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"Should I Introduce myself?": Asynchronous semi-guided professional introductions for enhanced perceived team effectiveness in new virtual dyadic teams☆

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ABSTRACT

Achieving effective collaboration and trust has been shown to be harder for virtual vs. in-person teams. Related work has confirmed that introductions are a key mechanism to form trust in newly-formed teams. The rise of remote work necessitated by the COVID-19 pandemic highlighted the need for accelerating the development of effective collaboration in virtual teams. In response to this need, based on the research around introductions and trust in team settings, we have developed a novel approach for virtual introductions. This is what we term as asynchronous, semi-guided, professional introductions. Participants pre-record an introduction that uses a set of professionally-focused questions and watch these introductions prior to the meeting. Our study examines the impact of these introductions on virtual teams in three conditions: video, text, and no introduction. In this study, we used the Team Diagnostic Survey post-task completion to assess team effectiveness and interpersonal processes of 28 dyads. Thematic coding was used to collect dyads' experience and engagement. The introduction conditions demonstrated significantly improved collaboration, effectiveness, and engagement amongst participants. Notably, the video condition was particularly well-received by participants and resulted in higher levels of engagement and effectiveness compared to the text and no introduction conditions. Ultimately, the use of these introductions led to a marked increase in trust and collaboration amongst participants. We reflect on the effects of this finding in the mainstream and propose further research to support newly-formed virtual dyadic teams to increase team effectiveness. This study contributes to the existing literature by introducing a novel asynchronous, semi-guided approach to virtual dyadic team introductions, offering insights crucial for contemporary remote work dynamics.

1. Introduction

The COVID-19 pandemic has demonstrated that virtual team meetings have become essential in enabling teamwork. What was a pandemic necessity is increasingly becoming an operational norm. Despite the benefits of virtual teaming, studies have consistently indicated that it is less effective than face-to-face interactions (Morrison-Smith and Ruiz, 2020; Walther and Bunz, 2005; Wilson et al., 2006). For example, remote work can lead to communication barriers, misunderstandings, and a lack of trust amongst team members. Furthermore, numerous studies conducted over the past two decades to today have demonstrated that virtual teams face difficulties in collaborating as effectively as in-person teams (Al-Ani et al., 2013; Jarvenpaa et al., 1998; Molinillo et al., 2018; Muhlfelder et al., 1999). For instance, Nurmi and Hinds (2020) found that differences in the amount of time, space, and synchronicity between virtual and collocated teams impact their shared context, resulting from differences in the frequency of meetings. As virtual teaming becomes a preferred option in many workplaces, it becomes critical to explore mechanisms to address these known factors that influence individuals' perceptions of teamwork effectiveness. A particular concern is in bringing in new team members whose main connection to a group may be via virtual teaming. Our approach, described in this paper, has been to focus on the established value of the introduction, and to help participants before their first virtual

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team working meeting, prepare that introduction and make it available asynchronously, prior to the meeting, to other participants.

Studies have identified trust-building (Jarvenpaa et al., 2004; Jarvenpaa and Leidner, 1999; Khvatova and Block, 2017; Zakaria and Mohd Yusof, 2020) and familiarity with team members' work competence and knowledge (Hinds and Bailey, 2003) as key factors that contribute to perceived team effectiveness in virtual teams (Hinds and Mortensen, 2005). These attributes are typically built during team introductions (Lu and Farzan, 2015; Maynard et al., 2019), which serve as icebreakers where team members share information about themselves to reduce stress and uncertainty (Qin and Men, 2022) and establish social connections (Kim et al., 2022). Despite the growing importance of remote work and virtual collaboration, virtual icebreaker activities remain relatively unexplored (Jolak et al., 2018). While there has been some research on virtual icebreaker activities, such as games or quizzes (Olsson et al., 2020), there is still much to be explored in terms of their effectiveness and optimal format. Prior research in computer-supported cooperative work has identified a gap in understanding and emphasised the need for further investigation, particularly as existing studies have shown that no established format currently exists for virtual team introductions. The closest work to exploring introductions is around general, real-time icebreakers to facilitate social connections (Miller et al., 2021; Lu and Farzan, 2015; Zhang et al., 2023). However, little research has been conducted to examine the implementation of these approaches. In the field of Human-Computer Interaction (HCI), there has been only limited consideration of the role of introductions, whilst recent work focused on face-to-face technology to foster meaningful conversations (Zhang et al., 2023). Recently, Miller et al. (2021) investigated the use of a synchronous/real-time video interface to support icebreakers and found that video interactions can help reduce anxiety.

Our objective has been to develop and assess the perceived effectiveness of these asynchronous introductions for fast-forming, potentially globally distributed dyadic teams. We aimed to create a mechanism that would incorporate the positive attributes of introductions into virtual meetings as well as free up more time for the meeting process, and ultimately enhance perceived team effectiveness. Drawing on related work in professional disclosure (Byrne et al., 2022), in our asynchronous introductions, we ask participants to answer five questions about professional experience. We call this our Asynchronous Semi-Guided Professional Introduction (ASGPI). Our rationale for this approach is that the professional questions help others focus on the relevance of the person's skills for the upcoming meeting, and may create a more levelled starting point. By being asynchronous, a person can consider their presentation too, so as not to feel as put on the spot, to help level the field in the introductions, and to facilitate trust-building and effective collaboration in virtual teams. This approach aims to complement current synchronous tools and practices used by virtual teams, which have been the focus of previous virtual team and dyad studies.

To advance our design objectives of improving meeting productivity and fostering future collaborations, we have formulated research questions to guide our investigation. To measure perceived team effectiveness, we will use the Team Diagnostics Survey (TDS) (Wageman et al., 2005), which is a standardised team assessment tool for evaluating various aspects of team performance. In our study, our primary focus will be on assessing the overall perception of team effectiveness, one of the key criteria within the TDS (Jun et al., 2019; Mendenhall et al., 2017; Wageman et al., 2005), as well as determining how interpersonal interactions contribute to perceived team effectiveness. Specifically, we will assess peers' perceptions of their collective efforts in accomplishing tasks and evaluate the quality of team interpersonal processes to determine how satisfied peers are with their interactions within the dyad they are part of. Furthermore, we will measure the extent of peers' motivation to work together and their effective response to the team and its work to gain insights into individual learning and well-being within the team.

Based on these considerations, we have formulated the following research questions:

- Q1 : How does having a text-based ASGPI prior to the team's first meeting affect perceived team effectiveness compared to no ASGPI?
- Q2 : How does having a video-based ASGPI prior to the team's first meeting affect team perceived effectiveness compared to no ASGPI?
- Q3 : How does the perceived effectiveness of a video-based ASGPI prior to the team's first meeting compare to that of a text-based ASGPI?

By exploring these questions, we aim to gain insights into the impact of ASGPIs on perceived team effectiveness and identify which format – text-based or video-based – is most effective. In the following sections, we present a detailed exploration of our research. In Section 2, we provide an in-depth review of the related work and the motivations behind our study, focusing on the key aspects of perceived team effectiveness and relation to trust in dyadic teams and the development of ASGPI. In Section 3, we provide a detailed exploration of the process by which we developed the questionnaire used to guide participants in creating their ASGPIs. This questionnaire was designed to operationalise the concept of familiarity, serving as a tool to facilitate the construction of effective introductions. Section 4 provides a comprehensive overview of our study design, detailing the methodology, participants, and experimental setup. Moving forward, in Section 5, we will present our research findings, including the outcomes of the one-way ANOVA and Tukey's HSD Test for post-hoc multiple comparisons used to compare the effects of our three conditions on perceived team effectiveness. The results indicated a significant improvement in perceived team effectiveness, which also addresses the quality of interpersonal interactions, for participants in the video-based ASGPI condition. In Section 6 we engage in a thorough discussion of these results, while also addressing any limitations identified during the study.

It is also important to acknowledge that our findings are primarily contextualised within a Western-centric perspective, and may not fully reflect the varied cultural norms shaping professional introductions globally, potentially limiting their applicability to non-Western contexts. We reflect on this point further in our Limitations section. With this caveat in mind, we propose that our work here introduces an innovative approach to enhance collaboration and perceived effectiveness within new virtual dyadic teams. While our study focuses the dynamics of dyadic teams, the exploration of its applicability and implications for larger team configurations warrants further exploration.

2. Related work

In the following sections, we present related work that lays the foundation for our research questions, the development of our approach, and the motivation for our study. We begin by examining the differences between virtual and physical team interactions and the challenges they pose, underscoring the importance of our study's focus on improving collaboration and trust. We then delve into the significance of dyadic teams and the factors that influence effective team collaboration, with a particular emphasis on perceived team effectiveness. Finally, we explore how the introductions of team members can impact the early stages of collaboration, setting the stage for our investigation into asynchronous, semi-guided, professional introductions.

2.1. Impact of the COVID-19 pandemic on remote work

The COVID-19 pandemic has precipitated an unprecedented global shift towards remote work, transforming professional collaboration and significantly impacting virtual teams. This transformation, catalysed by the rise of online collaboration software since the pandemic's onset, has led to an increased prevalence of remote working arrangements (Scott and Wildman, 2015). Greatly influenced by dynamics such as the reconfiguration of workspaces and the impact on social relations (Sewell and Taskin, 2015), this shift underscores various challenges and opportunities within virtual teams, marking a significant pivot in how professional collaboration is conceived and executed in the digital age.

Additionally, the pandemic has brought to light the challenges of balancing the flexibility of remote work with the blending of work and personal life. It has uncovered the dynamics between employee autonomy and the oversight of managers in remote work contexts (Sewell and Taskin, 2015). With the shift to virtual operations, the digital environment has both offered increased autonomy and complicated the separation of professional and personal spaces. This change has not only shifted traditional office dynamics but also sparked concerns about maintaining productivity and well-being in a largely virtual environment. The lack of face-to-face interactions has underscored the importance of spontaneous conversations and knowledge-sharing, which occur naturally in office settings but need intentional effort to simulate in a virtual context (Waizenegger et al., 2020). Addressing these challenges calls for innovative strategies to cultivate a sense of belonging and connection amongst virtual teams, ensuring that the advantages of digital collaboration are not diminished by issues such as social isolation and "Zoom fatigue" (Waizenegger et al., 2020).

The effects of this transition into the digital also reveal how working virtually can influence cognitive, social and professional well-being, with some employees thriving, whilst others struggle with social isolation (Charalampous et al., 2019). In this digital landscape, effective communication and collaborative tools have become indispensable. Augstein et al. (2023) and Waizenegger et al. (2020) both state how technological affordances have arisen out of necessity. Nguyen et al. (2021) highlight the risks posed by this change, including the potential loss of social learning opportunities and the sidelining of experiential knowledge, often best communicated through in-person engagement. Furthermore, other studies highlighted the challenges faced by virtual teams, showing that they tend to be less effective overall when compared to their physically collocated counterparts (Borup et al., 2012; Morrison-Smith and Ruiz, 2020).

2.2. Overcoming challenges in virtual team dynamics

One significant factor contributing to this effectiveness gap is that collocated teams often benefit from more straightforward access to information about their team members, promoting trust and facilitating communication (Hinds and Bailey, 2003). Trust is indeed a cornerstone of effective teamwork within smaller-sized teams, like dyads (Yakovleva et al., 2010) and within larger team structures. The willingness of team members to rely on each other, especially in virtual settings, is influenced by trust, as it facilitates information sharing and collaboration (Chen et al., 2014). Moreover, trust and perceived team effectiveness are vital components of successful team collaboration, particularly in the context of virtual teams. In physical meetings, teams rely on trust to establish effective communication, foster a sense of collective commitment, and achieve shared goals (Gibson and Cohen, 2003). In these instances, perceived team effectiveness, distinct from objective performance measures, also plays a pivotal role in shaping team members' motivation, engagement, and overall collaboration. In virtual settings, however, constructing and maintaining trust and fostering perceived team effectiveness pose distinct challenges. Studies demonstrate that even the choice of backgrounds in virtual meetings has emerged as a subtle yet impactful factor influencing perceptions of trustworthiness (Cook et al., 2023). These findings underscore the importance of visual elements and non-verbal cues in virtual environments, which can enhance professional perceptions and mitigate potential biases.

A recent IEEE survey on virtual team research themes and opportunities (Alaiad et al., 2019) focused primarily on the effects of tools on team interactions. The survey identified two areas for future research, which are addressed in our work:

(1) Developing mechanisms and methods to ensure perceived team effectiveness amongst virtual team members, including dyadic teams. The dynamics within these teams, often involving pairs of individuals, are unique and require specific attention.

(2) Addressing challenges related to knowledge-sharing within virtual teams. Effective knowledge-sharing is a cornerstone of successful collaboration in virtual settings and hinges on factors like trust and communication. In dyadic teams, knowledge-sharing can be particularly influential, as it is often the primary mode of communication.

In situations where virtual teams, including dyadic teams, are rapidly assembled for mission-critical issues, such as crisis meetings during the height of the COVID-19 pandemic or virtual review meetings amongst experts who may be meeting for the first and only time, there are often challenges in establishing trust and, consequently, in becoming effective. The absence of traditional interpersonal and collaborative processes can lead to delays in building trust (Morrison-Smith and Ruiz, 2020; Nurmi and Hinds, 2020). First-time interactions between strangers in a virtual setting can be particularly challenging (Guo et al., 2023), especially in dyadic teams (Breuer et al., 2020; Yakovleva et al., 2010), so our primary objective in this study is to explore innovative approaches designed to foster better first-meeting perceived team effectiveness amongst members who are strangers but are required to collaborate. Within this context, the presence of trust, which leads to perceived team effectiveness, along with an understanding of the dynamics within dyadic team structures, are foundational factors that contribute to successful collaboration in virtual teams.

The pandemic has led to a reevaluation of remote work practices highlighting the need to leverage digital innovations to improve perceived team effectiveness and collaboration in the post-pandemic era. By addressing these aspects and understanding virtual teamwork, we aim to provide practical insights and mechanisms to enhance the effectiveness of virtual dyadic teams, especially during their initial interactions, where building trust, fostering perceived team effectiveness, and managing the complexities of dyadic team dynamics are critical. In doing so, we aim to bridge the effectiveness gap that often affects virtual dyadic teams, and offer solutions to the challenges highlighted by both recent studies and industry demands.

2.3. Dyadic team structures

For our study, we chose to focus on dyads, which are specific forms of small teams consisting of two individuals who share the same organisational goal (Becker and Useem, 1942). The dyad team size is the most frequently encountered in daily situations (e.g., Andres et al. (2020) and Bakeman and Beck (1974)) and is a common focus in HCI research (e.g., Chikersal et al. (2017), Derlega et al. (1993) and Schuldt et al. (2017)). Choosing dyads aligns with the core objective of assessing trust development in the realm of professional introductions. Despite being a specific form of teams, the unique characteristics of dyads serve as an ideal foundation for initiating our research.

The focus on dyads allows us to take advantage of several key features that are particularly beneficial for assessing trust development. Compared to larger groups, dyads present differences in temporality, complexity, and intensity (Cooney et al., 2020; Hackman and Vidmar, 1970). Dyads offer a faster pathway to observing the impact of interventions due to their reduced complexity stemming from the smaller group size. In the context of trust, the presence and absence of trustful interactions and self-reports are more discernible within a

dyad since there are only two individuals involved, simplifying the analysis of trust dynamics. Moreover, the intensity of responses within dyads is higher, which aids in identifying trust-related behaviours and patterns (Moreland, 1987; Swamy, 2021). Additionally, dyads, as suggested by Simmel (2011), experience rapid changes in social integration, leading to a shorter temporal gap in trust development. These factors together suggest that our study is likely to provide a clearer understanding of the creation of trust leading to perceived team effectiveness within dyads than in larger groups.

Analysing trustful interactions within dyads, despite the absence of external comparisons, offers a unique lens through which to explore trust dynamics. Research in social psychology and small group communication has demonstrated that dyads serve as the foundational units of conversation, providing a controlled environment where trust can be observed and studied directly (Liden et al., 2016; Gasiorek, 2017). Within dyads, participants' interactions are inherently concentrated, allowing for an in-depth examination of the subtleties in verbal and non-verbal cues that contribute to the formation and development of trust. In the context of dyads, where external benchmarks for trust comparison may be lacking, trustful interactions can still be identified through indicators such as increased willingness to share information, the emergence of cooperative behaviours, and the expression of mutual vulnerability.

Despite the focus on larger team dynamics in some areas of HCI research, dyads have gained increasing attention in recent years. Agrawal et al.'s research brought dyadic teams to the forefront by identifying a significant gap in our knowledge of how interface design technology supports dyadic interactions (Agrawal et al., 2010). This discovery has sparked an increase in research exploring dyads in HCI and computer-mediated communication, underscoring their growing significance and impact within the discipline. Dyads are acknowledged as critical units for analysis, particularly in contexts where interpersonal interactions play a key role. Previous work (Chikersal et al., 2017; Schuldt et al., 2017) has explored dyads by emphasising the significance of studying interactions within smaller teams. Focusing on dyads allows the exploration of factors such as synchrony without the added complexity that can emerge in larger group dynamics, as observed in earlier HCI research emphasising physiological and collaborative aspects of dyadic interactions (Chikersal et al., 2017). Furthermore, the choice of analysing teams of two individuals is consistent with existing research that demonstrates the applicability and importance of collective intelligence constructs and measures to dyads (Woolley et al., 2010). Our study is primarily centred on exploring perceived team effectiveness within dyadic teams, recognising that larger teams possess distinct dynamics and complexities. Starting with dyadic interactions enables a more in-depth and concentrated examination of trust and the development of perceived team effectiveness in such settings. A notable research gap persists in comprehensively understanding the intricacies of perceived team effectiveness development within dyads in the context of professional introductions. Our study addresses this gap by providing a nuanced exploration of trust dynamics, emphasising the unique features of dyads that contribute to a deeper understanding of the creation of trust leading to perceived team effectiveness. We aim to build a strong foundation of knowledge within dyadic teams before extending our research to larger groups.

2.4. Trust and perceived team effectiveness

Trust is a crucial factor for perceived team effectiveness and can compensate for the missing aspects of collocated teams in the digital realm, such as geographical, temporal, and psychological distances amongst team members (Cascio, 2000; Jarvenpaa et al., 1998). The concept of trust has been defined as the willingness of one party to be vulnerable to the actions of another party based on the expectation that it will perform a particular action that is important to the trusting party, regardless of whether it can monitor or control the other party (Mayer et al., 1995). The significance of trust, perceived team effectiveness and collaboration (De Jong and Elfring, 2010) has been widely discussed in the literature. A detailed analysis of two decades-worth of research (Costa et al., 2018) has shown that trust enables team peers to be vulnerable in a "leap-of-faith" manner, both at an interpersonal level between team members and at the team level.

DeOrtentiis et al. (2013) define team effectiveness as the collective belief amongst team members in each other's skills and ability to achieve success, which is a social perception influenced by both individuals and the group as a whole. While this work suggests that trust may not have a direct correlation with team effectiveness, studies such as Dirks (1999) and Kiffin-Petersen (2004)'s work, and most importantly in the context of virtual teams, Pangil and Moi Chan (2014) highlight a strong link between trust and virtual team effectiveness. Generally, the perception of team effectiveness results in team members who are motivated and engaged in team activities, as they feel invested in the team's goals and perceive their work as meaningful. Furthermore, drawing from existing literature, there are four key aspects of perceived team effectiveness that are relevant to team quality efforts: (1) overall team effectiveness: the team's belief in their access to essential information, authority, autonomy, and the resources required to perform their work effectively; (2) team skills: the team's ability to initiate improvements, which, in turn, enhances team cohesion; (3) participation and goal agreement: centres on the team's alignment with a shared objective and their recognition of individual contributions; (4) organisational support: the team's capability to obtain necessary resources and the appropriateness of reward structures that incentivise their efforts (Shortell et al., 2004).

Since 2010, Liu et al. have highlighted the importance of trust, underscoring the multifaceted nature of perceived effectiveness within virtual team settings. This connection becomes particularly apparent when considering the dynamics of relationships within newly formed teams. It extends beyond the concept of trust alone and encompasses factors such as closeness and interpersonal dynamics (Dangmei, 2016). While closeness and interpersonal dynamics hold significance in the broader landscape of team effectiveness, they often develop over time as teams continue to collaborate. By strengthening trust and focusing on the perception of team effectiveness during these early stages, teams can naturally progress to develop closer bonds and more intricate interpersonal dynamics as they continue to collaborate (Dangmei, 2016). This study's focus aligns with the recognition that trust and the perception of team effectiveness are fundamental factors in the early stages of collaboration, particularly when team members may be unfamiliar with each other. Therefore, this research aims to explore strategies that specifically address the establishment of trust and the perception of team effectiveness as foundational elements in virtual team collaboration during the critical first interactions of newly formed teams.

Virtual teams tend to discuss trust and perceived team effectiveness in a descriptive manner (Hakonen and Lipponen, 2009), with little focus on developing effective mechanisms to positively impact these aspects. While virtual teams recognise the importance of trust, there is a gap in providing practical guidance for nurturing trust and promoting perceived team effectiveness in virtual settings (Molinillo et al., 2018). As a result, it is crucial to explore and develop effective strategies for promoting these attributes in virtual teams. In our work, we aim to use ASGPIs to facilitate the formation of trust in newly formed professional teams, with perceived team effectiveness serving as the measure of success, based on the link between the two (Costa et al., 2001; DeOrtentiis et al., 2013).

2.5. Introductions

Establishing trust and perceived team effectiveness within virtual teams hinges not only on ongoing interactions but also on the initial stages of team formation (Paul et al., 2016). This critical phase

often begins with introductions (Coppola et al., 2004). Introducing oneself has been shown to reduce uncertainty and stress in social situations (Dandeneau et al., 2007; Gunnar and Donzella, 2002; Levine et al., 1997). These introductions serve various purposes, including initiating conversations (Indrayanti, 2014), forming impressions in work settings (Hinds and Mortensen, 2005), and establishing expectations of collaboration (Hinds et al., 2000). Information shared during introductions helps individuals understand their community and assess peers' trustworthiness through multiple cues (Rusman et al., 2013b; Yang et al., 2023). Schumann et al. (2017) demonstrate that virtual team contact, when designed to enhance participants' social presence, could reduce prejudice, suggesting that similar strategies in virtual professional introductions may foster more positive perceptions amongst team members, enhancing overall effectiveness. However, despite the effectiveness of introductions as an icebreaker for forming impressions, there is currently limited research in the field of HCI on how to build introductions to address the challenges of connecting peers in virtual teams.

Overview of introductions as icebreakers

Icebreakers were defined as common activities used by a group to ease into an activity, which can aid in trust formation and have positive effects on the interaction (Alitolppa-Niitamo, 2004; Depping et al., 2016; Indrayanti, 2014; Miller et al., 2021; Tan and Cox, 2019). The study "Meeting You, Seeing Me" examines the potential of video-based synchronous icebreaker online introductions in comparison to text and audio, to reduce anxiety amongst peers who are new to each other (Miller et al., 2021). However, further research is needed on how to conduct virtual team icebreaker introductions in order to leverage trust and positively contribute to perceived team effectiveness, as acknowledged by Rocco et al. (2000) and Knowles et al. (2015). Nevertheless, additional research is essential to understand the art of crafting introductions, given the potential for misleading introductions in the realm of social platforms (Schlosser, 2020). Our work builds on this knowledge to provide users with guidance on creating introductions in a professional virtual setting. Studying these activities within first-time meetings is particularly relevant as they lay the foundation for trust and perceived team effectiveness, crucial for the early phases of team development.

According to Berger and Calabrese (1975), people naturally feel the need to introduce themselves to increase predictability in social interactions. In another study by Pillet-Shore (2011), the processes behind naturally occurring introductions and the social responses people have were examined. Pillet-Shore found that in professional meetings, for example, "mediators" are preferred over self-initiated introductions as they can help speed up the process of acquiring vital information about the participants. To introduce oneself, speakers must answer the question "Who are you?" (Fontaine, 2012), which directly affects the social uncertainty between the two parties. Explicit identification is needed to decrease this uncertainty, but older studies suggest that simple identification, such as names, does not convey information about the person's identity (Sacks, 1992; Searle, 1958). A mediator can help with the identification process. However, if a mediator is not present or the two parties are not guided through introductions, different patterns of self-introductions can occur, which can either decrease or increase social uncertainty. For example, one pattern is initiating the conversation by presenting one's name (Pillet-Shore, 2011). Although introductions happen naturally, there are various ways in which they can be initiated, led, and concluded. Therefore, a level of instability is associated with these types of encounters, which can have a significant impact on social collaboration.

Introductions through self-disclosure using asynchrony

Self-disclosure refers to the intentional act of revealing personal information to another person or group (Molinillo et al., 2018). The objective of self-disclosure is to share accurate and objective information about oneself, without concern for how the individual may be perceived (Johnson, 1981). Studies such as Laurenceau et al. (1998)'s suggest self-disclosure plays crucial roles in fostering feelings of understanding, acceptance, and care in interpersonal interactions. Conversely, self-presentation involves an individual attempting to shape their image in the eyes of others. This is defined as a "goal-directed activity of controlling information to influence the impressions formed by an audience about the self" (Derlega et al., 1993). Self-disclosure and self-presentation involve sharing information about oneself, but the latter aims to influence others' impressions through strategic information control. However, true information shared for self-presentation may not constitute self-disclosure, as individuals may do so to improve their public image (Johnson, 1981; Schlosser, 2020).

Hinds and colleagues have emphasised the significance of self-disclosure in the context of virtual teams, highlighting the importance of attributes such as impression formation, familiarity, and work competence in addressing challenges and promoting collaboration. Impressions formed by coworkers are identified as crucial for averting conflicts, building trust, and improving collaboration (Hinds and Mortensen, 2005; Miller et al., 2021; Mendenhall et al., 2017; Nurmi and Hinds, 2020). As such, we view self-disclosure as a multifaceted process in which individuals share both objective information and personal emotions. This mixture of shared information plays a pivotal role in fostering familiarity, trust, and effective collaboration. Self-disclosure encompasses sharing various aspects about oneself, including objective facts, personal experiences, and emotions. While some self-disclosure activities focus on presenting facts about one's professional background and competence, others may involve disclosing personal emotions and experiences. The specific approach to self-disclosure can vary, and it often reflects the goals and context of the interaction (Johnson, 1981; Schlosser, 2020). Self-disclosure is not limited to promoting one's competence but extends to revealing personal experiences, positive or negative, which can have a significant impact on building interpersonal relationships. In the context of our study, we concentrate on self-disclosure as a means of promoting familiarity amongst individuals within virtual teams. Our objective is to leverage self-disclosure to facilitate the initial stages of team formation by enhancing trust and improving perceived team effectiveness. Therefore, our investigation delves into how individuals can use self-disclosure to share information about their professional background, experiences, and even vulnerabilities (i.e. situations they did not handle well). By focusing on self-disclosure as a tool to enhance familiarity and trust, our study seeks to contribute to a deeper understanding of its role in fostering effective collaboration within virtual teams.

Schlosser and previous research (Bargh et al., 2002; Schlosser, 2020) have examined the social environment to predict intentions and address the challenge of categorising information conveyed through self-disclosure. Asynchronous contexts have been found to be more conducive to self-disclosure and expressing one's true self compared to synchronous contexts like face-to-face meetings, where factors such as perceived attractiveness can impact self-disclosure. Asynchronous self-disclosure can eliminate this problem by eliminating knowledge of the target audience. Similarly, in unfamiliar team settings, exchanging professional information through self-disclosure can help newcomers gain insight into the group, establish initial trust, and promote the sharing of work-related background information (Molinillo et al., 2018; Muhlfelder et al., 1999; Thomas et al., 2017). Our study aims to explore the potential of professional introductions in improving perceived team effectiveness and perceived trust, particularly in situations where team members are unfamiliar with each other.

Delivery of introductions: Semi-guided

This study addresses the challenge of creating professional impressions virtually by examining comprehensive measures of first-impression formation that can support long-term collaboration, with a specific focus on perceived team effectiveness and trust. Recent research has shown that different media, such as images, text, and video cues, can have varying effects on trust during impression formation, even if some of this research was conducted in different contexts (van der Zanden et al., 2022; Yang et al., 2023). While previous studies have explored topics like trustworthiness and deception during first impressions, there is a noticeable gap in research concerning the use of icebreaker activities for initiating and sustaining professional relationships.

Adding to the diverse methodologies for facilitating introductions, Shin et al. (2023) demonstrate the potential of chatbots in enhancing trust and cohesion through guided interactions during the familiarisation phase in virtual teams. The field of HCI has also explored the use of games as effective icebreakers, emphasising their potential as alternatives to traditional guided conversation starters. Furthermore, users may sometimes misuse features, such as audio self-presentations, on these platforms, underscoring the need for guidance on their effective use. To address these gaps and provide guidance, the present study examines the impact of semi-guided introductions on key personality traits, including agreeableness, which require further exploration (Drouin et al., 2016; Guillory and Hancock, 2012; Toma et al., 2018). We use pre-recorded semi-guided interventions based on information relevant to first-impression formation scenarios, including competence, commitment, availability, and communality, identified by Hinds, Rusman, and Hancock.

Introduction content: Professional familiarity

Previous research by Maynard and Hinds has highlighted the benefits of using professional familiarity in introductions. In 2019, Maynard et al. identified five key attributes as crucial aspects of professional familiarity: Competencies, Reputation, Work Performance, Dependability, and Attention to Detail. When team members are already familiar with each other's work, they tend to be more comfortable sharing information and are less likely to fear being excluded or ridiculed (Lu and Farzan, 2015; Maynard et al., 2019). Although familiarity amongst teams as a concept in HCI is a relatively new area of research, a recent study has taken a step forward by utilising the concept to develop a chatbot, which was designed to improve team interpersonal processes (Shin et al., 2023). Additionally, Lu and Farzan suggest that introductions can increase familiarity and facilitate self-disclosure, which is the purposeful sharing of personal information with others (Lu and Farzan, 2015). Professional self-disclosure can be used to convey messages of competence and a desire to be known by others, which reduces uncertainty and increases trust in collaborations before the initial task-oriented interaction (Derlega et al., 1993; Hinds et al., 2000; Lu and Farzan, 2015). In contrast, when individuals are not familiar with their teammates' work, they may be hesitant to disclose information due to uncertainty about how it will be perceived by others (Hinds et al., 2000; Lu and Farzan, 2015; Maynard et al., 2019).

We recognise a potential for enhancing perceived team effectiveness and fostering initial trust through the use of asynchronous, semi-guided professional introductions as icebreakers. However, while cultural diversity enriches teams, it also presents communication and team cohesion challenges. Jayanthi and Rajandran (2014) emphasise the importance of understanding the effects of cultural differences in introductions to account for the cultural factors affecting virtual teams. While our work has primarily adopted a Western-centric approach to ASGPIs, this aspect offers a foundation for future research to expand upon. Investigating how various cultural contexts and professional introductions influence team dynamics could provide comparative insights and guide the development of more universally-effective virtual dyadic team strategies.

3. Apparatus

Within this section, we describe the apparatus developed to explore the aforementioned research questions and gain insights into the impact of ASGPIs on perceived team effectiveness. This approach operationalises the attributes of professional familiarity into constructing asynchronous, semi-guided introductions for professionals.

Deconstruction in HCI as a design technique

Alan Dix's Deconstructing Christmas Crackers (Dix, 2018) has inspired our approach. Rather than attempting to replicate physical introductions in online settings (as is typically done), we have analysed the characteristics of effective introductions based on research and consciously considered how to translate these experiences to digital media and interactions. Previously, desktop interfaces tended to mimic the appearance of physical objects rather than focusing on the interaction qualities. For instance, notebook interfaces imitated the look of paper (such as lines on pages and covers on "books", what Dix calls "Surface Elements") rather than prioritising the convenience of quick note-taking (the "experience effects") that pen and paper offer (Dix et al., 2003). Dix refers to this approach as "digital reconstruction not reproduction". Using this Deconstruction of the Physical towards the Reconstruction in the Digital, we have created ASGPI.

ASGPI

Computer-mediated communication provides the unique advantage of flexible time management, which we leverage through our ASGPI. ASGPI offers a departure from traditional in-meeting introductions, eliminating the need for individuals to allocate valuable meeting time for this purpose. ASGPI is thoughtfully designed to afford individuals the time and space necessary for self-disclosure and reflection, recognised as pivotal aspects of effective team building (Altschuller and Benbunan-Fich, 2013; Miller et al., 2021). Furthermore, our innovative approach facilitates introductions outside the constraints of meeting contexts, enabling team members to genuinely engage with and absorb their colleagues' self-disclosures.

Informed by Miller et al.'s research on perceived team effectiveness, which underscores the significance of structured introductions, our study integrates a semi-guided approach within ASGPI. This approach aims to address the common challenge of spontaneous self-disclosure and unstructured icebreakers that can create uncertainty, particularly in dating situations, while maintaining relevance within a professional context. Within the ASGPI process, participants are semi-guided through a predetermined set of questions. The use of pre-recording empowers participants to rehearse their responses within the allotted time for each question, providing them with the opportunity to refine their introductions. We are also investigating whether the time limits for responses can serve as social equalisers, ensuring that every team member has an equitable chance to participate.

Drawing on previous research that emphasises the importance of professional experience as a means of building team trust (such as Maynard et al.'s work), the questions in ASGPI are centred on five professional attributes. We refer to this questionnaire as the Professional Familiarity Questionnaire.

Professional Familiarity Questionnaire

Our objective in formulating the questions to guide the introductions was twofold. First, we aimed to support the "multi-dimensional nature of familiarity" (Espinosa et al., 2007), which refers to the idea that our social identities are communicated through "self-categorisations" that contribute to the development of knowledge about a person and can have a positive impact on perceived team effectiveness. Second, according to research, building professional familiarity also fosters confidence in team members about each other (such as in Lu

Table 1
The Professional Familiarity Questionnaire is based on the five key attributes of professional familiarity, comprising of a set of questions each: competencies, reputation/integrity, work performance, dependability, and attention to detail. These questions are adapted from various sources in the literature to comprehensively evaluate professional familiarity.

Attributes of professional familiarity	Questions	Adapted from
Competencies	Can you tell me about a situation where you had to collaborate with others in order to solve a numerical task? (i.e. solving a mathematical problem, coding competition, puzzle, logical activity, etc.) Who was involved in it? (i.e. software team, friends, classmates, etc.) Where and when did this situation occur? (i.e. a situation at work, an activity, in school, etc.) How did you do it? What was the result? (i.e. split the work, work in shifts, which led to receiving awards/gaining experience, etc.)	Hasim (2019)
Reputation/Integrity	Can you tell me about an achievement on a task assessing your interpretation/problem-solving skills? (i.e. in a competition, game, etc.) How was this achievement perceived by the others? (i.e. your team members, the jury, your circle of friends etc.) If people who have previously worked with you in a team could characterise you by 3 attributes, which would they be? (personality-wise)	Aharoni and Nachum (2000)
Work performance	Tell me about a time when you were not as effective as you would have liked in managing a team's problem-solving work. How would you improve that? (i.e. time managing problems, work assessment, contribution, etc. and how you would change that)	Hoevemeyer (2017)
Dependability	Tell me about the measures you use to keep informed of your activities, achievements, progress towards objectives (i.e. calendars, software programs, notes, etc.).	Hoevemeyer (2017) and Simcic Brønn (2007)
Attention to detail	Give me an example of a time when your attention to detail helped you avoid making a mistake or helped you catch an error that others have missed (i.e. in a coding task, in solving a puzzle or mathematical problem, activity, etc.)	Hoevemeyer (2017)

and Farzan (2015) and Maynard et al. (2019) studies). To create our questionnaire, we drew heavily on Maynard et al. (2019)'s work on the key attributes of professional familiarity detailed in Section 2.4. Building on this structure, we integrated relevant research (Aharoni and Nachum, 2000; Hasim, 2019; Hoevemeyer, 2017; Simcic Brønn, 2007) to formulate the set of questions presented in Table 1.

By using the Professional Familiarity Questionnaire, we incorporated the key aspects of professional familiarity, with an emphasis on participants sharing positive experiences and lessons learned. This approach aligns with prior research that underscores the significance of positive self-disclosure in fostering perceived team effectiveness, trust and successful collaboration within teams (Sand, 2020; Dee et al., 2002; Assmann and Gallenkamp, 2009; Posey et al., 2010). Our questionnaire primarily focused on soliciting narratives related to positive experiences, including one item from the Work Performance section, that prompted participants to reflect on how they transformed a negative experience into a valuable lesson and personal growth. This unique focus is based on literature which highlights the constructive influence of positive storytelling and its role in cultivating trust and interpersonal processes within teams (Auvinen et al., 2013; Tesler, 2011; Tesler et al., 2018). Prior studies have suggested that emphasising positive stories can be instrumental in creating a supportive atmosphere during the initial stages of team formation, promoting open self-disclosure, and ultimately enhancing perceived team effectiveness (Kozlowski and Ilgen, 2006; Kozlowski and Bell, 2003; Menabney, 2020). By centring our questionnaire on positive experiences, we aimed to encourage participants to share insights and experiences that could contribute positively to team dynamics. Thus, by utilising professional profile templates, meeting participants can evaluate the trustworthiness of their colleagues based on the information presented in their introductions. This insight informs the development of an artefact that facilitates the formation of trust during the initial stages of virtual team collaboration, an area that has not yet been thoroughly explored in the literature (Rusman et al., 2013a). Furthermore, the questions in the Professional Familiarity Questionnaire were intentionally designed to be broadly applicable across various fields, work departments, and personalities, providing participants with the flexibility to select situations that align with their unique professional backgrounds. Here, the questionnaire's umbrella terminology (i.e."numerical task") encompasses a wide array of activities, including problem-solving in work-related contexts, as well as in other circumstances (i.e. sports or games), ensuring inclusivity and relevance for a diverse range of experiences.

To summarise, our use of digital affordances such as asynchrony, question guidance, rehearsal, and limited recording time for replies is aimed at translating and supporting the introduction intervention as an additional and flexible tool to enhance perceived team effectiveness before task-oriented meetings. We explore whether these features will help achieve this goal.

4. Study methodology

We explore introductions in new virtual dyadic teams via three conditions: video-based ASGPI (VC), text-based ASGPI (TC), and no ASGPI (NC), where participants provide their introductions through the Professional Familiarity Questionnaire. Participants were allocated to dyadic teams for this study. The study was structured into four distinct stages: Onboarding, Pre-Meeting Preparation, the Zoom Meeting, and the Post-Experiment Survey. A diagram illustrating all phases of the experiment can be found in Fig. 2 at the end of this section. The subsequent sections will delve into each of these stages, providing a comprehensive description of our study design, the rationale for our methodological choices, including participant recruitment, study set-up, ASGPI creation, collaboration tasks, data analysis, and the nature of the survey instrument.

4.1. Recruitment and participants

We enrolled 28 dyads comprising of 17 females, 26 males, and 13 participants who did not specify their gender, with ages ranging from 21 to 60 years (Mean = 33 years, Std. Dev. = 12.06 years). The recruitment of participants was carried out globally to ensure a diverse range of geographical locations and experiences, contributing to a rich and varied participant pool, whilst the recruitment process was structured based on specific criteria. Prospective participants initiated the process by completing a detailed questionnaire that solicited information on demographics, professional expertise, and geographical location. This initial questionnaire played a vital role in shaping our participant allocation and distribution strategy, ensuring a well-rounded and heterogeneous participant pool. The participants were required to be currently employed and have experience in office settings, underlining

the professional context essential for the study. Proficiency in English for work purposes was also a prerequisite, given that English was the primary language of communication in the study. Importantly, participants should have no prior knowledge of each other, meaning they have never worked together or been part of the same organisation. This criterion was followed to eliminate any pre-existing relationships or biases amongst participants, as it could impact the dynamics of trust development during the study. At the same time, participants had no prior acquaintance with the investigators responsible for running the study's virtual meeting. These criteria were met by the pairing process, which will be elaborated upon in the subsequent sections. By engaging participants through an initial questionnaire, we not only ensured that they met the study's specific requirements but also set the stage for their allocation and distribution into dyads.

4.2. Study set-up and participant pairing

We adopted a between-subjects design for our study, wherein participants were randomly assigned to one of three distinct introduction conditions, each designed to examine the impact of varying introduction formats on trust development within newly formed virtual dyadic teams.

(1) VC: In this condition, dyads utilised ASGPI with video-format introductions. Participants followed a structured process of providing their introductions through video, with specific guidelines for video and sound quality to ensure a consistent experience.
(2) TC: Participants in this condition engaged in ASGPI using text-based introductions. They were provided with clear instructions on how to craft their introductions in written format, with a predefined word limit for each question, promoting a textual approach to self-disclosure.
(3) NC: Participants in this group did not have a structured ASGPI process, and no specific guidance, encouragement, or recommendations were provided on how to introduce themselves.

Our objective was to investigate the influence of ASGPI on perceived team effectiveness compared to no ASGPI and to assess which communication channel, either video or text, best enhances this metric within virtual dyadic teams. Our participant pairing strategy was based on the information provided in the questionnaire, allowing us to pair individuals with distinct professional experiences, diverse geographical locations, and differing work profiles. Investigators played a crucial role in facilitating the meeting and guiding participants through tasks, following a standardised protocol.

This design allowed us to investigate how the nature of the introduction format – video or text – impacted perceived team effectiveness development in virtual dyadic teams, as well as analyse the effectiveness of ASGPI against no structured introduction. It also facilitated a focused assessment of the unique effects of each format on trust dynamics.

4.3. Creating the ASGPI

ASGPI allowed participants to create, asynchronously, detailed professional introductions about themselves in a semi-guided manner. This approach aimed to foster a better understanding of each participant's professional background thereby facilitating perceived team effectiveness and trust development in newly formed dyadic teams. Two days prior to the virtual meeting, participants who were assigned to complete an ASGPI were emailed a link to access and complete the necessary steps for uploading their introductions. Participants in the NC Condition did not have an introduction, and they received no specific guidance or recommendations on how to introduce themselves. Instead, they were informed solely of the meeting date and time.

Participants in the VC were provided with a link to a portal that we built for the purpose of this study, where they could record their introductions. They were instructed to follow specific guidelines to ensure optimal video and sound quality. Each question within the ASGPI process was timed differently, with a maximum of 1 min per question available, to maintain consistency and keep the process efficient. Additionally, we provided guidance to participants on lighting and background considerations to optimise the video recording conditions for the best possible outcomes. A screenshot of the user interface for the VC participants is presented in Fig. 1.

TC participants were given access to the same designated portal through a provided link, where they composed their introductions in a written format. They were presented with the same set of questions as VC participants. Here, participants were instructed to answer each question with a maximum of 100 words per response. This allowed us to maintain uniformity and standardisation in the text introduction process, ensuring that participants had equal opportunities to present themselves succinctly and effectively.

All participants had the flexibility to edit their answers as many times as they desired before moving on to the next section. This feature allowed them to re-record or revisit previous questions to refine their responses as needed. Once they were satisfied with their introductions, they could proceed to the next section. Upon completion of the entire set of questions, participants submitted their introductions, which were then sent to us. Furthermore, participants were explicitly informed that the introductions they created would be shared with their new team member, with whom they were slated to collaborate in an upcoming video conference. In addition to this, participants were also informed that they would receive the introduction of their assigned team member in advance of the scheduled meeting.

4.4. Virtual video meeting

Participants in both text-based and video-based conditions were sent the link to view or read their team member's introductions 15 min prior to their scheduled video conference. To simulate a globally distributed team, timezone differences were not a confounding factor, and the conference was scheduled at a convenient time. To ensure visibility consistency, all participants, regardless of the condition they were in, received guidelines on lighting.

At the start of the video conference, participants were introduced to the meeting's structure and the collaborative problem-solving tasks by the investigator. Additionally, to confirm that participants had no prior knowledge of one another, the investigator inquired at the beginning of the experiment whether participants had previously worked together or collaborated. The investigator maintained the camera off throughout the study and delivered instructions to participants via audio at the commencement of the video conference, followed by communication through the text chat interface for the duration of the collaborative problem-solving tasks. These six tasks, comprising three insight and three incremental problems, were adapted from a problem-solving assessment conducted by Jun et al. (2019), as listed in Appendix A. It is important to note that these tasks were intentionally designed to investigate the intricacies of dyadic teamwork, with an emphasis on communication's role in trust-building, rather than being primarily focused on task performance. Our intent in selecting these tasks was to encourage collaboration, effective communication, and critical thinking amongst participants, simulating real-world challenges they might encounter when forging professional relationships with new colleagues.

We incorporated both insight and incremental problems due to their established significance in evaluating convergent creativity and cognitive abilities (De Bono, 1995; Dominowski, 1995). Insight problems were included to assess participants' capacity for generating innovative and practical solutions, often necessitating "lateral thinking" (i.e. If you have black socks and brown socks in your drawer, mixed in a ratio of 4 to 5, how many socks will you have to take out to make sure that you have a pair the same colour?). In contrast, incremental problems, reminiscent of algebraic reasoning, require the application of specific

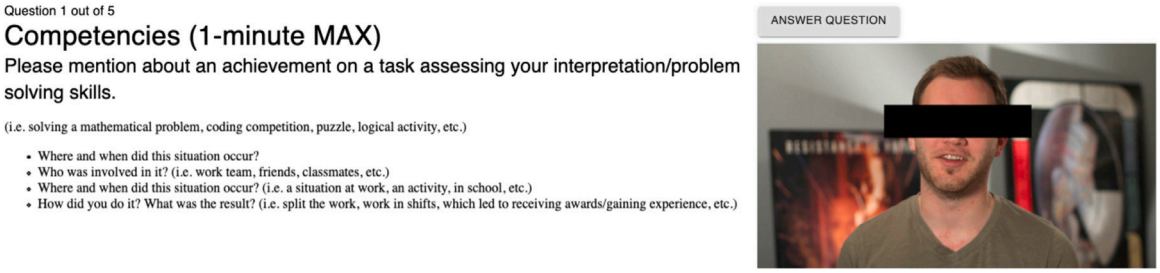

Fig. 1. Participant using our platform to record their video ASGPI.

rules or strategies to arrive at a solution (i.e. Ann is twice as old as her son. They were both born in June. Ten years ago Ann was three times as old as her son. What are their present ages?). This choice to incorporate a variety of problem types was informed by established research (De Bono, 1995) and aimed to provide a comprehensive assessment of participants' creative and cognitive competencies within the context of trust development in virtual teams.

We designed tasks that would be accessible to participants from various cultural backgrounds, yet we recognise the possibility of cultural biases influenced by a Western-centric view. Future iterations of this research could seek to more comprehensively account for cultural differences in task design. During the video conference, participants were permitted to use pen and paper for problem-solving if they wished. They were instructed to submit their answers in the meeting chat within four minutes of receiving each problem, and a timer countdown was provided through the video conference interface. Notably, to ensure the participants' perception of team collaboration remained unbiased, no feedback on the accuracy of their responses was provided during the video conference.

4.5. Post-study survey: Assessment instrument for perceived team effectiveness

To assess the perceived team effectiveness in our study, we employed the Team Diagnostic Survey (TDS) as part of our research methodology, in line with established research conventions (Bos et al., 2002; Furst et al., 1999; Wageman et al., 2005). We evaluated perceived team effectiveness using a subset of the Team Diagnostics Survey (TDS), focusing on the Team Effectiveness Process Criteria. This subset comprised of three sections (Effort-Related Process, Strategy-Related Process, Knowledge and Skill-Related Process), containing nine questions drawn from the TDS (Wageman et al., 2005), as listed in Appendix B. The chosen questions were designed to assess critical dimensions within this sub-scope, including the level of effort expended by team members on the task, the quality of team task performance strategies, and the effective utilisation of member knowledge and skills within the team. The choice of using the TDS was based on its comprehensive evaluation of team dynamics and team effectiveness, which are integral to fostering trust development and overall team satisfaction (Wageman et al., 2005). It was chosen for its ability to gauge multiple dimensions of team effectiveness and capture the interactions that emerge during the early stages of virtual team formation. The survey's design allows us to evaluate the development of perceived team effectiveness and trust, which remain vital for exploration in smaller team contexts (Paul et al., 2021). The choice of TDS was also reinforced by its suitability for small-sized teams, which aligns with the group tasks employed in our study, including insight and incremental tasks adapted from Jun's work. These tasks were carefully crafted to promote task-focused effort and effective teamwork, resonating with the principles of task design highlighted by Hackman (1980). Moreover, TDS's ability to assess team composition and diversity, emphasising the need for team members with complementary skills and the ability to communicate and coordinate effectively, was consistent with our goal of evaluating perceived team effectiveness within dyadic teams. By adapting it to our study's context, we aim to shed light on the relationship between communication efforts and trust-building in virtual dyadic teams.

The "Process Criteria of Team Effectiveness" subdimension of the TDS was selected due to its strong connection to overall team effectiveness and its ability to gauge essential aspects of team interaction and performance (Wageman et al., 2005). Participants provided ratings for statements such as "Team members actively share their specialised knowledge and expertise with one another" or "Our team encounters challenges in implementing the plans we formulate for task progression". These responses were recorded on a five-point scale, ranging from "highly inaccurate" (1) to "highly accurate" (5). Given that perceived team effectiveness is fundamentally a collective measure, we calculated the team's mean scores for these adapted TDS questions. Data analysis and the production of results tables were conducted using the statistical software tool SPSS. We used one-way ANOVA and conducted Tukey's HSD Test for post-hoc multiple comparisons to assess the TDS data. At the conclusion of the survey, participants were also presented with a set of qualitative open-ended questions, designed to elicit their insights and reflections on the intervention, collaborative experience, and overall impressions of the virtual team meeting. Qualitative data extracted their meeting interactions, and from the questionnaires at the conclusion of the study underwent a thematic coding process. This involved a detailed examination of participant responses to identify recurring themes, patterns, and meaningful insights.

5. Results

In this section, we will examine the outcomes of the experimental procedures, encompassing the analysis of introduction structures, followed by an exploration of cognitive performance. Subsequently, we will conduct an in-depth investigation into perceived team effectiveness and finally, we will delve into the qualitative data extracted from the interactions and the post-experiment questionnaires.

5.1. Experimental procedure

Our analysis is based on the data collected from 10 NC dyads (20 participants), 9 TC dyads (18 participants), and 9 VC dyads (18 participants). The sample represented a global perspective, with participants recruited from various regions, including North America, Europe, and Australia. Our participants spanned a broad age range, reflecting the multi-generational workforce often found in global virtual teams. The age groups were distributed as follows (Fig. 3A): 18–25 (14.29%), 26–35 (30.36%), 36–45 (25.00%), over 45 (30.36%). Gender diversity was also a prominent feature of our sample, with approximately 30.91% of participants identified as female, 47.27% as male, 0% as other, with 21.82% of participants who did not specify their gender (Fig. 3B). A breakdown of each of these categories can be observed in Fig. 3. Our sample's distribution included participants from countries such as the United States, India, Romania, the United Kingdom, and Australia (Fig. 3C).

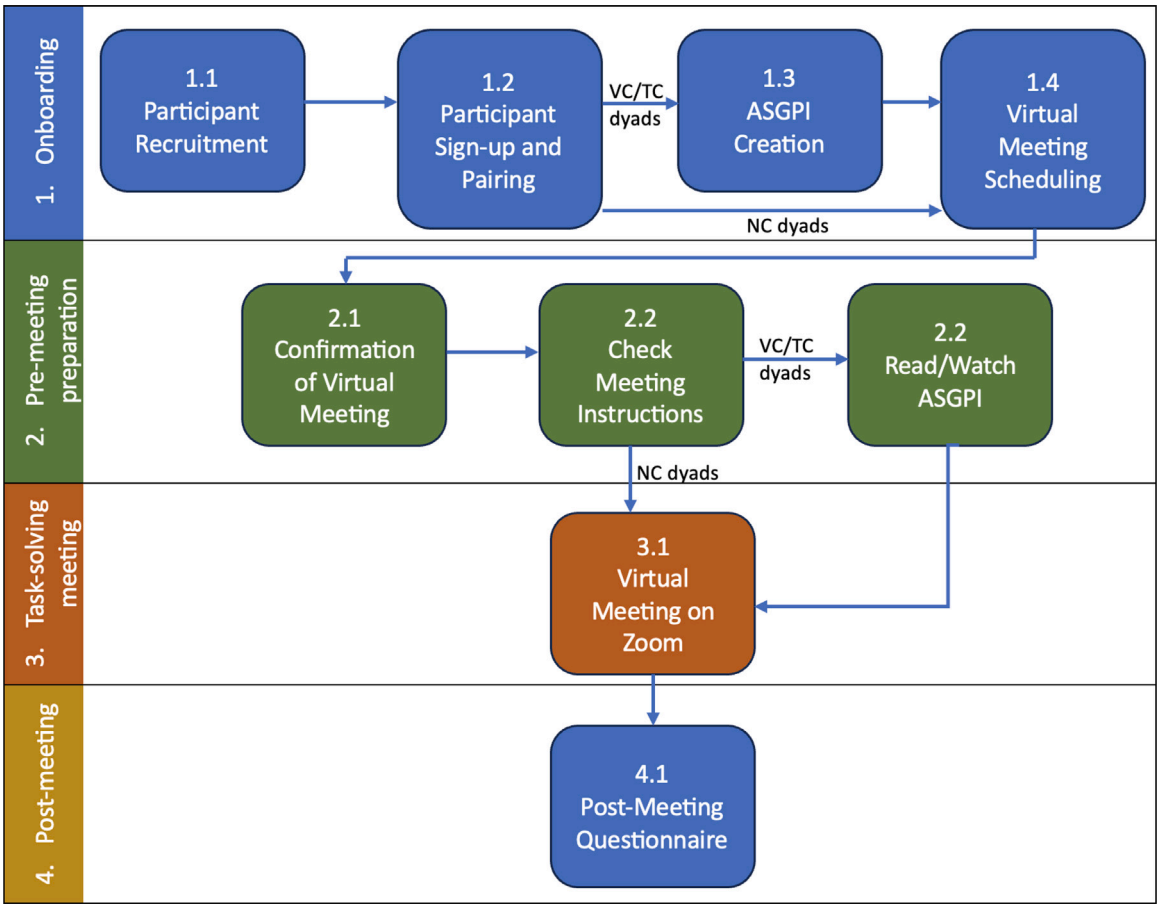

Fig. 2. Four stages of the experiment and outline of steps, 1. the process of onboarding; 2. pre-meeting preparation through scheduling and self-disclosure record; 3. zoom meeting; 4. post-experiment survey.

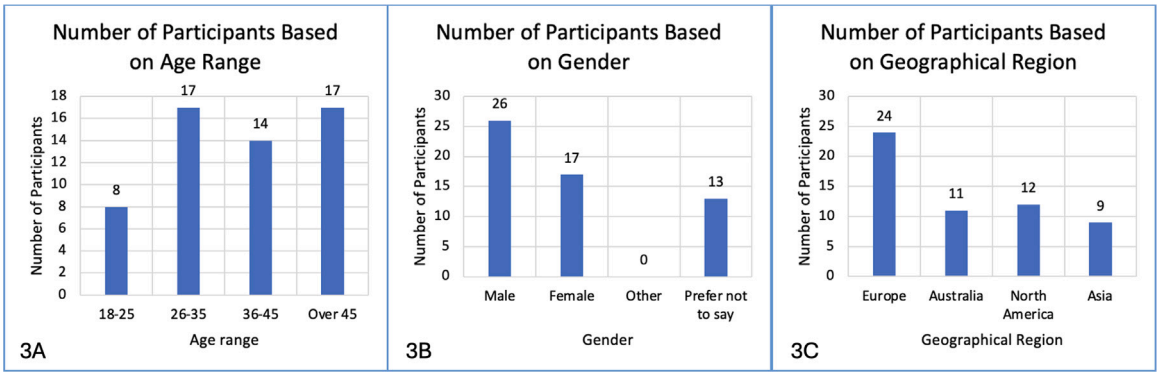

Fig. 3. Distribution of study participants by (3A) Age; (3B) Gender; and (3C) Geographical region.

ASGPI creation

To gain a deeper understanding of how participants initiated their interactions, we examined the introduction conducted within the three conditions:

Video-based ASGPI: VC participants created video introductions with an average duration of 43 s per section. These introductions were accompanied by non-verbal cues, such as facial expressions and gestures, that contributed to conveying their professional identities. The average word count in video-based ASGPIs was approximately 92 words per section (18 participants, across 5 sections of the professional familiarity questionnaire). Participants employed strategies such as storytelling to provide a comprehensive overview of their backgrounds and expertise.

Text-based ASGPI: TC participants composed text introductions with an average word count of 71 words per section. Participants often included personal anecdotes and professional achievements, focusing on written communication to establish their professional identity.

No ASGPI: Within the NC dyads, no professional introductions were provided prior to the meeting. 3 out of the 10 NC dyads attempted a brief introduction, with participants simply providing their names as an initial step and sharing no further information.

Cognitive performance

We conducted an analysis of task performance, whilst considering both completion time and accuracy across the three experimental conditions. It is important to highlight that task performance was not

Table 2
Descriptive statistics for cognitive task completion time (in seconds) and accuracy, along with the Shapiro–Wilk statistical test of normality.

Dependent variable	Descriptive stats				Shapiro–Wilk normality test	
	Condition	Mean	Std. Dev.	Std. Err. Mean	Statistic	Sig.
Completion time	NC	196.944	44.841	12.944	.984	.995
	TC	195.037	45.365	15.121	.947	.662
	VC	190.950	32.152	10.167	.920	.361
Accuracy	NC	4.500	1.167	.337	.900	.156
	TC	3.888	1.536	.512	.924	.429
	VC	3.800	1.686	.533	.910	.283

Table 3
Independent samples t-test results for cognitive performance (Completion Time and Accuracy) with equal variances assumed (non-significant Levene's Test, $p > 0.05$).

Dependent variable	Condition pairing		Levene's test for equality of variances		t-test		
			F	Sig.	t-value	Sig.	Std. Error Diff.
Completion time	NC	TC	.002	.964	.096	.925	19.870
		VC	.396	.536	.353	.728	16.971
	TC	VC	.295	.594	.228	.822	17.888
Accuracy	NC	TC	.979	.335	1.038	.312	.588
		VC	1.019	.325	1.147	.265	.610
	TC	VC	.012	.916	.120	.906	.743

uniform, and it was influenced by various factors, such as participants' backgrounds, skills, and individual knowledge. As one participant remarked, "I could definitely see that my math abilities were, let us say, not at their best", illustrating the role of individual attributes in task execution.

Completion time was determined by totalling the seconds spent on the six tasks, with a maximum possible time of 6 × 4 min, while accuracy was measured as the number of tasks answered correctly out of six. To evaluate the normality of the data distribution for completion time and accuracy, a Shapiro–Wilk test was conducted. The results, showed in Table 2, indicated that none of the three conditions exhibited statistical significance ($p > 0.05$) for either completion time or accuracy, suggesting that the data followed a normal distribution. Therefore, parametric tests were considered appropriate for further analysis.

Given the normal distribution of data in all conditions for both completion time and accuracy, we conducted independent samples t-tests to investigate potential differences in task performance amongst the three conditions. The results of this test are summarised in Table 3. The results revealed no statistically significant differences between the conditions regarding completion time or accuracy. The lack of statistical significance indicates that our intervention (ASGPI) along with the formats we evaluated did not have a substantial impact on task performance. Variations in completion time and accuracy are more likely attributed to individual skills, knowledge, and backgrounds rather than the introduction format.

5.2. Perceived team effectiveness: TDS results

To assess the normality of the data distribution for the Team Effectiveness Criteria TDS score, we applied the Shapiro–Wilk test (Table 4). Notably, this test revealed that the TDS scores for all three conditions exhibited no statistical significance ($p > 0.05$), indicating that the data conformed to a normal distribution. Given the normal distribution of data across all three conditions, we opted to employ a one-way ANOVA to examine whether there existed a statistically significant difference amongst the three conditions — VC, TC, and NC (Table 5). This initial step allowed us to determine if there were overall group differences in perceived team effectiveness. The choice of one-way ANOVA was motivated by our objective to comprehensively assess the impact of these conditions on team effectiveness. Following this analysis, we conducted post-hoc multiple comparisons using Tukey's Honest Significant Difference (HSD) test. This approach enabled us to delve further into the specific pairwise differences amongst the intervention conditions, allowing us to pinpoint which conditions had a statistically significant positive impact on perceived team effectiveness. By following this sequential analytical process, we aimed to provide a robust evaluation of the effectiveness of our interventions and identify any differences between the groups.

Table 4
TDS results: Descriptive statistics for perceived team effectiveness, along with the Shapiro–Wilk statistical test of normality.

Condition	Descriptive stats					Shapiro–Wilk	
	N	Mean	Std. Dev.	Std. Err.	Variance	Statistic	Sig.
NC	20	2.608	.595	.133	.354	.976	.871
TC	18	2.732	.383	.093	.147	.981	.965
VC	18	3.224	.532	.125	.283	.916	.109

Table 5
TDS results: One-way ANOVA to compare effects interventions (VC, TC, and NC) on TDS' subdimension score - Teams' perceived effectiveness.

	Sum of squares	Mean square	F	Sig.
Between groups	3.932	1.966	7.355	.002
Within groups	13.899	.267		
Total	17.831			

As shown in Table 5, the one-way ANOVA revealed that there was a statistically significant difference in the mean of the dyadic team scores ($F(2, 52) = [6.746]$, $p = 0.002$ ($p < 0.05$)) between the VC (Mean = 3.224; std. dev. = .532), TC (Mean = 2.732; std. dev. = .383), and NC (Mean = 2.608; std. dev. = .595). Therefore, in light of the significant differences established by the one-way ANOVA, we proceed with our exploratory analysis, including Tukey's HSD post-hoc comparisons (Table 6), to delve deeper into the results. We aim to conduct these post-hoc comparisons between the conditions and explore their respective effect sizes, allowing us to gain a more comprehensive understanding of the interrelationships amongst the conditions.

Q1: How does having a text-based ASGPI prior to the team's first meeting affect perceived team effectiveness compared to no asgpi?

In comparing no ASGPIs with text-based ASGPIs, we used the Turkey's HSD analysis to examine the potential effect on perceived team effectiveness. The analysis did not reveal any significant difference between the two methods (Mean = −1.123, Std. Dev. = 0.17); p = .75, $p > 0.05$. While there was a trend suggesting an improvement in perceived team effectiveness with text-based ASGPIs, the difference

Table 6
Tukey's HSD post-hoc multiple comparisons over conditions for perceived team effectiveness (TDS Subdimension score).

Dependent variable	I	J	Mean difference (I-J)	Std. Error	Sig.
Perceived team effectiveness	NC	TC	−.123	.170	.750
		VC	−.616*	.167	.002
	TC	NC	.123	.170	.750
		VC	−.492*	.174	.018
	VC	NC	.616*	.167	.002
		TC	.492*	.174	.018

* The mean difference is significant at the 0.05 level.

was not statistically significant. Therefore, we need to explore the next set of questions to address the media type and examine the potential significance of this trend. It is important to note that the lack of statistical significance does not necessarily indicate that the observed trend is not meaningful, but it suggests that the difference between the two methods is not large enough to be detected with the current sample size and statistical methods used. Further investigation is needed to determine whether the trend is a true effect or merely a chance occurrence.

Q2: How does having a video-based ASGPI prior to the team's first meeting affect perceived team effectiveness compared to no ASGPI?

The results of post-hoc comparisons using Tukey's HSD analysis suggest that video-based ASGPI's are more effective in improving perceived team effectiveness compared to no ASGPI. The data indicates that there is a significant difference in perceived team effectiveness between the two conditions (Mean = −.616, Std. Dev. = .167) with a p-value of .002, $p < 0.05$.

Q3: How does the effectiveness of a video-based ASGPI prior to the team's first meeting compare to that of a text-based asgpi?

The post-hoc comparison between text-based and video-based introductions yielded a significant difference in perceived team effectiveness ($p < 0.05$), with video-based ASGPI's showing better results (Mean = −.492, Std. Dev. = .17485) with p = 0.018.

5.3. Analysis of dyadic interactions across experimental conditions

In this section, we delve into an examination of participant interactions during task performance across the three experimental conditions, TC, VC, and NC. To quantify the engagement between participants, we focused on two primary types of interactions:

- Articulated Suggestions: Instances where participants explicitly suggested solutions or approaches.
- Questions: Instances where participants sought clarification or additional information.

Fig. 4 illustrates the total number of interactions observed between participants during the task performance in each dyad for all three conditions.

To investigate the interactions within dyadic teams under various conditions, we employed a reflexive thematic analysis, guided by Braun and Clarke' framework (Braun and Clarke, 2019; Clarke and Braun, 2017). This approach allowed us to identify and interpret themes related to task engagement and interpersonal dynamics. Initial coding was driven by both the content of interactions and the underlying context provided by different introductory formats. In the NC groups, where dyads lacked prior knowledge about each other, our analysis revealed a thematic emphasis on task-oriented communication. For example, 8 of the dyadic interactions frequently revolved around clarifications, such as "How do you think we should do this?" or "How do we start?", highlighting a straightforward, objective-focused dialogue. The thematic presence of direct queries underscored the limited scope of engagement when personal context was absent. Conversely, the TC groups showed a shift in thematic content, with 3 dyads exhibiting an enhanced engagement level. This was reflected in more detailed exchanges that incorporated participants' professional backgrounds, as in "You work in engineering, did you do anything similar before?". This theme of leveraging professional backgrounds for task-related discussions indicated a deeper, though still primarily task-focused level of interaction. The most complex thematic transformation was observed in the video-based ASGPI groups, where the rich auditory and visual cues facilitated a broader range of interactions. Notably, 7 participants moved beyond task clarification, engaging in personal and collaborative discussions. This thematic domain included articulated suggestions rooted in personal insights from video introductions, such as "I noticed in your video you said you worked with [project details]; could we use that here?". The emergence of this theme illustrates the significant impact of richer introductory formats on fostering collaborative dynamics.

Reflexivity was pivotal in our analytical process, guiding our interpretation of the data and ensuring awareness of the potential influence of the research setting on theme identification and analysis. Adhering to Braun and Clarke' methodological guidelines, this approach enabled a detailed examination of how various introduction methods influence dyadic collaboration, underscoring the significant role of personal and professional backgrounds in enriching team dynamics.

5.4. Analysis of participant feedback and insights on collaboration

After completing the TDS, participants were asked to provide feedback on their experience and assess the quality of their team collaboration and interaction with their peers through an open-ended question. The qualitative data collected was used to complement the quantitative information and identify any patterns in the participants' experiences. We analysed the qualitative input of 45 participants out of the total number of participants. In this section, we provide an in-depth exploration of the rich insights derived from participants' open-ended responses to our questionnaire. Two independent coders systematically examined the data to identify recurrent patterns and themes that emerged from participants' comments across the three conditions: Relations between cognitive performance and perceived effectiveness, the importance of ASGPI over no ASGPI, and the value of video over text-based ASGPIs.

Unrelated aspects: Cognitive performance and perceived effectiveness

Our goal was to provide participants with a mix of activities that required both logical and intuitive skills, such as drawing, spelling, and calculating. However, we found that familiarity with tasks played a larger role in team performance than we initially thought. Participants unfamiliar with the specific tasks presented in our study tended to have lower accuracy rates, suggesting that task familiarity may vary significantly across different cultural or educational backgrounds. However, this did not necessarily affect their perception of team effectiveness. Two out of the 18 participants in the TC group mentioned that knowing who the other person was beforehand reduced their anxiety when starting the meeting, even though their team scored lower on accuracy (16%). Similarly, in the VC group, one participant said that they enjoyed the experience despite their poor performance on the tasks because they specialised in geography, while three others mentioned that while they were not great at "puzzle" activities, they had "fun". We observed that overall, 24 participants (8 from TC and 15 from VC and 1 from NC) reported that they were more inclined to collaborate, communicate, and solve problems together as a team when they had a professional context about each other before the meeting, whilst only one of the participants from the NC group reported this. Overall, it was discovered that a majority of participants in ASGPI

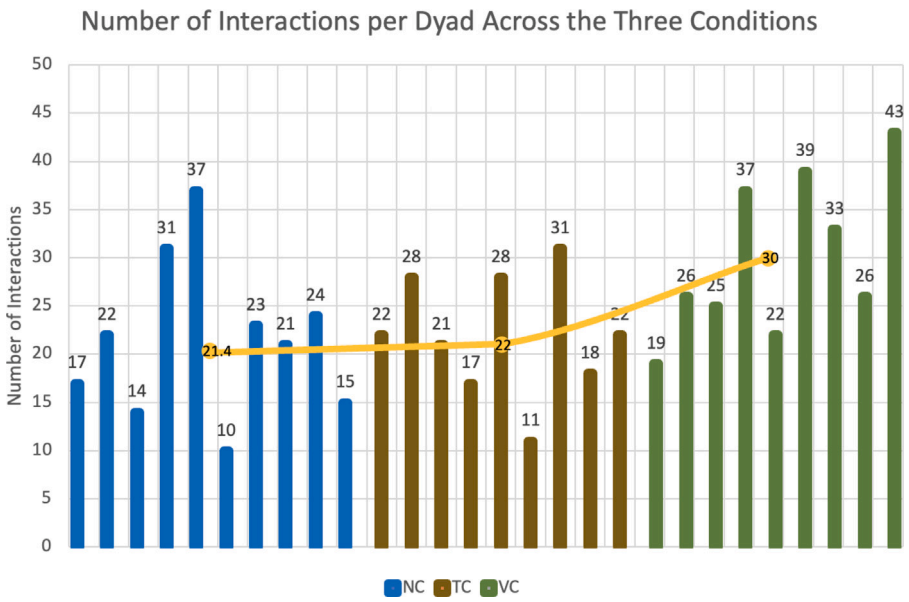

Fig. 4. The total number of interactions (the summary of articulated suggestions and questions) across the dyads of each experiment condition: NC, TV, and VC. Illustrated by the yellow trendline is the average of the interactions in each condition.

groups expressed satisfaction and enjoyment towards the collaboration experience, with many reporting positive feelings of working together on the tasks, though they acknowledged cognitive performance was not their asset. For example, some participants commented that it was a "very interesting, exciting experience" (VC), or that they "loved working with someone [they had] never met before" (TC), or that it was "exciting and fun" (VC).

Text-based and video-based ASGPIs: Better than no ASGPI

Amongst the 20 participants in the NC group, a majority of 14 participants opted for succinct and concise responses, averaging around 13 words per section to convey their experiences and thoughts, whilst the remaining 6 participants chose to provide more detailed explanations, with an average response length of 27 words per section. Contrasting the NC group, it is noteworthy that participants in the TC and VC groups displayed remarkable engagement and participation, with all participants in these groups (except for two individuals in the TC group) contributing substantial feedback and in-depth information, forming a significant portion of our qualitative analysis (average response lengths of 33 for TC and 31 for VC). This engagement underscores the effectiveness of text and video-based ASGPIs in fostering deeper involvement and offering more insightful feedback from participants, compared to no ASGPI. However, we did not observe any difference in responsiveness between TC and VC participants. The difference between these two conditions was more related to the media used, with video-based introductions being more effective in conveying visual cues. Participants in the TC and VC groups wrote more conclusive and elaborated responses, with comments such as "their experiences and expertise made me curious about them" (TC) and "It was very helpful having to see the video of the other group member. It gave me a background to [their] work and [their] personality" (VC). Three participants in the TC condition expressed a desire to "say hi" to the other person and "see what they're about", and two participants even mentioned finding it tiring to read lengthy written introductions and preferring to get to know their teammates in a different way. These similarities in participant comments were found indicating trends related to the use of professional introductions. Six NC participants stated they felt like something was "missing" and expressed a lack of motivation to collaborate. One of these participants described teamwork as something they "had to deal with" rather than an "interesting experience", which is what one TC participant pointed out. When comparing NC groups to TC and VC participants, who were professionally acquainted, the more comprehensive feedback and comments point to higher satisfaction on capabilities and team interaction. One TC participant said "The experience was lovely, I actually learned quite a lot from the other participant, and I'm very happy I decided to join". A VC participant stated "Really loved it, wish there were more tasks so that we could have a bit more fun solving them. It all came so natural to both of us!"

Differences between text and video: Information sharing and collaboration

In our analysis of participants with video-based ASGPI and text-based ASGPIs, we compared the information provided in the Professional Familiarity Questionnaire with the comments made by participants in TC or VC groups. In TC groups, while 11 out of 18 participants gave extensive professional information in their ASGPIs (more than three-quarters, 75 words, of the available space), the other 7 gave only brief statements and used less than half (50 words) of the available writing space per section. One TC participant mentioned that their peer "wrote a lot at the beginning", and another felt "a bit bad" about not providing as much information as their peer. No such comments were observed from the VC participants, as VC groups had a more balanced amount of information from both team members due to the use of recordings: all 9 VC dyads had made use of the 1-min limits on videos. We emphasise the importance of balance in the information provided by both participants in self-disclosure, which can lead to quicker trust formation. In VC dyads, communication was more balanced, with participants of 6 dyads frequently expressing appreciation for their partner's input and agreeing on task management and problem-solving strategies, as evidenced by statements such as "I'll read a question, and you read the next one" and "You solve the first half of the question, and I'll solve the second half". This interaction only occurred 3 times in TC groups, and none in NC groups. Moreover, we found that VC participants engaged in humour and collaborative problem analysis more frequently than participants in the TC groups. Specifically, in the VC condition, 7 of the dyads made jokes or collaboratively analysed the tasks, indicating a quicker development of interpersonal interaction, compared to only 3 dyads in the TC group.

Furthermore, the differences between the TC and the VC groups become more apparent from further observations made by participants in regard to their information sharing. Participants in TC groups felt as though "something was missing". For example, one participant stated they "had little time to know more about each other outside of

the tasks". Thus, seeing and hearing one's professional expertise and experience adds value that is harder to extract from text alone. One of our VC participants noted that "seeing who I'm gonna talk with definitely helped me accommodate with the process easier and faster". Such observations were supported by NC participants as well, where one declared that "it may have been helpful to have a couple of minutes to see them and say hi". Furthermore, the uneven balance between TC dyad introductions imposed a feeling of uncomfortableness, as we discovered that in one dyad, a participant stated "I felt a bit guilty because [their peer] has written more than me in their introduction", whilst a participant in another dyad saying "I didn't know if the information I'm providing is much more detailed than [their peer]". However, VC dyads did not face this challenge, as it was clear how long people had for their responses. On the contrary, participants within the VC groups expressed satisfaction with the opportunity of viewing their peer's introduction video prior to the first meeting, with one participant stating that they "watched [their peer]'s video twice" and another mentioning that "the fact that I knew the other person before joining the meeting made me feel less anxious about what I need to do".

6. Discussion

Our study examined the idea of improving perceived team effectiveness in newly-formed, dyadic, virtual teams using three conditions. In the following section, we will first discuss the results of our study and then delve into an examination of its limitations.

6.1. Impact of asynchronous, semi-guided, professional introductions

Previous research has shown that effective team introductions can improve communication and collaboration within the team (Owens and Hite, 2022; Sutherland et al., 2022). HCI research, in particular, has primarily focused on improving the virtual meeting time and environment for remote teams through the use of data visualisations and virtual environment representations (Altschuller and Benbunan-Fich, 2013; Jones et al., 2020; Son et al., 2019). This focus has addressed the in-meeting dynamics. However, our study highlights the importance of exploring ways to support team collaboration outside of the meeting itself in what we refer to as the "meta-meeting" space. Building on previous research on virtual team collaboration and icebreaker activities, we examined the impact of different types of introductions in an online group work setting, which is becoming increasingly common in the current era of remote work and online learning. In our study, the ASGPI tool was used to explore this meta-meeting space, and our findings suggest that there may be further opportunities to develop and utilise this time and space. We employed statistical tests to compare the impact of no ASGPI, text-based ASGPIs, and video-based ASGPIs on perceived team effectiveness and collaboration.

Leveraging the meta-meeting space

Our quantitative analysis unveiled notable differences in the impact of different introduction formats on perceived team effectiveness. Specifically, we found that video-based ASGPIs led to a significant improvement in perceived team effectiveness compared to both no introductions and text-based ASGPIs. However, it is important to note that text-based ASGPIs, although not reaching statistical significance over no introductions, exhibited a promising trend hinting at their potential effectiveness. The video-based introductions, in contrast, demonstrated a statistically significant advantage over no introductions. This finding highlights the effectiveness of video-based ASGPI formats in promoting perceived team effectiveness. This observation aligns with established theories such as Media Richness and Social Presence Theory, which suggest the importance of associating knowledge and experience with a face (Cui et al., 2013; Daft et al., 1987; Olson and Olson, 2013). Additional support for our findings comes from recent research that underscores the importance of associating experience with a face and the value of employing visual cues, which can prevent misunderstandings and unfavourable first impressions (Yang et al., 2023). This is particularly relevant as visual cues provided by video introductions offer a unique capability to convey authenticity, sincerity, and emotions.

Video ASGPIs allow for personalisation, self-expression, and social bonding, which are crucial for enhancing team effectiveness and collaboration (Johnson et al., 2014). Videos excel in conveying non-verbal information that can be lost in text-based ASGPIs, deepening the understanding of team members' personalities and communication styles (Yang et al., 2023). This enables team members to gain a deeper understanding of their colleagues' personalities, tones, and communication styles, leading to enhanced trust and collaboration. In addition, video-based introductions provide a level of flexibility that is not possible with text introductions, making them particularly valuable for remote dyads or dyads operating across different time zones. These findings underscore the importance of considering the media type in introductions and suggest the potential benefits of video-based ASGPIs for fostering community, collaboration, and creativity amongst team members. However, the use of video in introductions can also accentuate surface-level differences amongst culturally diverse team members, potentially fostering a sense of "otherness". While video ASGPIs excel in conveying non-verbal cues and facilitating deeper understanding and social bonding, they may also highlight differences in skin colour, attire, and accents, impacting perceptions, trust levels and team dynamics (Little and Roberts, 2012; Birkás et al., 2014).

Moreover, our study indicates that supporting collaboration in the meta-meeting time and space plays a pivotal role in enhancing not only performance and trust but also in fostering team closeness and the feeling of connectedness amongst team members. The positive impact of ASGPI formats, particularly video-based introductions, on perceived team effectiveness extends beyond the quantitative measures we examined. It encompasses the qualities that contribute to team cohesion and synergy. The ability of video-based ASGPIs to convey authenticity, emotions, and personalisation is a demonstration of their potential to strengthen interpersonal connections. These qualities provide an opportunity for team members to not only understand each other's professional backgrounds but also to connect on a more personal level. By offering a richer and more engaging experience, video-based ASGPIs create a sense of community, enabling team members to establish not only professional but also personal bonds. This dynamic is crucial for dyads collaborating remotely, as it transcends geographical boundaries and bridges the gap between team members scattered across different time zones. As organisations increasingly rely on remote and virtual teams, the nurturing of such connections outside of formal meetings is a strategic avenue for fostering effective teamwork in virtual environments. However, acknowledging the dual nature of video introductions, future applications should consider strategies to mitigate the potential for emphasising "surface-level diversity", such as cultural sensitivity training and guidelines for creating inclusive video content. Moving forward, our findings indicate promising avenues for using video-based ASGPIs to enhance perceived team effectiveness, although these results are context-specific. Further research is imperative to understand how these methods can be generalised across various virtual team settings. Given the dual nature of video introductions, future studies should explore strategies to harness their potential for deepening interpersonal connections while also addressing the challenges they present in highlighting cultural and personal differences.

Key aspects to an ASGPI: Asynchrony, semi-guidance, professional familiarity

Our study provides further insights into the roles of asynchrony, semi-guidance, and professional familiarity in dyadic team collaboration and the formation of ASGPIs. The benefits of asynchrony became evident as participants had the opportunity to get to know each other before the meeting, facilitated by the ASGPI tool, which allowed them to view each other's video introductions in advance.

The semi-guidance aspect, especially evident in the professional context of introductions, proved to be influential in shaping the dyad's collaborative dynamics. The structured nature of these introductions provided team members with a well-defined framework to follow, encouraging them to introduce themselves with a professional focus. This semi-guided approach not only streamlined the introduction process but also ensured that team members highlighted their professional expertise, experiences, and competencies, making it easier for others to grasp the value each individual brought to the team.

Lastly, the professional familiarity aspect was found to be crucial for effective collaboration, as evidenced by participants' comments in both the TC and VC groups. Team members expressed their desire to collaborate again or stay in touch, emphasising the importance of professional connections. The study's TDS results further confirmed the significance of professional knowledge amongst team members: both TC and VC participants provided more comprehensive responses, demonstrating their curiosity about their team members and the value of understanding their professional backgrounds and personalities.

In contrast to using ASGPI formats, participants' qualitative responses showed that NC participants expressed lower motivation to collaborate and viewed teamwork as a task they simply "had to deal with". Conversely, those in TC and VC groups exhibited higher satisfaction, acknowledging their colleagues' capabilities and the overall team interaction. The findings collectively emphasise that by dissecting these aspects of asynchrony, semi-guidance, and professional familiarity, our study contributes valuable insights into optimising team collaboration in virtual environments.

Cognitive performance, interactions and ASGPI

As we delve into the implications of our study's results, it is noteworthy that while we found significant effects of ASGPI formats on perceived team effectiveness and collaboration, cognitive performance was not significantly affected by the introduction format. This observation is valuable in that it suggests a decoupling of perceived team effectiveness from cognitive task performance. Despite dyadic team introductions playing a significant role in enhancing collaboration and trust formation, our results indicate that individual cognitive performance remains influenced by personal attributes, knowledge, and skills rather than the format of dyadic team introductions. This outcome underscores the complexity of virtual teamwork dynamics, where perceived team effectiveness, which relies heavily on social interactions and trust, can coexist with individual cognitive abilities unaffected by the introduction method. As organisations increasingly rely on remote and virtual teams, understanding the multifaceted nature of team dynamics is vital. It is evident from our findings that interventions aimed at improving dyadic team collaboration, such as ASGPIs, can effectively enhance social aspects without necessarily altering individual cognitive capacities. However, Carte and Chidambaram (2004) argue that strategic deployment of collaborative technology capabilities could enhance performance by effectively managing the challenges and benefits presented by diversity within teams. This observation calls for an approach to building and maintaining effective virtual dyadic teams, where cognitive performance and dyad dynamics are addressed independently. Thus, future research can further explore these interactions to optimise remote teamwork environments.

In addition to cognitive performance, we examined participant interactions during the experiment through the three conditions and observed patterns of collaborative dynamics fostered by different introduction formats. The difference in the average number of interactions across conditions suggests that a richer introduction format, a video-based ASGPI, stimulates a more engaged and interactive environment amongst participants. The thematic analysis further unravelled the nature of these interactions. In NC groups, interactions were predominantly task-centric, with participants seeking basic clarifications. TC groups exhibited a deeper engagement, with participants leveraging textual information for nuanced discussions. VC groups, benefiting from both visual and auditory cues, surpassed the others. Here, interactions transcended task-related queries to include personalised exchanges and collaborative problem-solving. This aligns with prior research emphasising the impact of media richness on collaborative outcomes (Olson and Olson, 2013). This exploration underscores the role of introduction formats in shaping the collaborative dynamics within dyadic teams, with richer media fostering a more interactive and engaged environment.

Implications over subsequent uses of ASGPI

In our study, we investigate the advantages of supporting team collaborations in the pre-meeting asynchronous space, beyond the virtual meeting, which leads to a more efficient and effective collaboration process. To achieve an equal-playing field, we propose a standardised format for creating virtual professional introductions that allow everyone to be heard before the actual meeting. The asynchronous approach enables individuals to make unlimited edits and take their time in creating their introductions, leading to introductions that are not challenged during subsequent meetings, thus promoting trust formation.

A significant benefit of this approach is the time-saving factor. Once these introductions are recorded, they can be reused for multiple instances, eliminating the need to repeat the process in every meeting. This contrasts with the traditional synchronous method where valuable meeting time is dedicated to individual introductions and listening to others' introductions, often taking up a substantial portion of the meeting's duration. In a hypothetical scenario, when individuals first adopt ASGPI, they invest time in creating and editing their initial introductions. Before the initial team meeting, each team member is required to view the introductions of others. However, as they engage in subsequent collaborations with new teams, the efficiency of using pre-existing video introductions becomes evident. New team members can simply view their colleagues' introductions without the need to create their own, resulting in significant time savings. By reusing these introductions, valuable time is saved, illustrating the efficiency of our approach.

In our study, thoughtful responses to the questions within the Professional Familiarity Questionnaire were integral to our approach in enhancing perceived team effectiveness. While some of the questions may require more in-depth thinking, they were designed to encourage participants to share essential professional information, thereby fostering a deeper understanding of their team members. The video creation process, accompanied by clear examples and time constraints, was carefully structured to strike a balance between eliciting meaningful responses and maintaining efficiency. It is worth noting that while the initial time investment for participants to create their video introductions may seem substantial, the ability to reuse these introductions for subsequent collaborations introduces significant efficiency gains. This mechanism reduces the time spent on repetitive introductions, enabling team members to redirect their efforts towards more productive discussions and collaborative work.

In essence, we propose a shift from the synchronous to the asynchronous, highlighting the advantages of pre-meeting preparation. By watching these introductions beforehand, team members can arrive at the meeting already acquainted with their colleagues, leading to a more focused, time-effective, and productive meeting. This approach not only saves time but also enhances the overall meeting experience, allowing team members to engage more deeply in discussions and decision-making rather than spending valuable meeting time on repetitive introductions. Moreover, this approach becomes even more advantageous in larger team settings, particularly due to the semi-guidance factor, which provides a controlled introduction process and ensures that all team members present balanced responses in terms of both time and content—a critical consideration for maintaining effectiveness in larger collaborative environments.

6.2. Limitations

Larger team settings

In addressing the consideration of larger team settings, it is crucial to recognise that our study primarily focused on the dynamics within dyadic virtual teams. While our findings provide valuable insights into the advantages of the ASGPI approach in this context, the transition to larger teams may introduce distinct challenges. Teams comprising more than two members often exhibit intricate dynamics, which can be further influenced by factors such as coordination, communication, and workload distribution. The potential impact of ASGPI on larger teams is an area that warrants exploration in future research, as the dynamic interplay within larger teams may yield diverse outcomes. As such, our study serves as a foundational step in understanding ASGPI's implications for team effectiveness within dyadic collaborations, with opportunities for extending this knowledge to encompass larger team scenarios.

Professional familiarity content

The limitation regarding the Professional Familiarity Questionnaire pertains to the nature of the content generated by participants in response to items within the professional familiarity questionnaire. While our study employed a framework that invited participants to share positive aspects of their professional experiences, it is essential to acknowledge that the exclusion of negative or more diverse experiences could present limitations in capturing the full spectrum of familiarity within the team. This limitation primarily relates to the potential for self-disclosure to be skewed towards positive narratives, possibly diminishing the depth of shared experiences amongst team members. By fostering an environment where participants can express both positive and negative aspects, a more comprehensive understanding of professional familiarity could be obtained, offering insights into the intricacies of team dynamics. Future research may consider incorporating this approach to further explore the multifaceted nature of professional familiarity and its influence on collaborative outcomes.

Cross-cultural global teams

This study, while offering valuable insights into the dynamics of virtual teams and professional introductions, acknowledges its broadly Western-centric perspective, which may limit its cross-cultural applicability. The impact of cultural differences in multicultural teams is apparent (Laroche, 2012), and our research framework, predominantly drawn from Western sources, may not fully capture the diverse practices and cultural variations associated with professional introductions globally. Stahl et al.' meta-analysis (2010) and research by Hertel et al. (2005) underline the critical importance of understanding cultural diversity's impact on team processes, especially in the context of global virtual teams. Additionally, Staples and Zhao (2006) and He et al. (2017) work suggest that technological interventions can mitigate some challenges posed by cultural diversity, pointing towards the potential for more inclusive collaboration tools. However, our study's underrepresentation of non-Western introduction practices highlights a gap. The recognition of cross-cultural distinctions in professional introductions is crucial. Professional practices, particularly introductions, can significantly differ across cultures, sometimes emphasising relational aspects over task-related details (Laroche, 2012). Our findings suggest that effective communication and trust-building, crucial from the onset of team formation, must be sensitive to these cultural differences. The limitation posed by conducting our study in English also raises concerns about language proficiency and communication challenges faced by non-native speakers, as evidenced by He et al.' emphasis on automated feedback fostering empathy amongst team members from diverse backgrounds. To bridge the effectiveness gap identified in virtual dyadic teams and beyond, future studies should delve deeper into the practices and cultural variations associated with professional introductions in a global context. Exploring the specific mechanisms through which cultural diversity influences team dynamics and outcomes, as suggested by the work of Staples and Zhao (2006), and examining the role of technology in enhancing cross-cultural understanding, will be critical. While we acknowledge the role of technology in potentially bridging cultural gaps (He et al., 2017), we advise caution in extending our results to non-Western settings without further research that includes a broader range of cultural perspectives. This approach will not only address the limitations highlighted by this study but also pave the way for developing more culturally inclusive virtual work environments.

6.3. Future work considerations

The findings from this study open up exciting possibilities for future research in the meta-meeting design space. One direction for future work could be exploring the impact of ASGPIs on team performance over a more extended period, examining how introductions and dyad dynamics affect lasting collaborations. Another promising avenue for future research is exploring the impact of incorporating bodily knowledge (Guo et al., 2023) such as chronotypes and chronobiology into virtual team collaboration design. Jun et al.'s research 2019 provides a starting point for this exploration, demonstrating that bodily knowledge can enhance trust-building experiences in team collaboration. However, there is a gap in the literature regarding the application of this concept in virtual teams, and further research is needed to understand its potential benefits. Incorporating bodily knowledge into virtual team collaboration design presents an exciting opportunity for future research in enhancing trust-building experiences and fostering effective collaboration (Andres et al., 2020; Jun et al., 2019; Tabor et al., 2020).

7. Conclusion and contributions

Effective collaboration and trust are often more difficult to achieve in virtual teams than in-person settings. Research has previously highlighted the importance of introductions and their impact on team satisfaction, trust, and engagement. However, in the field of HCI, there has been a lack of exploration into the support of interactions for introductions. Our research with ASGPI provides valuable contributions to this under-investigated area.

(1) First, our study assessed the effectiveness of ASGPI as a mechanism for asynchronous, semi-guided, professional introductions in new virtual dyadic teams. The results showed that the video-based form of the approach positively contributes to perceived team effectiveness, as evidenced by a higher perceived team effectiveness score compared to the text-based and no ASGPI conditions.
(2) ASGPI offers a unique innovation by providing introductions outside of the meeting context, allowing for asynchronous access by all team members. Our qualitative responses suggest that this approach is highly valued, as it enables rehearsal and time limits on a set of questions that can enhance the value of the introduction beyond what is possible in synchronous virtual meetings.
(3) The Professional Familiarity Questionnaire, which forms the foundation of ASGPI, draws from research on the value of professional competencies that enhance perceived team effectiveness and ultimately, trust and satisfaction with collaborative processes. This questionnaire has the potential to be applied in other contexts beyond ASGPI.

Furthermore, the COVID-19 pandemic has brought to light the issue of back-to-back meetings and the negative impact it can have on productivity and wellbeing (Augstein et al., 2023). As a result, there has been a growing interest in finding ways to create space between meetings and improve the quality of virtual interactions. Our research

suggests that the use of video-based, asynchronous, semi-guided, professional introductions can help address this issue. By providing team members with the opportunity to get to know each other's professional backgrounds before meetings, it allows for more focused and productive discussions. Moreover, this approach can be especially helpful for dyads working across different time zones, as it provides a way for team members to connect and collaborate asynchronously, reducing the need for constant synchronous communication. While our approach allowed us to gain insights into the use of introductions for building professional relationships and perceived team effectiveness, we acknowledge that the small sample size limits our ability to make broader generalisations. Future studies with larger sample sizes and more diverse populations could provide a more comprehensive understanding of the effectiveness of ASGPI in professional networking.

To summarise, ASGPI employs a strategy of Dixian Reconstruction, rather than Reproduction, to transfer physical experiences to digital settings. By leveraging the benefits of digital materials in facilitating interaction amongst virtual dyadic teams, we developed an approach that tackles the challenge of virtual teams historically experiencing lower levels of perceived effectiveness compared to their physical counterparts. As we continue to digitally transform how work is done in the 21st century through more people embracing remote and distributed work, it is vital to explore how technology can support wellbeing and effective collaboration in virtual teams. Our work contributes to this gap to benefit more people's wellbeing by utilising digital affordances such as asynchrony and rehearsal which can significantly enhance virtual dyadic team satisfaction and perceived team effectiveness, starting from the very first meeting.

Ethics

The studies involving human participants were reviewed and approved by the ERGO Ethics and Research Governance Office (56029.A1), University of Southampton. The patients/participants provided their written informed consent to participate in this study. ERGO Ethics and Research Governance Office, University of Southampton (56029.A1).

CRediT authorship contribution statement

George Catalin Muresan: Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Conceptualization. **Sebastian Mititelu:** Writing – review & editing, Software, Investigation, Data curation. **Josh Andres:** Writing – review & editing, Visualization, Resources. **m.c. schraefel:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Problem solving tasks

A.1. Insight problems

Prisoner: A prisoner was attempting to escape from a tower. He found in his cell a rope which was half long enough to permit him to reach the ground safely. He divided the rope in half and tied the two parts together and escaped. How could he have done this? Explain specifically what he did.

Water lilies: Water lilies double in area every 24 h. At the beginning of summer there is one water lily on the lake. It takes 60 days for the lake to become completely covered with water lilies. On which day is the lake half covered?

Socks: If you have black socks and brown socks in your drawer, mixed in a ratio of 4 to 5, how many socks will you have to take out to make sure that you have a pair the same color?

A.2. Incremental problems

Age: Ann is twice as old as her son. They were both born in June. Ten years ago Ann was three times as old as her son. What are their present ages?

Store: Smith is a butcher and president of the street storekeepers' committee, which also includes the grocer, the baker, and the pharmacist. They all sit around a table.

- Smith sits on Jones' left.
- Davis sits at the grocer's right.
- Bailey, who faces Jones, is not the baker.

Words: Rearrange the following patterns to make familiar words:

- runghy;
- flymia;
- mulcica;
- dornev;
- lendraca.

Appendix B. TDS: Team effectiveness process criteria

Our post-experiment questionnaire featured TDS questions rated on a 5-point Likert scale, covering three subdimensions within the Team Effectiveness Process Criteria section: highly inaccurate, inaccurate, neutral, accurate, and highly accurate.

B.1. Effort-related process

Members demonstrate their commitment to our team by putting in extra effort to help it succeed.

Everyone on this team is motivated to have the team succeed.

Some members of our team do not carry their fair share of the overall workload.

B.2. Strategy-related process

Our team often comes up with innovative ways of proceeding with the tasks that turn out to be just what is needed.

Our team has a great deal of difficulty actually carrying out the plans we make for how we will proceed with the task.

Our team often falls into mindless routines, without noticing any changes that may have occurred in our situation.

B.3. Knowledge and skill-related process

How seriously a member's ideas are taken by others on our team often depends more on who the person is than on how much he or she actually knows.

Members of our team actively share their special knowledge and expertise with one another.

Our team is quite skilled at capturing the lessons that can be learned from our work experiences.

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