing and social cognition
Multitasking	
Examine paradata (long delays, switching away from the experiment) to identify sequential multitasking	Examine the role of simultaneous sequential and parallel multitasking
Examine participants' experience with sequential and parallel multitasking	Examine experimental performance across different paradigms based on participants' familiarity with sequential and parallel multitasking
If it is not possible to include a multitasking measure, stress the importance of avoiding external distractions	
Memory and Attention	
When possible, control for participants' reliance on internet-supported transactive memory, acceptance or rejection of revisionist histories, and attention span.	Employ longitudinal methods to explore the role of personality in changing acceptance of transactive memory and attention span over time
Digital Laboratories	
Consider approaches that standardize participants' experiences as much as possible, while remaining realistic	Explore the degree to which different digital laboratory approaches increase ecological validity
If possible, consider a platform, entirely controlled by researchers, that includes required downloadable files/programs	
Consider gathering browser, browser version, and system information as control variables	
Digital Researcher Presence	
Consider whether having a researcher or AI avatar digitally present is worth the time investment to increase ecological validity.	Examine the effect of real and AI-controlled digital researcher presence across more experimental approaches
Group Membership	
Employ screening techniques to ensure that participants belong to the groups of interest, and remove responses from bad-faith actors and malicious outsiders.	Employing community consultation with minority group members to build knowledge on how to identify bad-faith actors pretending to belong to the community
When communicating screening criteria, avoid implying that those who were invited as an outsider into a culturally-specific social media group do not "belong" in the group	Examine the role of the "accepted outsider" in minority group social media spaces; i.e., whether they actively engage in discussion or limit themselves to reacting to others' posts
	Wider and deeper examinations of the role of non-linguistic cultural "languages", especially when (and, if so, how) meaning is successfully communicated cross-culturally.

there is a need for social cognitive researchers to take steps to ensure that, when recruiting from or examining internet-based groups, the individuals examined are truly members of these groups through screening measures to remove well-meaning respondents outside the group(s) of interest, as well as identifying and removing responses from bad actors pretending to belong to a particular group in order to inflict harm. Table I presents the methodological guidance and future directions for research based on this study.

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