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SURVEY ARTICLE

A Review of Online Social Conformity: Outcomes and Determinants

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ABSTRACT

Social conformity occurs when individuals forego their personal judgements to agree with opposing judgements of a group majority. While conformity was initially observed and investigated in physical groups, recently there has been an increasing interest to understand dynamics of this phenomenon in online group settings. This survey summarises 36 years of social conformity literature (1988–2023) and reviews its occurrences, positive and negative outcomes, and contextual and personal determinants in online groups. By doing so, we identify gaps in the conformity literature that require further investigation, discuss common challenges and inform the design of future online conformity studies.

KEYWORDS

Online social conformity; contextual and personal determinants; outcomes; majority group; experimental task; social presence; gender; age; personality; culture; confidence

1. Introduction

Social conformity is a powerful social phenomenon that motivates individuals in group settings to forgo their personal judgements to agree with contradicting judgements of the group's majority (Asch, 1951). Since early 1950s, researchers have investigated occurrences of social conformity in physical groups, primarily to understand its impact on group decision making processes (Asch, 1955; Deutsch & Gerard, 1955). For instance, in the landmark "line judgement" study by Asch (1951) where participants matched a straight line with one of three other options based on length, researchers observed that the presence of a unanimous group majority compelled participants to conform to its clearly incorrect judgements in 33% of responses. Comparing this behaviour to the 1% of errors made when completing the same task in the absence of a group, Asch (1951) suggests that social conformity can have serious repercussions on the quality of group judgements.

A subsequent study by Deutsch and Gerard (1955) proposed a theory to explain conformity behaviour by distinguishing between *normative* and *informational* conformity. The authors describe *normative* conformity as the tendency to align with the expectations of the majority in order to be accepted or "liked" by the group. This concept was further corroborated by research that highlighted conformity as a result of individuals' desire to fit in with others (Levine, 1999) and to maintain a sense of belonging (Cialdini & Goldstein, 2004). Conversely, *informational* conformity refers to the tendency to adopt the majority's judgement, particularly in ambiguous situations, where the majority's judgement is perceived as more accurate than one's own. Levine (1999) also emphasised the significance of informational influence in conformity, noting that individuals often seek guidance from groups when the correct course of action is uncertain. Therefore, while normative conformity is driven by the desire for social acceptance, informational conformity arises from a need for accuracy and guidance in uncertain situations.

Moreover, since *Asch*'s line judgement study, the literature has investigated factors that directly influence (encourage or discourage) conformity behaviour—from here on referred to as conformity *determinants* (Bond, 2005; Bond & Smith, 1996). These studies, while restricted to physical groups, have quantified effects of multiple *contextual* and *personal* determinants that can influence a person's decision to conform or not. More specifically, contextual determinants form the *external* social pressure situation that trigger conformity behaviour from the participant involved. For instance, the number of group members opposing participant's personal judgement (Allen & Levine, 1968, 1969; Goldberg, 1954; Mouton et al., 1956; Rosenberg, 1961, 1963), and the nature of the experimental task (Blake et al., 1957; Crutchfield, 1955; Deutsch & Gerard, 1955; Sistrunk & McDavid, 1965) are identified as critical contextual determinants of conformity. Conversely, personal determinants—i.e., user gender (Costanzo & Shaw, 1966; Endler et al., 1973; Larsen, 1974; Santee & Maslach, 1982), confidence (Baron et al., 1996; Rosenberg, 1963), personality (Crutchfield, 1955; Strickland & Crowne, 1962), age (Allen & Newtson, 1972; Costanzo & Shaw, 1966; Klein, 1972; Pasupathi, 1999) and culture (Huang & Harris, 1973; Milgram, 1961; Sistrunk et al., 1971; Whittaker & Meade, 1967)—relate to individuals, and are used to explain individual differences in susceptibility to social influences in physical groups.

More recently, with the increasing proliferation of societal interactions in online group settings (Christopherson, 2007; Grieve et al., 2013; Li et al., 2022; Vorderer et al., 2016),

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understanding how social conformity manifest and impact our opinions and online behaviours has become crucial. This is particularly important as online groups become spaces for political discourse (Papacharissi, 2004; Popan et al., 2019), collaborative learning (Kreijns et al., 2003), and information seeking (Morahan-Martin & Schumacher, 2003; Shih et al., 2012)—all of which rely on judgements and opinions of groups and hence can be significantly impacted by social conformity influences. On one hand, online social conformity can exacerbate the already polarised nature of political discourse by pressuring individuals to adopt dominant, and sometimes extreme, views within their online groups (Panizza et al., 2021). Social conformity can also lead individuals to prioritise information that aligns with the group consensus, potentially overlooking more accurate or relevant sources (Bakshy et al., 2015). On the other hand, social conformity can be harnessed to promote positive and constructive behaviours in online groups, especially where traditional methods are less effective or where changing a person's mind is particularly challenging (Contractor & DeChurch, 2014). Thus, investigating the dynamics of social conformity in online spaces is critical to understanding how they shape individual behaviour and decision-making.

However, as online groups significantly differ from physical groups (McKenna & Green, 2002) the extent to which social conformity influences can impact user behaviours in the former is unclear. For instance, social interactions in physical groups that have led to conformity behaviour are often real-time and verbal, insinuating high social presence (Asch, 1951, 1955). However, online groups lack physicality and enable communication through computer-mediated means i.e., text, audio, video, or a combination of them. They also offer the possibility for anonymity and asynchronous communication between group members—leading to significantly lower social presence (McKenna & Green, 2002). Therefore, it is unclear if determinants of social conformity observed in physical groups are relevant in online settings. Furthermore, while there are several surveys that summarise effects of conformity determinants in physical groups (e.g., Bond, 2005; Bond & Smith, 1996), to the best of our knowledge, no survey has reviewed the existing social conformity literature that is based on online group settings.

1.1. Research questions and survey structure

Therefore, this survey will systematically collate, analyse and summarise current works that investigate social conformity in online group settings that rely on computer-mediated communication (CMC). By doing so, we will first provide an overview of where and how conformity behaviours manifest in online groups and emphasise their potential to result in both positive and negative outcomes *(RQ1)*. Currently, there is no systematic review reporting on the occurrences and outcomes of social conformity within the literature, particularly in online settings. Given this gap, it is crucial to first examine whether and how social conformity behaviours occur in online spaces that are inherently distinct from face-to-face groups. This foundational understanding will establish the need to further explore the determinants of online social conformity, providing insight into the factors that drive conformity in digital interactions.

Next, the survey will identify and categorise popularly investigated online conformity determinants (i.e., majority group, experimental task, social presence, gender, age, culture, self-confidence, and personality) as *contextual* or *personal* determinants, and describe their reported effects on online conformity behaviour *(RQ2 & RQ3)*. While we do not specify which determinants to focus on in the search strategy (see Section 2.1), the selection of determinants analysed in this survey is strongly grounded in the social conformity literature within physical groups. A person's tendency to conform can vary based on *contextual* determinants such as the size of the opposing majority (Allen & Levine, 1968, 1969; Goldberg, 1954; Mouton et al., 1956; Rosenberg, 1961; 1963), the subjective or objective nature of the task (Blake et al., 1957; Crutchfield, 1955; Deutsch & Gerard, 1955; Sistrunk & McDavid, 1965), and the level of perceived social presence—or the degree to which an individual feels connected to others in the group. Furthermore, the physical conformity literature highlights differences in conformity tendencies based on *personal* determinants such as gender (Costanzo & Shaw, 1966; Endler et al., 1973; Larsen, 1974; Santee & Maslach, 1982), age (Allen & Newtson, 1972; Costanzo & Shaw, 1966; Klein, 1972; Pasupathi, 1999), culture (Huang & Harris, 1973; Milgram, 1961; Sistrunk et al., 1971; Whittaker & Meade, 1967), as well as individual traits like self-confidence (Baron et al., 1996; Rosenberg, 1963) and personality (Crutchfield, 1955; Strickland & Crowne, 1962). These determinants are frequently discussed in the physical conformity literature and, consequently, are often investigated in the context of online conformity as well. Notably, social presence is particularly relevant to online groups, where it is shaped by the affordances of the online environment (e.g., text-based chat vs. video conferencing). Therefore, unlike other determinants, social presence is included in this survey due to its unique influence in online settings (e.g., Laporte et al., 2010; Wijenayake et al., 2020b). Additionally, where applicable, we discuss how personal and contextual determinants moderate each others' effects on online conformity behaviour. By doing so, this survey aims to answer the research questions outlined in Table 1, highlight research gaps and inform the future direction of online conformity research.

The rest of the survey is organised as follows. Section 2 provides details of the methodology used for article selection. The survey's findings are presented in Section 3 beginning with an overview of the literature in Section 3.1. Next, we summarise occurrences and outcomes of online social conformity reported by the literature in Sections 3.2–3.4 detail the contextual and personal determinants of online conformity identified in the analysed papers, respectively. In Section 4 we discuss common challenges of conformity research and set forth avenues for future research. We conclude the review with a brief summary in Section 5.

Table 1. Research questions investigated in this review.

#	Research Question	Section
RQ 1	How does social conformity manifest and impact user behaviours (positively or negatively) in online groups?	3.2
RQ 2	What contextual determinants influence online social conformity behaviour and how?	3.3
RQ 3	What personal determinants influence online social conformity behaviour and how?	3.4

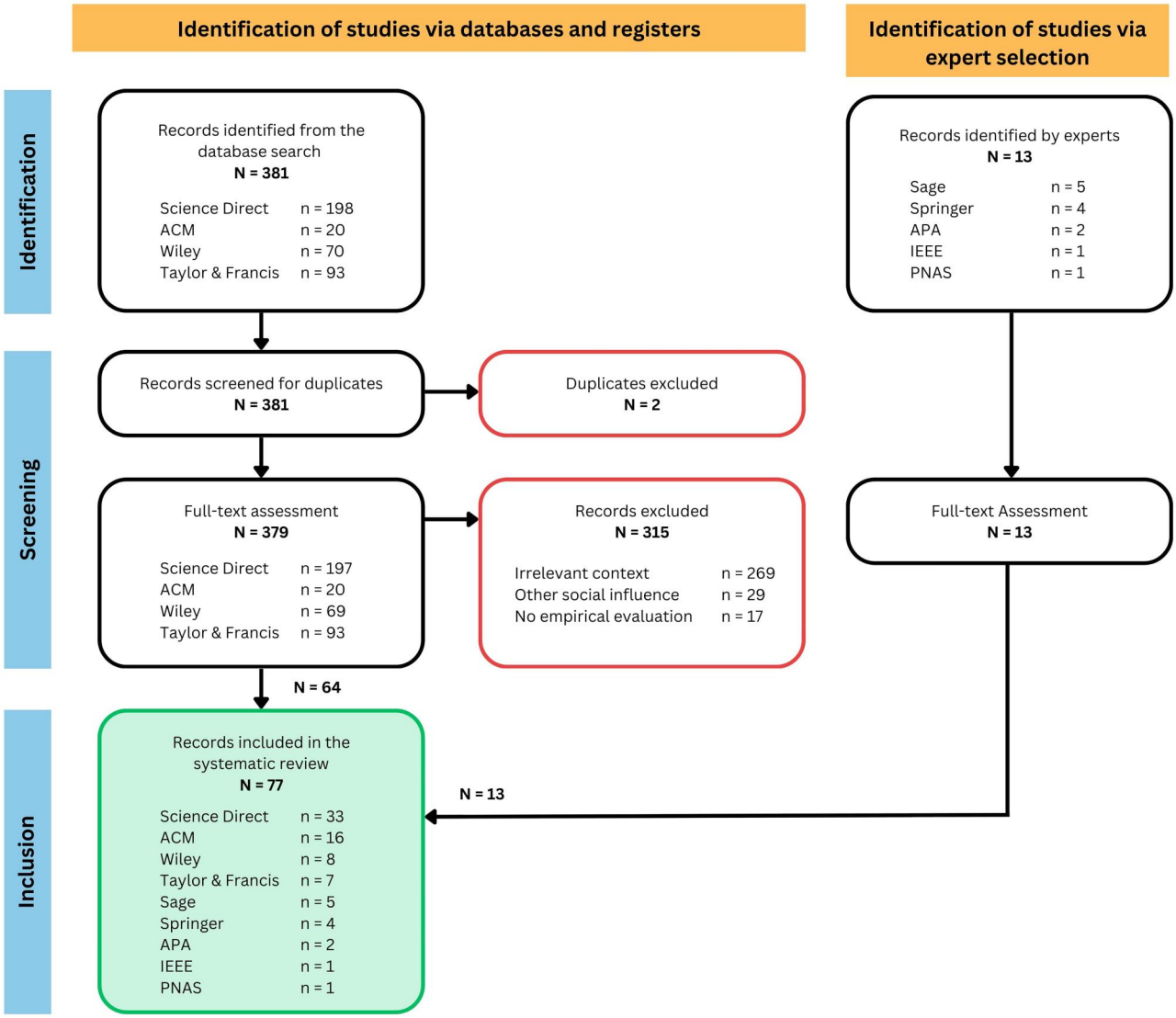

Figure 1. Procedural flowchart following PRISMA guidelines for article selection.

2. Methodology

We followed the PRISMA literature review guidelines to select the final corpus of articles considered in this systematic review (Page et al., 2021). Figure 1 shows the procedural flowchart followed for article selection.

2.1. Search strategy

We chose four digital libraries that are recognised for disseminating research that explore socio-psychological phenomena in online groups, namely, *Association for Computing Machinery (ACM), Science Direct, Wiley and Taylor & Francis*. Together, these libraries provide a comprehensive collection of literature on how social influences impact user behaviours in online settings. Next, the two authors (who are experts in social conformity literature) collectively agreed on the search query given below to retrieve social conformity research based on online groups. We note that the term "computer mediated communication" was included in the search query as an alternative for the term "online" as they are often used interchangeably in the social conformity literature. Moreover, as some articles tend to describe conformity influences more specifically as either "normative" or "informational" the search query also included these terms together with "influence" and "conformity." These terms were aggregated to form the final search query shown below.

Search Query: *("online"* ***OR*** *"computer mediated communication")* ***AND*** *("conformity"* ***OR*** *"social conformity"* ***OR***

"normative influence" **OR** *"normative conformity"* **OR** *"informational influence"* **OR** *"informational conformity")*

Furthermore, as social conformity was first investigated in a computer-mediated setting by Smilowitz et al., in 1988, we applied a search filter to retrieve publications from January 1988 to December 2023, which accounts for 36 years of the literature. The final corpus of articles included in this survey is the result of a search conducted on February 14 2024. To ensure that only the most relevant publications were retrieved, we restricted our search to metadata (e.g., paper title, abstract and keywords) and only considered complete research articles by setting the *content type* to "Research Articles" (i.e., short papers, extended abstracts, review papers, posters, demonstrations, editorials, book chapters, and work-in-progress were not considered). We retrieved a total of 381 articles through this process across the four digital libraries (see Figure 1 for the number of records from each library). Next, the articles were screened for duplicates, which resulted in 379 papers.

2.2. Inclusion and exclusion criteria

The two authors then independently analysed the full text of these papers to determine their relevance to this review's objectives. Articles were included in the final sample if both authors agreed that they met the following inclusion criteria, as per the SPICE framework (Booth, 2006):

- *Setting:* The article describes a study that investigates social conformity within any online group environment where participants complete an experimental task through computer-mediated means.
- *Perspective:* The study examines changes in online opinions, judgements, or behaviours of users within online group environments. The focus may or may not be on a specific user group.
- *Intervention:* The article reports on the occurrences, determinants, or outcomes of social conformity behaviour in an online group setting.
- *Comparison:* The study includes a comparison of participants' responses before and after exposure to a group majority, compares responses in the presence versus absence of majority group influence, or contrasts conformity tendencies across different experimental conditions.
- *Evaluation:* The study measures the level of social conformity as a primary outcome, typically through observed changes in participants' responses. For the purposes of this review, social conformity is defined as a shift or change in individual responses towards the majority's response.

We excluded papers that only consider conformity as a factor when modelling online user behaviours and information diffusion models ($n = 269$), investigate other forms of social influence i.e., theory of planned behaviour and exchange theory ($n = 29$) or discuss effects of social influences without empirical evidence or evaluation ($n = 17$). As a result, 64 papers that either report occurrences and outcomes of online social conformity *(RQ1)* and/or present a study specifically designed to investigate contextual *(RQ2)* and/or personal *(RQ3)* determinants of conformity in online groups were retained for further analysis.

Furthermore, to ensure that a good proportion of the relevant and most updated conformity research is included in the final corpus, the two authors (with expert knowledge on social conformity research) then independently hand-picked seminal research papers that report on conformity determinants, but are published in digital libraries which were not considered for the initial assessment. The authors then collectively agreed upon which papers to include in the final sample based on their relevance to this review's objectives (i.e., answer at least one of the research questions). This process resulted in an additional 13 complete research articles, published in *Sage* ($n = 5$) (Gaither et al., 2018; Hertz & Wiese, 2016; 2018; Lee, 2006; Postmes et al., 2001), *Springer* ($n = 4$) (Kraemer, 2013; Midden et al., 2015; Schneider, 2021; Wijenayake, Hu, et al., 2021), *APA* ($n = 2$) (Campbell & Fairey, 1989; Winter et al., 2015), *IEEE* ($n = 1$) (Wijenayake, Hettiachchi, et al., 2021) and *National Academy of Sciences (PNAS)* ($n = 1$) (Lorenz et al., 2011). Thus, the final corpus considered eligible for further analysis included a total of 77 full research papers. On that note, we acknowledge that despite our best efforts, this review may not be all inclusive. Some relevant literature might not have been indexed in the four selected libraries. Nonetheless, we emphasise that the chosen libraries include the majority of the most prominently cited research on social conformity in online contexts.

2.3. Data extraction and coding process

Then, we populated a data extraction sheet to systematically link each paper to the three research questions considered in this survey (see Table 1). The sheet indicated the metadata of each paper such as the paper title, authors, abstract, journal/conference and digital library, publication year, type of study, methodology used, number of participants, participant characteristics, and ethical considerations that each study presented.

Additionally, for each study we noted the platform used to create a computer-mediated social setting and positive and/or negative outcomes observed (if any) to answer *RQ1* (occurrences and manifestations of online social conformity). For *RQ2* (contextual determinants of online social conformity), we carefully documented, where applicable, the sizes of majority and minority groups and the methods used to manipulate these group dynamics within the experiment. Additionally, we noted the specifics of the experimental task, including its nature, objectivity, and difficulty level. We also detailed how varying levels of online social presence were manipulated. Similarly, for research papers that investigate personal determinants of online conformity *(RQ3)*, we extracted details of how self and peer gender, age, confidence, personality, and cultural background were captured and investigated where applicable. In both cases, we also

recorded any outcomes relevant to the influence of contextual and/or personal determinants on participants' conformity behaviour.

2.4. Assessment of methodological quality of included studies

During the data extraction and coding process, the two authors also independently assessed the methodological quality of the papers included in the final sample. Each paper was assessed against the following criteria that closely align with the JBI Critical Appraisal Checklist (Barker et al., 2024) and are modified to suit the assessment of conformity literature. First, the authors individually marked the methodological quality of each paper as *low*, *moderate* or *high*. Any discrepancies between the two authors were later resolved through discussion.

- *Design bias*: We assessed whether the study design allowed for valid comparisons between participants' conformity behaviours in the presence and absence of social influence (JBI item 1: Cause and effect), ensuring that any observed conformity behaviour can be attributed directly to the experimental manipulation. For instance, studies that included repeat measurements before and after exposure to social pressure (JBI item 5: Multiple measurements) or compared outcomes of experimental conditions with a suitable control condition were rated higher (JBI item 4: Control group). We also examined whether the study design adequately controlled possible effects of confounding variables that could influence the outcome (JBI item 3: Similar treatment).
- *Participant comparability*: In studies comparing conformity behaviours across multiple control and experimental groups, we examined whether participants were similar in terms of demographics, technical experience, and other relevant factors (JBI item 2: Similar participants). Ensuring this comparability is essential for accurately attributing observed differences to the experimental intervention and avoiding potential confounding effects.
- *Suspicion bias*: We assessed whether proper concealment was implemented, ensuring that participants were unaware that conformity behaviour was being tested. Particularly in conformity studies, concealing the true purpose of the study is necessary to maintain natural behaviours and minimise the risk of participants altering their responses due to suspicion. In addition, we examined whether the experimental design further minimised the opportunity for participants to become suspicious of the manipulations. For instance, studies that effectively concealed their manipulations, i.e., avoiding highly inaccurate/improbable majority responses or by using filler tasks, were rated more favourably. We also considered whether the studies probed for participants' suspicions after the experiment during the debriefing and appropriately addressed any identified suspicions in their analysis (JBI item 6: Follow-up and analysis).
- *Exclusion of compromised data*: We evaluated whether data from participants who indicated suspicions about the experiment's true purpose were excluded from the final analysis (JBI item 6: Follow-up and analysis). High-quality studies should clearly report and exclude such data to maintain the integrity of their results.
- *Analytical fit and statistical rigour*: We assessed whether the study design was well-suited to the research questions and if the statistical methods used were appropriate (JBI item 9: Statistical analysis). We also examined whether the outcomes of participants included in any comparisons were measured consistently (JBI item 8: Outcome measurement consistency) and if the outcomes were measured reliably (JBI item 7: Outcome measurement reliability). Studies that provided robust statistical analysis and had data supporting or explaining observed conformity behaviours were rated more highly.

The results of the quality assessment indicated that 62% ($n = 48$) of the included studies were of high methodological quality, 33% ($n = 25$) were of moderate quality, and 5% ($n = 4$) were of lower quality. Common areas of weakness included insufficient reporting on whether participants were debriefed regarding the study's true purpose and probed for suspicions after the experiment, and how suspicion bias was handled in the study design. However, the majority of studies were well designed, used repeat measures or an appropriate control group to obtain comparable responses, ensured similarity in participants across conditions, removed data from participants who indicated suspicions and used suitable statistical methods to analyse data. These quality assessments were used to inform our interpretation of the findings, ensuring that conclusions drawn from this review are based on studies that were meticulously planned and conducted.

3. Results

3.1. Preliminary characteristics of included studies

Based on our data extraction process, we note that 100% ($n = 77$) of the papers analysed in this review report occurrences of conformity in different CMC-based online group settings (*RQ1*). Almost 60% of the corpus ($n = 46$) have investigated contextual determinants (*RQ2*), where as only 31% ($n = 24$) have investigated personal determinants (*RQ3*). Out of them, 13 papers have investigated both contextual and personal determinants in tandem.

Table 2 provides an overview of the final corpus of research articles considered in this survey, including the country in which the experiment was conducted, participant details including the sample size, gender distribution and average age (where applicable and reported). Additionally, the table also indicates how each research paper we analysed links to at least one of the three research questions of this review, and where applicable, the contextual and personal determinants they have investigated. In the next three sections of this paper—Sections 3.2–3.4—we describe this

Table 2. Overview of the studies used in the literature review.

				Scope			Contextual				Personal				
Reference	Year	Country	Sample size (male, female); avg age (where reported)	RQ1	RQ2	RQ3	Group	Task	Social	Presence	Gender	Confidence	Personality	Age	Culture
Smilowitz et al. (1988)	1988	USA	42 (19 M, 23 F) students Avg age = 19.3 years	✓											
Campbell and Fairey (1989)	1989	Canada	207 students	✓	✓		*	*							
Spears et al. (1990)	1990	Netherlands	48 universty students	✓	✓					*					
Adrianson and Hjelmquist (1991)	1991	Sweden	65 (48 M, 17 F) participants Avg age = 41 years	✓	✓	✓		*		*			*		
Postmes et al. (2001)	2001	Netherlands	S1: 75 (34 M, 41 F) university students S2: 64 (19 M, 45 F) university students	✓	✓					*					
Sassenberg and Postmes (2002)	2002	Germany	S1: 44 (15 M, 29 F) university students S2: 96 (49 M, 47 F) university students	✓	✓					*					
Lee and Nass (2002)	2002	USA	S1: 72 (36 M, 36 F) university students S2: 72 (36 M, 36 F) university students	✓	✓		*			*					
Walther et al. (2002)	2002	Germany	S1: 69 university students S2: 120 university students	✓	✓		*	*							
Lee (2003)	2003	USA	116 (28 M, 88 F) university students	✓		✓					*				
Lee (2004a)	2004	USA	S1: 141 (44 M, 97 F) university students S2: 64 (27 M, 37 F) university students	✓		✓					*	*			
Lee (2004b)	2004	USA	S1: 60 (18 M, 42 F) university students S2: 55 (25 M, 30 F) university students	✓	✓					*					
Reysen (2005)	2005	USA	S1: 45 university students S2: 37 university students	✓											
Lee (2006)	2006	USA	217 (92 M, 125 F) university students Avg age = 20.9 years	✓	✓	✓				*	*		*		
Cinnirella and Green (2007)	2007	UK	71 university students	✓		✓									*
Guadagno and Cialdini (2007)	2007	USA	205 (103 M, 102 F) university students	✓	✓	✓				*	*				
Lee (2007b)	2007	USA	193 (96 M, 97 F) university students	✓		✓					*				
Lee (2007c)	2007	USA	S1: 171 (103 F, 68 M) university students S2: 91 (51 F, 40 M) university students	✓		✓					*	*			
Moral-Toranzo et al. (2007)	2007	Spain	77 (17 M, 60 F) university students	✓	✓					*					
Chen (2008)	2008	China	815 (366 M, 449 F) university students	✓	✓		*								
Lee et al. (2008)	2008	South Korea	248 college students	✓	✓		*								
Schlosser (2009)	2009	USA	S1: 293 university students S2: 200 university students S3: 118 university students	✓	✓					*					
Laporte et al. (2010)	2010	Belgium	S1: 31 student/working population S2: 14 student/working population	✓	✓	✓		*		*		*			
Packer (2010)	2010	Canada	33 (20 M, 13 F) Avg age = 18.8 years	✓		✓							*		
Hullman et al. (2011)	2011	USA	100 Mechanical Turk crowd workers	✓											
Kim and Park (2011)	2011	USA	345 (132 M, 213 F) university students Avg age = 19.6 years	✓	✓					*					
Lee et al. (2011)	2011	Hong Kong	104 (50 M, 54 F) university students	✓											
Lorenz et al. (2011)	2011	Switzerland	144 university students	✓											
Sukumaran et al. (2011)	2011	USA	24 (7 M, 17 F) university students	✓											
Rosander and Eriksson (2012)	2012	Sweden	926 (375 M, 551 F) users of 10 online forums and communities Avg age = 30.7 years	✓	✓	✓		*			*				
Wang et al. (2012)	2012	China	240 university students	✓	✓		*								
Zhu et al. (2012)	2012	USA	433 (260 M, 173 F) Mechanical Turk crowd workers Avg age = 27 years	✓	✓	✓	*				*			*	
Das et al. (2013)	2013	USA	125 Mechanical Turk crowd workers	✓											
Kraemer (2013)	2013	USA	23 university students	✓	✓		*								
Tsikerdekis (2013)	2013	Czech Republic	114 (105 M, 9 F) Wikipedia contributors	✓	✓					*					
Cameron and Geidner (2014)	2014	USA	82 (18 M, 64 F) university students Avg age = 20 years 145 (73 M, 72 F) university students Avg age = 20 years	✓											

(*continued*)

Table 2. Continued.

Reference	Year	Country	Sample size (male, female); avg age (where reported)	Scope			Contextual				Personal				
				RQ1	RQ2	RQ3	Group	Task	Social	Presence	Gender	Confidence	Personality	Age	Culture
Langley et al. (2014)	2014	Netherlands	4830099 tweets linked to 4622 hashtags on Twitter	✓											
Maruyama et al. (2014)	2014	USA	51 (22 M, 29 F) Twitter users	✓	✓					*					
Beran et al. (2015)	2015	Canada	53 (10 M, 43 F) university students	✓											
Chou et al. (2015)	2015	Taiwan	510 (293 M, 217 F) online community contributors	✓											
Midden et al. (2015)	2015	Netherlands	S1: 74 male university students Avg age = 22.5 years S2: 98 male university students Avg age = 21.8 years	✓	✓			*		*					
Winter et al. (2015)	2015	Germany	197 university students (97 M, 100 F) Avg age = 25.2 years	✓	✓		*								
Christie and Dill (2016)	2016	USA	256 (74 M, 182 F) university students Avg age = 19.4 years	✓											
Hertz and Wiese (2016)	2016	USA	62 (40 F, 22 M) university students Avg age = 19.3 years	✓	✓			*		*					
Rösner et al. (2016)	2016	Germany	143 (32 M, 111 F) university students Avg Age = 26.4 years	✓	✓		*								
Enjaian et al. (2017)	2017	USA	126 participants (71 M, 55 F) Mechanical Turk crowd workers	✓		✓					*	*			
Kelly et al. (2017)	2017	USA	S1: 592 Mechanical Turk crowd workers Avg age = 32.8 years S2: 1002 Mechanical Turk crowd workers	✓											
Maruyama et al. (2017)	2017	USA	122 participants (34 M, 77 F, 2 other)	✓	✓					*					
Mendel and Toch (2017)	2017	USA	167 Mechanical Turk crowd workers	✓	✓		*								
Xu and Lombard (2017)	2017	USA	72 (37 M, 35 F) university students Avg age = 20.3 years	✓	✓					*					
Gaither et al. (2018)	2018	USA	S2: 103 (48 M, 55 F) participants Avg age = 39.3 years S3: 308 (168 M, 140 F Mechanical Turk crowd workers Avg age = 34.7 years	✓		✓									*
Hertz and Wiese (2018)	2018	USA	90 (31 M, 59 F) university students Avg age = 19.9 years	✓	✓			*		*					
Kyrlitsias and Michael Grigoriou (2018)	2018	Cyprus	S1: 22 (14 M, 8 F) participants Avg age = 24 years S2: 53 (25 M, 27 F) participants Avg age = 25 years	✓	✓	✓				*		*			
Neubaum et al. (2018)	2018	Germany	127 (40 M, 87 F) participants Avg age = 23.5 years	✓											
Sharma and De Choudhury (2018)	2018	USA	400 user comments on Reddit	✓											
won Kim (2018)	2018	USA	S1: 459 (211 M, 248 F) Mechanical Turk crowd workers S2: 392 (170 M, 222 F) Mechanical Turk crowd workers	✓	✓		*								
Colliander (2019)	2019	Sweden	506 Mechanical Turk crowd workers	✓											
Perfumi et al. (2019)	2019	Italy	181 (42 M, 139 F) university students Avg age = 22.1 years	✓	✓	✓		*		*			*		
Lucas et al. (2019)	2019	USA	121 (65 F, 56 M) participants Avg age = 35.8 years	✓	✓					*					
Sarkar et al. (2019)	2019	USA	257 participants	✓	✓		*								
Wijenayake et al. (2019)	2019	Australia	54 (27 M, 27 F) participants	✓	✓	✓	*			*	*	*			
Smith et al. (2020)	2020	UK	Tweets from 219 users	✓											
Tata et al. (2020)	2020	India	408 university students (308 M, 100 F)	✓											
Wang et al. (2020)	2020	USA		✓	✓					*					

(*continued*)

Table 2. Continued.

Reference	Year	Country	Sample size (male, female); avg age (where reported)	Scope			Contextual				Personal				
				RQ1	RQ2	RQ3	Group	Task	Social	Presence	Gender	Confidence	Personality	Age	Culture
			353 (169 M, 193 F) Mechanical Turk crowd workers												
Wijenayake et al. (2020a)	2020	Australia	50 (25 M, 25 F) university students	✓	✓	✓	*	*			*	*	*		
Wijenayake et al. (2020b)	2020	Australia	64 (32 M, 32 F) university students	✓	✓	✓	*	*		*	*	*			
Bleize et al. (2021)	2021	Netherlands	S1: 233 (108 M, 125 F) adolescents Avg age = 13.1 years S2: 296 (140 M, 156 F) adolescents Avg age = 13 years	✓	✓					*					
Li et al. (2021)	2021	China	191668 online restaurant reviews	✓											
Savolainen et al. (2021)	2021	Finland USA South Korea Spain	1200 (600 M, 600 F) young people 1212 (597 M, 615 F) young people 1192 (591 M, 601 F) young people 1212 (621 M, 591 F) young people	✓											
Schneider (2021)	2021	Germany	62 (19 M, 43 F) university students Avg age = 22.4 years	✓		✓					*				
Wijenayake et al. (2021a)	2021	Australia	52 (26 M, 26 F) US-based Mechanical Turk crowd workers	✓	✓	✓	*					*			
Wijenayake et al. (2021b)	2021	Australia	32 participants (8 middle-aged men, 8 middle-aged women,8 young men, 8 young women)	✓		✓						*		*	
Duderstadt et al. (2022)	2022	Germany	208 (124 M, 81 F) Prolific users Avg age = 25.8 years	✓	✓			*		*					
Hu et al. (2022)	2022	China	317898 user reviews posted on an online tourism platform	✓	✓		*								
Masjutin et al. (2022)	2022	Germany	92 (31 M, 59 F) participants Avg age = 29.4 years	✓	✓					*					
Wijenayake et al. (2022)	2022	Australia	48 (24 M, 24 F) participants	✓	✓	✓	*			*		*			
Gokcekus et al. (2023)	2023	USA	20397 user reviews on a wine social networking site	✓	✓		*								
Hurst et al. (2023)	2023	USA	545 (255 M, 290 F) university students Avg age = 20.3 years	✓		✓						*			
Total				77	46	24	20	12		29	13	12	5	2	2

The final row of the table summarises the total number of papers associated with each research question and determinant.

review's findings corresponding to each research question investigated.

3.2. Occurrences and outcomes of online social conformity

Social conformity occurs when a person changes their personal judgement of a situation to a different judgement endorsed by the group majority. Despite online groups being inherently different to their physical counterpart, all research papers analysed in this survey have either observed or systematically investigated social conformity in different online social settings. In general, these studies are concerned with groups of individuals who communicate with others through web-based computer-mediated communication methods (e.g., text-based chats and posts on community forums), to achieve a certain group objective (e.g., complete a quiz together or choose one of two applicants for a job). The majority of the studies manipulate the dominant or popular judgement of the group (i.e., the majority's opinion), so that it challenges the initial judgement of the naive participant, by using confederates of the research team or other simulations—thereby exposing them to group pressure situations. If the naive participant changes their opinion to align with the majority's, such behaviour is regarded as conformity. This section summarises the reported occurrences of such online social conformity behaviour in the papers analysed and resulting positive and negative outcomes.

3.2.1. Conformity can lead to incorrect judgements

We find that conformity behaviour can lead to changes in personal judgements in online spaces, but often less frequently than in face-to-face groups. For example, Smilowitz et al. (1988) found that Asch's line judgement task resulted in 69% error free responses (due to non-conformity) in a CMC setting, whereas the original experiment had only 25% error free responses. Furthermore, as the task at hand becomes less straightforward—e.g., completing an online quiz in comparison to matching lines similar in height (Smilowitz et al., 1988)—conformity rates as high as 50% have been reported (Rosander & Eriksson, 2012), suggesting the presence of *informational* conformity. Higher conformity is explained by people conforming to the majority assuming the majority's answer to be correct. However, except for a few, most conformity studies analysed in this review have manipulated the majority's judgement so that it supports a clearly incorrect or less popular answer (Beran et al., 2015; Campbell & Fairey, 1989; Laporte et al., 2010; Rosander & Eriksson, 2012; Wijenayake et al., 2020a). Consequently, users who conform to the majority often end up with more incorrect answers than those who do not (Beran et al., 2015). Moreover, we note that in the absence of clear indicators of expertise, people infer their online peers' ability to make correct judgements based on available gender and age-related user cues (e.g., stereotypically gendered avatars (Lee, 2003; Lee, 2004a; Wijenayake et al., 2019) or usernames with birth years (Wijenayake, Hu, et al., 2021)), and show stereotypical conformity behaviour (Lee, 2003; 2004a), which results in even more incorrect judgements (Wijenayake et al., 2019; Wijenayake, Hu, et al., 2021). For example, Wijenayake et al. (2019) found that users who conformed to female-dominant and male-dominant majorities in stereotypically feminine and masculine quiz questions respectively, ended up with significantly more incorrect quiz responses, that those who did not.

3.2.2. Conformity can undermine quality of social proof and wisdom of crowds

The prevalence of online conformity behaviour raises significant concerns about the quality of online social proof—i.e., the phenomenon where actions are viewed as "correct" to the extent that one sees others doing them (Hullman et al., 2011). For instance, Hullman et al. (2011) note that conforming to biased and incorrect responses from peers have led to more errors among crowdworkers in a visual judgement task. Others (Das et al., 2013; Dev et al., 2019) emphasise that conforming to prior votes and responses in online groups can undermine the quality of wisdom of crowds, which relies on people to make individual judgements without being influenced by others (Galton, 1907). For example, Lorenz et al. (2011) found that in estimation tasks on geographical facts and crime statistics, even simple social influences (such as seeing the arithmetic mean of others' estimates) can undermine the wisdom of crowds effect due to conformity behaviour. They further note that seeing others' estimates and adjusting personal responses accordingly, diminished the distribution and diversity of the crowds' estimates, thereby undermining their collective wisdom.

3.2.3. Conformity influences individuals' attitudes, preferences and opinions

Conformity behaviour can lead to attitude and preference changes in users of online spaces. The literature reports many instances where users exposed to either positive or negative reviews from unknown online peers have conformed to the majority's attitude on products (e.g., Chen, 2008; Lee et al., 2008; Li et al., 2021; Schlosser, 2009; Tata et al., 2020). For example, Gokcekus et al. (2023) analysed existing data on a social media platform for wine evaluations to note that the majority's attitude insinuated through the first four reviews, determined how subsequent users reviewed the same product. They further note that the reviews coming from other users were equally influential than those coming from wine experts attributing this behaviour to *normative* conformity. Furthermore, seeing preferences of other users can encourage people to change their personal preferences to align with the majority's (Zhu et al., 2012). Therefore, even in circumstances where there is no "correct" answer, people conform to others' attitudes and preferences in online spaces indicating *normative* conformity behaviour.

Online conformity can also determine how people form opinions on more critical aspects such as important societal

issues and political votes. For example, Maruyama et al. (2017) observed that people tend to adopt the "popular" view expressed on social media by anonymous, unknown users, regardless of their personal attitude, knowledge and interest on the same civic issue (redevelopment of their neighbourhood). Being exposed to tweets supporting a clear majority opinion on social media has also been seen to trigger conformity in people's voting choices in elections (Maruyama et al., 2014). In general, it is seen that conforming to majority's opinion in online groups can increase polarisation of opinions in the direction of a manipulated group opinion (Spears et al., 1990). This is particularly concerning because we generally rely on the anonymous nature of online social settings to encourage diverse opinions—especially on social and political issues (Kim et al., 2021; Stromer-Galley, 2003).

Conforming to majority's opinions posted on online forums and communities can lead to diverse negative experiences that vary in terms of their severity. On the less severe end, we note that conforming to others' opinions on rumours posted on online communities can significantly impact a person's own belief on the rumour as well as their intention to further disseminate it in online groups (Wang et al., 2012). But, online conformity can lead to more dangerous behavioural outcomes as well. For instance, an analysis of Twitter timelines have shown that social media users conform to linguistic styles used by extremist groups when their exposure to mobilizing online interactions increase (Smith et al., 2020). Another study by Savolainen et al. (2021) found that young people's conformity to online pro-gambling norms is associated with youth problem gambling in a cross-country study. These studies indicate serious repercussions from an individual's online conformity tendencies to their offline lifestyle. Moreover, another study note that users also conform to cyber-aggressive norms they see on popular messaging applications like WhatsApp (Bleize et al., 2021). Specifically, when exposed to peer opinions that support cyber-aggressive behaviours, people tend to publicly agree with such negative social norms, even when their personal opinion disagrees with the group norms.

3.2.4. Conformity can lead to positive behavioural changes

However, there are instances where conformity can encourage compliance to positive and constructive behaviours in online groups. For instance, Sukumaran et al. (2011) emphasise that displaying several high quality and "thoughtful" comments underneath online news articles encourages subsequent users to conform to standards set by the community when posting their own comments, indicating positive effects of *normative* conformity behaviour. Similarly, another study by Sharma and De Choudhury (2018) shows that conforming to the accepted conventions of behaviour and linguistic norms promotes a sense of belonging and security within online support groups, so that sensitive issues can be more openly discussed.

Moreover, Wijenayake, Hettiachchi, et al. (2021) note that users who conform to the majority's opinion of a Facebook news article's trustworthiness (insinuated through user comments on the post that are either supportive or critical of its trustworthiness), adjust their response to the article to prevent further dissemination of fake news and promote the dissemination of real news. In other words, users who believed an article to be fake when exposed to a majority of user comments critical of the article's trustworthiness, showed significantly high inclination to fact-check and report, and low inclination to comment or share it. In a similar experiment, Colliander (2019) found that such conformity behaviour is more influential in minimising the dissemination of fake news than disclaimers by reputed fact-checking organisations. Additionally, other conformity studies report that users are more likely to conform to and adopt social media privacy policy recommendations, when these recommendations come from their friends than by organisations (e.g., social media companies) (Xu & Lombard, 2017). Moreover, people who initially did not support a sustainable environmental policy that requires significant change from them, have been seen to support its implementation once they are exposed to a majority of peers who are supportive of the policy (Hurst et al., 2023). Chou et al. (2015) note that general consensus among knowledge sources (i.e., a clear majority) in online communities can enhance knowledge adoption by users.

In summary, while almost exclusively seen as a negative social influence in physical groups (Deutsch & Gerard, 1955), findings of this survey indicate the potential for social conformity influences to trigger positive behavioural changes effectively in online groups. Moreover, this observation also has implications for the design of future online group settings that account for positive and negative outcomes of social conformity influences, which we discuss in Section 4. However, to account for social conformity in platform design, we need to first understand what causes such behaviour. Therefore, in the next two sections, we identify and describe *contextual* and *personal* determinants of online conformity and their effects in online groups.

3.3. Contextual determinants of online social conformity

60% (46 out of 77) of the research papers analysed in this survey report on contextual determinants of online conformity. In general, their findings report *three* critical determinants of online social conformity i.e., the composition of the group majority exerting social pressure ($n = 20$), the nature of the experimental task that the group completes together ($n = 12$) and the impact of perceived social presence in the online environment ($n = 29$) as shown in Table 2. Moreover, the literature on group composition and experimental task can be further categorised into subgroups as shown in Table 3. The following sections describe how each of these contextual determinants (and their subgroups) have been investigated in online groups and outline their effects on social conformity behaviour.

Table 3. The distribution of conformity studies based on the contextual determinants they investigate.

Contextual Determinants	Literature
Group	
- Unanimous majorities	(Campbell & Fairey, 1989) (Kraemer, 2013) (Lee & Nass, 2002)
- Non-unanimous majorities	(Gokcekus et al., 2023) (Hu et al., 2022) (Lee et al., 2008) (Rösner et al., 2016) (Sarkar et al., 2019) (Walther et al., 2002) (Wang et al., 2012) (Wijenayake et al., 2019) (Wijenayake et al., 2020a) (Wijenayake et al., 2020b) (Wijenayake et al., 2022) (Zhu et al., 2012)
- Features of the influencing source	(Chen, 2008) (Mendel & Toch, 2017) (Wijenayake et al., 2019) (Wijenayake et al., 2021b) (Winter et al., 2015) (Ji Won, 2018)
Task	
- Type	(Adrianson & Hjelmquist, 1991) (Hertz & Wiese, 2018) (Laporte et al., 2010) (Coppolino Perfumi et al., 2019)
- Objectivity	(Laporte et al., 2010) (Wijenayake et al., 2020a) (Wijenayake et al., 2020b)
- Difficulty	(Campbell & Fairey, 1989) (Duderstadt et al., 2022) (Hertz & Wiese, 2016) (Midden et al., 2015) (Coppolino Perfumi et al., 2019) (Rosander & Eriksson, 2012) (Walther et al., 2002)
Social Presence	
- User cues	(Kim & Park, 2011) (Lee, 2004b) (Lee & Nass, 2002) (Moral-Toranzo et al., 2007) (Coppolino Perfumi et al., 2019) (Postmes et al., 2001) (Sassenberg & Postmes, 2002) (Schlosser, 2009) (Spears et al., 1990) (Tsikerdekis, 2013) (Wijenayake et al., 2019) (Wijenayake et al., 2020b) (Wijenayake et al., 2022) (Xu & Lombard, 2017)
- Interactivity	(Laporte et al., 2010) (Lee, 2006) (Maruyama et al., 2017) (Maruyama et al., 2014) (Wijenayake et al., 2020b) (Wijenayake et al., 2022)
- Response visibility	(Bleize et al., 2021) (Laporte et al., 2010) (Lee & Nass, 2002) (Wijenayake et al., 2020b) (Wijenayake et al., 2022)
- Humanness of peers	(Duderstadt et al., 2022) (Hertz & Wiese, 2016) (Hertz & Wiese, 2018) (Kyrlitsias & Michael Grigoriou, 2018) (Lucas et al., 2019) (Masjutin et al., 2022) (Midden et al., 2015) (Wang et al., 2020)

3.3.1. Majority and minority group composition

Conformity experiments test for effects of majority group size by manipulating the number of supposed peer responses challenging a participant's personal judgement in a social pressure situation. In the papers reviewed, we note that the "majority" has been simulated differently based on the experimental task and social setting used. For instance, Wijenayake et al. (2020a) and Beran et al. (2015) used bar charts to indicate the percentage of supposed peers that support each answer option of a multiple-choice quiz, to indicate the answers supported by the group majority and (where applicable) the minorities (e.g., 60% of peer responses support option A whereas only 40% support option B). Zhu et al. (2012) investigated conformity in a preference-based task by displaying the number of other users who preferred two item options (e.g., 108 people prefer A vs. 2 people prefer B). Contrastingly, others have used more indirect methods where peer responses are shown without numercial aggregation. For example, Wijenayake, Hettiachchi, et al. (2021) and Colliander (2019) simulated majority and minority groups by displaying a series of comments that are either critical or supportive of a Facebook news article's trustworthiness. Similarly, Gokcekus et al. (2023) and Winter et al. (2015) manipulated the (positive or negative) sentiment of reviews left by supposed others to signal majority's opinion.

The effect of the "majority" has been investigated in terms of its *unanimity*, *size*, and certain *features of the influencing source*. As shown in Table 3, three and twelve studies have compared effects of unanimous and non-unanimous majorities of different sizes respectively. Six studies report on the impact of certain features of the majority or the influencing source. To ensure a fair comparison, we only considered experiments where the unanimity, size or features of the majority are varied across different experimental conditions of the same study (i.e., the same study comparing the effects of a unanimous majority of three against a unanimous majority of five), and do not compare results coming from different studies.

3.3.1.1. Effects of unanimous majorities. The earlier online conformity studies focused on understanding effects of unanimous majorities of different sizes, against one naive participant who finds themselves in a minority of one. For example, in an objective, visual perceptual task (i.e., indicating similarity between two dot patterns), Campbell and Fairey (1989) note that participants are more likely to conform when exposed to four computer-simulated responses of supposed peers, than when exposed to only two computer-simulated peer responses. Lee and Nass (2002) report similar behaviour in a subjective, choice-dilemma task where participants were more willing to conform when challenged by four "peer" responses than one. Another study that replicated Asch's line judgement task in a virtual world (Second Life) where unanimous "peers" were represented as virtual avatars, reported no conformity when participants were challenged by a single partner, but some conformity when challenged by four peers (Kraemer, 2013). Therefore, prior work analysed in this survey agree that larger unanimous majorities are more influential than smaller majorities in triggering conformity behaviour. Moreover, as conformity in the aforementioned cases is driven not by the pursuit of a correct answer but by the desire to fit in or avoid standing out when confronted by a larger opposing majority, we can infer that the magnitude of the majority significantly influences the degree of *normative conformity* pressure exerted on individuals.

3.3.1.2. Effects of non-unanimous majorities. Investigating conformity effects with unanimous majorities does not account for the fact that our personal judgements can be supported by others who share the same perspective. Hence, it is important to understand if observed conformity effects would remain, even when the majority is non-unanimous, especially as some studies have indicated that both unanimity and magnitude of the majority is critical for triggering online conformity behaviour (Gokcekus et al., 2023; Wang et al., 2012).

Walther et al. (2002) found that even a single dissenter can undermine the majority's influence—but only in smaller groups with a total of five users. Large groups with ten group members showed no meaningful reduction in conformity in the presence of a dissenter. Another study by Wijenayake et al. (2020a), where manipulated bar charts displayed the distribution of votes from supposed others across different response options—such that the majority size ranged between 40% and 90%, whereas one or more minority groups ranged between 5% and 40%—showed a significant effect from the majority group size, and no effects from the number or the size of minority groups. In other words, conformity was influenced only by the size of the opposing majority—with larger majorities being more influential than smaller majorities, whereas the presence or the magnitude of minorities had no impact.

Findings of other online conformity studies that investigate effects of having more than one dissenter (e.g., a minority of 2 vs. majority of 5) confirm that it is the *difference* between majority and minority group sizes that determines conformity behaviour (Wijenayake et al., 2019, 2020b, 2022). They note that as the size difference between the minority that supports a naive participant's response (dissenters) and the opposing majority increases, the participant often feels more pressure to conform. Additionally, other studies also confirm that non-unanimous majorities insinuated through user comments posted on online news pages (Rösner et al., 2016) and user ratings and reviews on e-commerce websites (Hu et al., 2022; Lee et al., 2008; Zhu et al., 2012) can exert social conformity influences. Similar to unanimous majorities, as the size of the majority's opinion increase, observed conformity is higher.

These findings suggest several implications. The presence of dissenters or a minority does impact the influence of the majority, as it can reduce *normative conformity* pressure. However, the presence of a minority does not eliminate conformity influences entirely. It is reasonable to assume that a minority is most effective in smaller groups where the majority is less prominent.

3.3.1.3. Effects of the influencing source. In addition to the unanimity and the magnitude of the majority, certain features of the influencing source have also been seen to impact conformity behaviour. For example, Mendel and Toch (2017) found that users trusted and hence were more likely to adopt online privacy practices recommended by their Facebook friends, than authoritative organisations. Chen (2008) found that book recommendations of other consumers exerted a greater influence on user choices than recommendations of an expert or the website owner. Another study that investigated how comments left by supposed others influence users' opinions of a news article report that comments with well-written arguments are more influential than opinion-based comments (Winter et al., 2015). They further note that the number of "likes" supportive of an article was less influential than user comments.

Similar effects have been noted in more objective experimental tasks where users are generally more susceptible to *informational* conformity influences, in an attempt to get the "correct" answer. For example, Wijenayake et al. (2019) found that in gender stereotypical tasks that were perceived as more masculine or more feminine (i.e., questions on sports vs. fashion), users were more likely to conform to majorities with more men and more women respectively. Similar effects were observed in age-stereotypical tasks when participants were challenged by younger and older peers (Wijenayake, Hu, et al., 2021). Authors describe that in the absence of clear indicators, people perceive expertise of their online peers through visible user cues (i.e., peer gender and age), which in turn impact their decision to conform to the majority or not. These findings suggest that, in addition to unanimity and magnitude, the composition of the majority can also affect its influence on conformity behaviour, particularly in situations where individuals may conform due to *informational* influences. As such, the majority group serves as a contextual determinant of conformity, capable of exerting both *informational* and *normative* pressure depending on the context.

3.3.2. Experimental task

In the papers analysed, conformity behaviour has been observed across a wide variety of *task types* such as—perceptual, logical, factual, attitudinal and preference-based tasks. Several examples of studies investigating conformity behaviour in each of these tasks are given in Table 4. Moreover, these experimental tasks have also been grouped into two distinct categories based on their objective or subjective nature—i.e., their *task objectivity*. For instance, perceptual, logical and factual tasks often have a single correct answer and thus, are objective in nature. On the other hand, attitudinal and preference-based tasks are subjective in nature in that they do not have one "correct" response. Additionally, the experimental tasks can also vary based on *task difficulty*. This term describes the perceived difficulty of the task as well as the ambiguity associated with it (e.g., adding two numbers together vs. completing an insolvable mathematical series).

We focused on the effects of the experimental task on conformity across three main aspects—*task type*, *task objectivity* and *task difficulty*. We note that 15% of the studies ($n = 12$) considered in this survey analyse the effects of at least one of these aspects as shown in Table 3. We note that only studies that compare conformity behaviour across different task types ($n = 4$), between subjective or objective nature of tasks ($n = 3$), or different levels of task difficulty ($n = 7$) within one experimental setup, have been considered

Table 4. Examples of different task types used in conformity studies.

Task Type	Examples
Visual Perceptual	Match lines based on height (Asch's line judgement task) (Hertz & Wiese, 2016; Kraemer, 2013; Laporte et al., 2010; Midden et al., 2015; Smilowitz et al., 1988)
	Indicate similarity between two dot patters (Campbell & Fairey, 1989)
	Indicate dominant colour of a displayed object (Duderstadt et al., 2022)
Factual	Complete a general knowledge quiz (Laporte et al., 2010; Wijenayake et al., 2019, 2020a)
Logical	Complete simple arithmetic tasks involving addition and subtraction (Hertz & Wiese, 2018; Rosander & Eriksson, 2012)
Preference-based	Indicate preference between two pictures (Zhu et al., 2012)
	Indicate preference between two candidates for a job (Masjutin et al., 2022)
Attitudinal/Opinion-based	Indicate decision in a hypothetical choice-dilemma scenario (Lee, 2006; Lee & Nass, 2002; Sassenberg & Postmes, 2002)
	Indicate attitude on moral and political questions (Kelly et al., 2017; Laporte et al., 2010; Savolainen et al., 2021)
	Indicate opinion on debating topics (Wijenayake et al., 2022)
	Indicate opinion on a university-wide policy (Hurst et al., 2023)

for this analysis to identify potential variations in conformity. In the following sections we explain how these three aspects are investigated in prior work and discuss their impact on users' social conformity behaviour.

3.3.2.1. Effects of task type and objectivity. The analysed literature has investigated conformity behaviour across a wide variety of experimental tasks (see Table 4 for examples). We observe that many CMC-based conformity studies have used visual perceptual experimental tasks where participants have to rely primarily on their visual senses and no additional knowledge is required to make a judgement (Campbell & Fairey, 1989; Duderstadt et al., 2022; Hertz & Wiese, 2016; Kraemer, 2013; Midden et al., 2015; Smilowitz et al., 1988). While the most popularly used visual perceptual task seems to be a digital version of Asch's line judgement task (e.g., Hertz & Wiese, 2016; Kraemer, 2013; Midden et al., 2015; Smilowitz et al., 1988), other variations of visual perceptual tasks have also been used. For instance, Campbell and Fairey (1989) investigated conformity in how participants indicate similarity of two dot patterns shown on a computer screen and Duderstadt et al. (2022) asked participants to indicate the more dominant colour of a shape displayed on screen. In terms of factual and logical tasks, we note a plethora of studies that used multiple-choice question (MCQ) quizzes including questions of logical (completing number series or solving arithmetic sums), factual (testing vocabulary and general knowledge) nature, as their experimental task (e.g., Beran et al., 2015; Lee, 2003, 2007c; Rosander & Eriksson, 2012). Moreover, the literature indicates that conformity behaviour also occurs in preference-based and attitudinal/opinion-based tasks in online settings. For example, Zhu et al. (2012) investigated conformity in how participants choose between two photographs that could be used to advertise baby products online, whereas Colliander (2019) tested conformity in how participants perceive trustworthiness of news articles shared on social media.

We further emphasise that the effects of task type and objectivity on conformity behaviour are often described in tandem within the literature. Task objectivity varies based on the task type. Perceptual, logical and factual tasks often have a "correct" response that can be objectively determined. Conversely, opinion and preference-based tasks are subjective in nature, where there could be a "popular" response, but no single "correct" response. In conformity studies that use subjective experimental tasks, control groups have been used to identify the "popular" attitudes, opinions and preferences of the target community. For instance, in studies by Wijenayake et al. (2020a) and Wijenayake et al. (2020b), capturing the "popular" opinion among a group of pilot participants on a 5-point Likert scale enabled the authors to fabricate the majority's response in an attitudinal task (e.g., "Abortions should be legal. To what extent do you agree or disagree with this statement?"), so that the simulated majority supported unpopular opinions that deviated from participants' opinions on the said statements—creating a social pressure situation.

We analysed the studies that have investigated effects of different task types on conformity within the same experimental setup, to understand variations in conformity behaviour across different task types. For example, Adrianson and Hjelmquist (1991) found that people are more likely to conform to majority's opinion in technical tasks that require "knowledge-sharing" (e.g., determining the importance of a list of items for surviving in the Arctic aka "Lost in the Arctic" task) than when attempting to reach consensus in a "value-laden" (and subjective) human-relations problem. Similar findings were reported by Hertz and Wiese (2018), where higher conformity rates (47%) were observed in objective, mathematical tasks, in comparison to lower rates (36%) in subjective, social tasks where participants had to judge the emotions indicated by photographs.

The above differences in conformity behaviour across different task types have been explained in the literature with reference to their *task objectivity* and resulting *informational* or *normative* conformity influences. In general, it is seen that in certain online groups with minimal social presence, users are more susceptible to *informational* influences that encourage them to find "correct" answers, than *normative* influences that encourage them to "fit in" with the group. Therefore, typically, higher conformity is likely to be observed in task types that are objective and has a correct

answer. For instance, in a recent study, Wijenayake et al. (2020a) systematically compared conformity across subjective (popularly debated topics of societal importance) and objective (factual and logical) MCQ questions. They note that out of all occurrences of conformity, 83% were related to objective questions whereas only 17% were related to subjective questions. Furthermore, authors describe that participants rationalised that they conformed to the majority in objective questions to improve their chances of being "correct"—signifying effects of *informational* influences. Conversely, the majority's opinions on subjective content were seen as useful in order to understand others' perspectives but not influential enough to change well-established, personal perspectives. Participants often referred to the anonymity and the reduced social presence enabled by the online environment (i.e., an online quiz with no user identifiable cues) to explain reduced social pressure to conform in subjective tasks. These findings corroborate findings of Adrianson and Hjelmquist (1991) and Hertz and Wiese (2018), where higher user conformity was reported in objective, analytical tasks (i.e., completing arithmetical sums) than in subjective, social tasks (i.e., judging the emotion indicated by a photograph).

However, contradicting results are reported by Laporte et al. (2010), where participants completed Asch's line judgement task, quizzes containing factual MCQ questions, and MCQ-style opinion and preference-based questions. Authors report that in an experimental setup that closely mimicked a realistic online chatting platform (with higher perceived social presence), they observed no conformity in the Asch's line judgement task, only 15% conformity in the factual tasks, and comparatively higher levels of conformity in opinion-based (30%) and preference-based (20%) tasks. We note that *Laporte et al.*'s study setup had visible, human confederates in contrast to other studies with no visible user cues (e.g., Adrianson & Hjelmquist, 1991; Hertz & Wiese, 2018; Wijenayake et al., 2020a), that enhanced the perceived social presence of the majority. Authors explain that in enhanced social presence situations, people are eager to conform to responses accepted by the majority to avoid undesirable situations (*normative* influence), leading to higher conformity even in subjective content where there is no single "correct" answer. Therefore, it is important to emphasise that different task types—and especially their objective/subjective nature—determine users' susceptibility to *informational* and *normative* influences that trigger conformity.

3.3.2.2. Effects of task difficulty. Task difficulty (or task ambiguity) determines the effort that is required to identify the "correct" answer in objective experimental tasks. Therefore, all studies that investigate effects of task difficulty on conformity behaviour are based on objective experimental tasks only. However, we note variations in the type of tasks used and how task difficulty was manipulated. For instance, in experiments using visual perceptual tasks where participants were asked to indicate similarity of two dot patterns (Campbell & Fairey, 1989) or complete a digital version of Asch's line judgement task (Hertz & Wiese, 2016; Midden et al., 2015), task difficulty was heightened by reducing the amount of time the visual stimulus was shown to participants. Conversely, Rosander and Eriksson (2012) categorised objective MCQ questions as "easy," "moderate" and "difficult" based on how a control group of participants completed the same questions. In general, all these studies indicate that when participants are exposed to tasks with higher difficulty, where the "correct" answer is unclear, they are more likely to conform to the majority for *informational* reasons (i.e., majority becomes a source of information).

Moreover, Walther et al. (2002) report a moderating effect from task difficulty on the impact majority group size. They note that while larger majorities (group size = 10) tend to trigger higher conformity than smaller majorities (group size = 5) in easier tasks, both group sizes are equally influential in difficult tasks. Another interaction effect between task difficulty and humanness of the "agent" exerting social influence has been reported by Midden et al. (2015). Through findings of two studies, they show that while non-human agents like computers and virtual agents may not trigger much conformity in a typical line judgement task, as the experimental task becomes more ambiguous (as a result of reducing the amount of time the stimulus is shown to participants), influenceability of non-human majorities increase, triggering significantly more conformity.

In summary, it is evident that task type, objectivity, and difficulty are linked to *informational* conformity pressures. Even in situations where there are no *normative* reasons to conform (e.g., in the presence of an opposing majority of non-human agents (Midden et al., 2015)), the nature of the experimental task (particularly its difficulty) can still trigger conformity due to *informational* reasons.

3.3.3. Social presence

A total of 29 out of the 77 papers (approximately 38%) analysed have investigated the effects of social presence on online conformity behaviour, making it the most frequently investigated contextual determinant in the literature. Moreover, while not directly relevant to the objectives of this survey, we note that three studies (i.e., Adrianson & Hjelmquist, 1991; Guadagno & Cialdini, 2007; Schlosser, 2009) have investigated conformity differences in online and face-to-face settings. In general, their results indicate that conformity behaviour is higher in face-to-face groups, where the social presence of peers exerting influence is stronger than in online groups. This observation has been noted in both objective tasks that are analytical (Adrianson & Hjelmquist, 1991) and subjective tasks that are opinion-based (Adrianson & Hjelmquist, 1991; Guadagno & Cialdini, 2007; Schlosser, 2009). In other studies that specifically focus on different levels of online social presence, we note four main subcategories as shown in Table 3. They have manipulated perceived online social presence through the user cues present in the online environment ($n = 14$), level of interactivity allowed between group members ($n = 6$), visibility of user responses to the rest of the group ($n = 5$), and the humanness of supposed peers exerting social pressure ($n = 8$). On that note, we highlight that the following

analysis is only based on studies that have tested how conformity manifest in different levels of online social presence within the same experimental setup, and do not compare conformity differences across multiple experiments.

3.3.3.1. Effects of user cues. Cues used to represent and identify users in online social settings vary among platforms. In the conformity studies analysed, we note that some have opted for complete anonymity (Maruyama et al., 2014, 2017; Wijenayake et al., 2020a), whereas others have used usernames (Postmes et al., 2001), avatars (Kim & Park, 2011; Lee, 2004b; Lee & Nass, 2002), photographs (Hertz & Wiese, 2016; Moral-Toranzo et al., 2007; Schlosser, 2009) and real names of users (Wijenayake et al., 2022). Furthermore, studies that investigate effects of user cues on conformity behaviour have manipulated the amount of user cues present on online group settings in terms of anonymity (i.e., presence or absence of identifiable user cues) and uniformity (i.e., similarity of cues used to represent group members).

The literature reports that anonymity can diminish sense of self (i.e., causing de-individuation) and enhance sense of group identity, that makes users more susceptible to conformity influences (Postmes et al., 2001; Spears et al., 1990). For example, in both visual perception and social dilemma tasks Postmes et al. (2001) compared conformity behaviour when group members (users and peers) were represented with (identifiable) and without (unidentifiable) their photographs on a CMC setting. They observed higher conformity to group's responses in the unidentifiable groups. Additionally, Sassenberg and Postmes (2002) found that anonymity enhances conformity behaviour only when *both* participants and their peers are anonymous. If users are identifiable, peer anonymity can reduce users' tendency to conform. However, contradicting results have been put forward by other studies where anonymous group members have either resulted lower conformity rates than when identifiable (Tsikerdekis, 2013), or showed no significant differences to when they are identifiable (Moral-Toranzo et al., 2007).

Furthermore, we observe differences in how uniform vs. different user representations impact perceived online social presence and de-individuation effects, and thereby conformity behaviour. For example, some studies (Kim & Park, 2011; Lee, 2004b) observed that users who were represented using the same avatar as everyone else in the group, perceived higher group identity, which in turn led to higher conformity intention, than when group members were represented using distinct avatars. Authors explain that while uniform avatars can enhance de-individuation effects in online groups, they also increase group identity, making users more susceptible to *normative* conformity influences. Findings by Xu and Lombard (2017) extend these observations to non-human agents exerting social influence in online groups. They found that uniform representations (e.g., using the same colour) can enhance perceived group identity even when "peers" are computer agents.

A few studies have analysed how anthropomorphic and non-anthropomorphic user representations impact conformity behaviour. For example, Lee and Nass (2002) compared user conformity when peers are represented by text boxes, stick figures and animated characters. They found that participants perceived peers represented by animated characters to be more intellectual, trustworthy and socially attractive than their counterparts represented using text boxes and stick figures. However, contrary to expectations, participants were seen to show greater conformity to group opinions when they were represented by low anthropomorphic text boxes, than high anthropomorphic animated characters. The researchers later rationalised that visual differences between animated characters may have emphasised intragroup differences that can encourage self-identity, whereas text boxes that lacked visual differences may have indirectly induced a sense of group membership through heightened de-individuation effects.

In summary, these findings indicate that user cues can moderate a sense of belonging within online groups, which in turn affects users' susceptibility to *normative* conformity. It appears that what triggers more conformity is not simply the increase in perceived social presence through anthropomorphic user representations, but rather the similarity or uniformity of these cues with the group.

3.3.3.2. Effects of the level of interactivity. The level of interactivity enabled between group members can also determine to what extent users feel connected to their peers (i.e., perceived social presence) and feel pressured to conform. The literature is consistent in that higher levels of online interactivity leads to higher conformity (Laporte et al., 2010; Maruyama et al., 2014, 2017; Wijenayake et al., 2020a ; 2022). For example, Laporte et al. (2010) compared conformity in participants who either communicated their responses with confederates through a text-based group chat (low interactivity), or using live-video streams (high interactivity). The reported conformity rates in text-based chat and live-video conditions for factual (15% vs. 28%), opinion-based (30% vs. 33%) and preference-based (20% vs. 24%) questions show a consistent trend for higher conformity in the live-video condition. Moreover, when the public (in the presence of the group) and private (paper-based survey after the experiment) responses of participants were later analysed, authors found an astounding 51% of changes from public to private responses of participants in the live-video condition, in comparison to only 18% of changes in the text-based chat condition—which indicates considerable levels of public compliance in the former. As public compliance is an indication of susceptibility to *normative* influences, their results suggest that higher perceived social presence induced through higher interactivity can trigger higher susceptibility to *normative* conformity in online groups.

Studies also indicate that by increasing the number of ways in which users can communicate with group members, perceived social presence can be enhanced leading to more frequent conformity behaviour. Maruyama et al. (2014) investigated effects of the level of interactivity in a social watching experiment, where participants were asked to indicate their preferential candidate to the 2012 US election

before and after watching the official televised election debate, while simultaneously following election-related posts on Twitter. They found that participants who were instructed to actively engage with the tweets by posting their own thoughts were more likely to change their pick for the preferential candidate to align with the majority's judgement on Twitter (33% conformity), than those who simply observed tweets without interacting with them (7% conformity). They concluded that the added interaction on Twitter significantly enhanced users' receptiveness to the majority's sentiment, which in turn determined their conformity behaviour. These findings have been confirmed in more recent work by Maruyama et al. (2017) and Wijenayake et al. (2022).

Therefore, the literature consistently indicates that higher interactivity and more means of interaction in online spaces can increase conformity behaviour, likely of a *normative* nature. This effect is probably due to the enhanced connection to the group resulting from increased interaction and the repeated exposure to the majority through multiple interactions.

3.3.3.3. Effects of response visibility. Participants' responses to an experimental task can either be publicly visible or hidden to other group members. The literature investigates effects of response visibility on conformity behaviour using two approaches. Some studies (e.g., Laporte et al., 2010; Lee & Nass, 2002) have compared conformity behaviour in participants' public responses (visible to the group) and private (invisible to the group) responses to the same task. Others (e.g., Wijenayake et al., 2020b; Wijenayake et al., 2022) have used study designs where the initial responses of all group members are publicly visible, whereas their responses after being exposed to group opinions may be public or private.

These studies in general indicate that when participants are aware their responses are publicly visible to the group, they conform more than when their responses are kept private. For example, Lee and Nass (2002) observed higher conformity in a social dilemma task when participants indicated their responses in the presence of a simulated group, than when they completed the same task in private (on paper). This behaviour has been previously explained with regards to offline, face-to-face groups by Deutsch and Gerard (1955). They explain that public responses can increase susceptibility of users to *normative* influences, increasing pressure to fit-in with the group. Conversely, if user responses are not visible to the group, the motivation to conform for *normative* reasons (or to fit-in) is lower. Our analysis of the conformity literature indicates that this behaviour extends to online groups as well.

Moreover, response visibility has been seen to interact with the level of interactivity enabled in online groups to influence conformity behaviour. For instance, Wijenayake et al. (2020a) analysed conformity behaviour across two levels of interactivity (discussion vs. no discussion with group members after being exposed to group's initial responses), and response visibility (public vs. private). They note that higher interactivity resulted in more conformity in the presence of public responses than in private responses. The researchers described that participants reported feeling more pressure to change their initial responses to agree with the group when their final responses were visible to others, than when they were not. Similar to Deutsch and Gerard (1955) rationalisation, authors explained that public visibility of the final responses immediately after a group discussion, left participants concerned for how they would be perceived by the group if their final responses did not align with the majority. This concern is likely due to normative conformity, as participants adjusted their responses to fit in with the majority and avoid negative judgement.

3.3.3.4. Effects of the humanness of peers. Humanness (the quality of being human or not) of "peers" can also determine to what extent social presence is perceived in online groups. Recently, several experiments have attempted to test if non-human peers such as computers, robots and virtual agents can induce conformity behaviour, similar to humans (Hertz & Wiese, 2016, 2018; Midden et al., 2015). For example, Midden et al. (2015) were amongst the first to compare how participants conform to human and non-human peers when completing Asch's line judgement task in online groups. They observed 12% conformity against human peers, whereas non-human agents generated almost no conformity. Hertz and Wiese (2016) also found no conformity behaviour when users are challenged by computers or robotic peers in the line judgement task. These studies explain that the "social" nature of non-human agents is not strong enough to to generate *normative* influences that are essential for the line judgement task to generate conformity.

However, Midden et al. (2015) subsequently observed that increasing ambiguity of the line judgement task triggered significantly higher conformity to both virtual agents (21%) and computers (24%), than in the control condition (5.5%). Hence, it was deduced that artificial majorities are capable of generating some *informational* conformity in online groups. This notion was later confirmed by Lucas et al. (2019) in a survival task (rank ten pieces of art based on their importance to be saved from a hypothetical fire), where participants were seen to agree more with virtual agents who presented arguments based on facts (and hence, appealed to *informational* influences), than those who resorted to *normative* tactics to convince users to accept their ranking. Furthermore, Hertz and Wiese (2018) found that non-human agents such as computers and robots can trigger conformity behaviour in analytical tasks (arithmetic sums) that benefit from *informational* influences, than social tasks (identifying emotion depicted on a photograph). No difference was observed for human peers in social and analytical tasks.

Some studies also insinuate that in ambiguous tasks that trigger *informational* influences, non-human agents are either equally (Duderstadt et al., 2022; Wang et al., 2012) or more influential (Lucas et al., 2019; Masjutin et al., 2022) than human peers. Hence, the potential for non-human peers to create social pressure in online groups is

Table 5. The distribution of conformity studies based on the personal determinants they investigate.

Personal Determinants	Literature
Gender	
- User	(Enjaian et al., 2017) (Guadagno & Cialdini, 2007) (Lee, 2006) (Rosander & Eriksson, 2012) (Wijenayake et al., 2020a) (Wijenayake et al., 2020b) (Zhu et al., 2012)
- User × Peers	(Lee, 2007b) (Schneider, 2021)
- User × Peers × Task	(Lee, 2003, 2004a, 2007c) (Wijenayake et al., 2019)
Self-confidence	(Hurst et al., 2023) (Enjaian et al., 2017) (Kyrlitsias & Michael Grigoriou, 2018) (Laporte et al., 2010) (Lee, 2004a) (Lee, 2007c) (Wijenayake et al., 2019) (Wijenayake et al., 2020a) (Wijenayake et al., 2020b) (Wijenayake et al., 2021a) (Wijenayake et al., 2021b) (Wijenayake et al., 2022)
Personality	(Adrianson & Hjelmquist, 1991) (Lee, 2006) (Packer, 2010) (Coppolino Perfumi et al., 2019) (Wijenayake et al., 2020a)
Age	(Wijenayake et al., 2021b) (Zhu et al., 2012)
Culture	(Cinnirella & Green, 2007) (Gaither et al., 2018)

apparent—especially in *informational* tasks that computers are perceived to perform better than humans.

3.4. Personal determinants of online social conformity

Despite being exposed to the same contextual factors, individuals demonstrate different rates of conformity behaviour. Literature has attributed such individual differences in conformity behaviour to personal conformity determinants such as gender, confidence, personality, age and culture. Out of the papers we analysed, 32% (25 out of 77) have investigated at least one of these personal determinants of conformity (see Table 2). We note that gender ($n = 13$) and confidence ($n = 12$) are more frequently investigated, whereas effects of personality ($n = 5$), age ($n = 2$) and culture ($n = 2$) on online conformity are less frequently reported as shown in Table 5.

3.4.1. Effects of gender

Gender is the most popularly investigated personal determinant of conformity among the papers analysed in this survey. We note that in the vast majority of conformity studies, "gender" is perceived as a binary variable i.e., whether an individual identify themselves as a man or a woman. Thus, while we acknowledge that this understanding of gender is outdated and does not represent reality, our analysis focuses on the available literature and their outcomes.

The effects of gender has been investigated in three main approaches as shown in Table 5. Some studies have specifically looked at potential differences in susceptibility to conformity influences in men and women (Enjaian et al., 2017; Guadagno & Cialdini, 2007; Lee, 2006; Rosander & Eriksson, 2012; Wijenayake et al., 2020a, 2020b; Zhu et al., 2012). Other studies have examined for potential interactions between peer and user gender (Lee, 2007b; Schneider, 2021), and if these effects are moderated by the gendered nature of the experimental tasks (Lee, 2003, 2004a, 2007c; Wijenayake et al., 2019).

Among the papers analysed in this survey, the first to investigate gender differences in conformity behaviour in CMC settings was by Guadagno and Cialdini (2007). More specifically, the authors compared how receptive men and women are to their same-gendered correspondents when communicating face-to-face and through email. They found that women were more receptive to their opposing partners in face-to-face interactions than in email-based interactions. Alternatively, men showed no differences in receptiveness to their peers over the two communication mediums. These differences in conformity behaviour was explained with reference to *gender roles* imposed by the society (Eagly et al., 1981; Endler et al., 1973). In other words, authors describe that women who often focus on relationship formation and cooperation, align their attitudes with those of their opposing partner more often in face-to-face interactions where relationship goals are more salient and attainable. Alternatively, men whose social roles focus on independence and agency, are not affected by differences in social constraints between the two communication mediums.

However, subsequent studies that compare conformity behaviour among men and women in online groups, often present different findings. For example, Rosander and Eriksson (2012) observed that men tend to conform more than women in factual and logical tasks, especially when task difficulty increase. Other studies found no differences in conformity behaviour between men and women (Wijenayake et al., 2020a; Zhu et al., 2012). For example, Wijenayake et al. (2020a) recruited an equal number of men and women to complete an online MCQ quiz that contained informational, logical and opinion-based questions to investigate whether men and women conform differently in online settings. The authors emphasised that no user cues were exposed throughout the study to avoid potential confounds that can arise from indications of peer gender. However, no significant gender differences in conformity were noted in this experiment. Moreover, Zhu et al. (2012) investigated potential gender differences in how men and women conform to peer choices in an online preference-based task. Similar to prior findings by Wijenayake et al. (2020a), they also reported that gender is not predictive of attitude change in online settings. Therefore, the majority of the literature indicates that user gender in itself does not impact their tendency to conform in online groups.

However, in the presence of gendered user cues, such as stereotypical masculine or feminine avatars (Lee, 2007a), gender-typed text (Lee, 2007c), and gendered-voice (Schneider, 2021), peer gender (inferred through gendered

representations) has been seen to moderate effects of user gender on online conformity behaviours. For example, Lee (2007a) tested how men and women responded to incorrect judgements of an online partner that was represented using a stereotypically masculine or feminine representation. They found that both male and female participants conformed more with their online partners, when their character and the partner's represented the same gender. We note that strong gendered representations such as avatars are not essential to trigger such behaviour, as similar observations have been reported in studies where users inferred peer gender using their typing styles (Lee, 2007c) and voice (Schneider, 2021).

Another set of studies have analysed if user and peer gender interacts with the gendered nature of the experimental task. The focus on these studies is to determine if inferring peer gender can create gender-stereotypical perceptions of self and peer competency that impact online conformity behaviour. For instance, when paired with a partner (who is represented using either a stereotypical masculine or feminine avatar) to complete a MCQ quiz containing both stereotypically masculine and feminine tasks (questions based on sports vs. fashion), studies have found that both men and women are less inclined to conform to their partner in stereotypically masculine (sports) and feminine (fashion) questions respectively—that they perceived to be well-known to their own gender group (Lee, 2003, 2004a). In addition, the authors observed that men were more receptive to conformity influences in stereotypically feminine questions when challenged by a partner represented using a stereotypically feminine user representation. Similarly, women were seen to conform more in stereotypically masculine questions when the opposing partner was represented using a stereotypically masculine user representation. Therefore, the authors concluded that in the presence of gender-stereotypical tasks, both men and women perceived competency of themselves and their peers based on available gender cues—which also determined whether an individual would conform to their partner or not. Furthermore, they rationalised these findings in relation to participants' susceptibility to *informational* influences. More specifically, they explained that when individuals stereotypically perceive a task to favour one gender over the other, they are more inclined to accept information coming from the favoured gender group because they assume such gender-stereotypical conformity will improve their chances of being "right."

Subsequently, Wijenayake et al. (2019) investigated effects of peer gender in larger groups with more than one peer. In this study, participants indicated their answers to a series of stereotypically gendered tasks (based on fashion and sports) as well as gender-neutral tasks (based on general knowledge), both before and after being exposed to responses of seven other "peers." The authors emphasised that simulating seven peer responses allowed them to expose the participants to both majorities and minorities with different gender compositions (e.g., a majority with more men than women against a minority with more women than men and vice versa). In addition, they also used two distinct gender cues to represent peers—stereotypically gendered user names (e.g., David, Sarah) and stereotypically gendered silhouette avatars (i.e., masculine and feminine silhouette avatars often used in online groups as default profile pictures)—in an attempt to compare their effects in triggering gender-stereotypical perceptions in online groups. The authors found that both men and women were more inclined to conform to majorities that consisted of more stereotypically masculine than feminine representations in questions that were stereotypically perceived to be better known to men, whereas they preferred majorities with more stereotypically feminine than masculine representations in stereotypically feminine questions. These findings resonate with prior observations by Lee (2003) where gender-stereotypical perceptions of peer competency were seen to enhance *informational* conformity in both men and women. The authors also highlighted that while simple gender cues such as peer names were sufficient to trigger gender-stereotypical conformity, such behaviour was more dominant in the presence of stereotypically gendered avatars than in stereotypically gendered user names (Wijenayake et al., 2019).

In summary, it is interesting to note that differences in conformity behaviour among men and women that have been reported in face-to-face groups are not as prevalent in online groups. Instead, in online spaces, it is the awareness of peer gender that tends to heighten an individual's susceptibility to gender-stereotypical conformity, primarily due to *informational* influences. In these instances, gender often acts as a stereotypical cue for perceived peer expertise, with stronger cues exerting a greater influence on conformity. The evidence suggests that such stereotypical thinking, likely unconscious, plays a significant role in shaping conformity behaviour in online environments.

3.4.2. Effects of self-confidence

People often conform to the majority when they are unsure of the "correct" response to an ambiguous situation—which we refer to as *informational* conformity. In other words, the level of self-confidence an individual has on their personal judgement has a significant impact on their decision to conform (or not) to the majority, forsaking their own judgement. In the research articles analysed, we observe a total of 12 studies (15% of the total sample) that report effects of self-confidence on online conformity behaviour (see Table 5).

The effect of self-confidence on online conformity has been tested differently in the literature. A majority of studies required participants to *self-report* their confidence in personal judgement. For example, in a study by Lee (2004a), participants indicated their initial answer and confidence in the chosen answer (or initial confidence) on a 10-point scale, for each question in an online quiz, after which they were exposed to the answer of their partner. A similar approach was used in a series of other studies (i.e., Wijenayake et al., 2019, 2020a, 2020b; Wijenayake, Hettiachchi, et al., 2021; Wijenayake, Hu, et al., 2021), where participants rated their confidence on a scale of 0–100, both before and after being exposed to group feedback.

Moreover, some others have used questionnaires specifically designed to capture self-esteem and self-worth (e.g., Enjaian et al., 2017) used the 10-item Rosenberg self-esteem scale) to investigate effects of self-confidence.

In general, the literature indicates that participants who are less confident of their personal judgements are more likely to conform to opposing judgements of their online peers. We note that this typically seems to be the case in both objective (Kyrlitsias & Michael Grigoriou, 2018; Lee, 2007b; Wijenayake et al., 2019; Wijenayake, Hettiachchi, et al., 2021; Wijenayake, Hu, et al., 2021) and subjective (Wijenayake et al., 2020a, 2020b) tasks. For instance, in a study by Wijenayake et al. (2020a), the effects of self-confidence on conformity was investigated with regard to both objective and subjective MCQ questions. The subjective questions were derived from non-sensitive high school debating topics, whereas objective questions were based on general knowledge. Participants were required to indicate their initial answer and confidence for every quiz question before being exposed to the group answers. The authors found that self-reported initial confidence directly influenced conformity behaviour, regardless of the objectivity of the quiz questions. They further report that participants when unsure of their initial answer conformed to the majority as an attempt to improve their chances of obtaining the "correct" or the more "popular" answer in both objective and subjective questions—which indicates effects of *informational* influences.

However, the effects of self-confidence on conformity can sometimes be moderated by other contextual and personal determinants, such as social presence, task objectivity and participant gender. Wijenayake et al. (2022) note that in low social presence situations with remote and asynchronous online communication, confidence in personal judgements may not be predictive of users' conformity behaviour in subjective, opinion-based tasks. Low social presence and the subjective nature of task together can discourage conformity, even when users are not confident of their personal opinions. Conversely, high social presence conditions have been seen to trigger conformity, even among users who report high confidence in their personal judgements (Laporte et al., 2010).

Moreover, gender differences have been reported in how self-confidence impact conformity behaviour. Lee (2004a) found that self-reported confidence on personal answer showed the expected relationship with conformity behaviour in women, but not in men. They note that men reported higher confidence on their initial judgements regardless of their subsequent conforming or non-conforming behaviour. Thus, they argue self-confidence is not a reliable measurement of conformity behaviour in men. Additionally, research also indicates that men who report high approval-based contingent self-esteem conform more often than those who do not (Enjaian et al., 2017). Therefore, more work is needed to investigate what other personal and contextual factors moderate effects of confidence on conformity online settings. We further note that none of the studies analysed in this survey investigate effects of peers' confidence on participants' conformity behaviour.

3.4.3. Effects of personality

Personality differences can also determine how susceptible people are to conformity behaviours. However, only five studies in the sample of papers considered have investigated effects of different personality traits (see Table 5) by capturing user personality in terms of the *big-five personality traits*, *social anxiety* or *need for public individuation.*

Personality is most often quantified using John and Srivastava (1999)'s *big-five taxonomy* that quantifies personality across five traits namely—Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism (Coppolino Perfumi et al., 2019; Packer, 2010; Wijenayake et al., 2020a). For example, Packer (2010) analysed effects of openness and conscientiousness traits on conformity behaviour among undergraduate students in an opinion-based experimental task. The students were required to indicate their personal opinion on the use of alcohol on campus premises in an online chat room, after being exposed to pro-alcohol use attitudes supposedly coming from their fellow students. The authors found that participants with higher self-reported conscientiousness and openness were more likely to disagree with the supposed pro-alcohol community stance and publicly express their concerns regarding alcohol use on campus. Additionally, Wijenayake et al. (2020a) observed that individuals with high conscientiousness and neuroticism conformed more often than others in an online quiz with both subjective and objective MCQs. The authors explained that individuals with high conscientiousness are goal-oriented by nature and hence are more likely to be susceptible to *informational* influences that often trigger conformity in online groups. Moreover, they rationalised that high neuroticism is an indication of disposition to become anxious—a trait that has been previously seen to heighten conformity tendencies in prior work in physical groups (Meunier & Rule, 1967; Santee & Maslach, 1982).

We further note that concise versions of the big-five personality test have been derived to allow for time-efficient personality measurement. For example, a study by Coppolino Perfumi et al. (2019) reported using the Five Factor Adjective Short Test (5-FasT) derived by Giannini et al. (2012) based on the big-five personality traits, to measure effects of personality on conformity behaviour. This inventory consists of 26 dichotomous (true-false) items, in comparison to the 44, 5-point scale (strongly agree-strongly disagree) items in the original inventory. The findings from this study indicate inverse relationships between conformity and three personality traits—neuroticism, extraversion, and agreeableness—and a positive relationship between conformity and openness. No effects were observed from conscientiousness.

Furthermore, we note that users' *social anxiety* has been analysed in relation to conformity behaviour. In simple terms, socially anxious individuals feel nervous and uneasy in social pressure situations—especially when the appropriate response is unclear. Coppolino Perfumi et al. (2019) used the State-

Trait Anxiety Inventory for Adults scale (STAI-AD) (Charles & Spielberger, 1983) to test effects of anxiety on conformity behaviour in a CMC-based replication of the line judgement task and a series of vocabulary tests. As hypothesised, the authors observed a positive correlation between conformity and anxiety such that those who rated higher scores in the STAI-AD scale were reported to be more inclined towards conformity behaviour than others.

Moreover, the *need for public individuation*—i.e., the need to differentiate oneself from others in group settings—has been investigated with regard to conformity in online groups. Lee (2006) investigated how need for public individuation (measured using *Maslach et al.*'s Individuation Scale (Maslach et al., 1985)) moderate the impact of individuating information on conformity in online groups. Participants in individuated conditions were requested to introduce themselves to their peers by mentioning their age, hobby, favourite colour and TV show before progressing to the experimental task. The authors note that introductions were a way of insinuating a sense of personalisation among the participants. Conversely, participants who were assigned to non-individuated conditions remained anonymous throughout the experiment. The findings from this study indicate that participants who showed high need for individuation were less likely to conform in the individuated condition—where their identities were personalised through introductions—in comparison to the anonymous condition with no personalisation. However, the presence or the absence of individuating information had no effect on the conformity behaviour of participants who showed low need for individuation. Therefore, authors concluded that the impact of an individual's need for individuation on their conformity behaviour can be enhanced in online settings by allowing for personalisation.

While the preliminary findings support that user personality impacts susceptibility to conformity, the literature is inconsistent on how specific personality traits link with conformity behaviour. For instance, the three studies that have investigated effects of personality using the big-five traits report contradictory results (Coppolino Perfumi et al., 2019; Packer, 2010; Wijenayake et al., 2020a). The literature also indicates that observed effects of personality traits may vary across different experimental tasks and the version of the inventory that is used for measurement (e.g., Packer, 2010 and Wijenayake et al., 2020a vs Coppolino Perfumi et al., 2019). Moreover, the multi-faceted nature of personality implies that it can be captured in other ways—i.e., ascendancy vs. submission (Beloff, 1958; Mouton et al., 1956) and need for affiliation vs. achievement (Hardy, 1957; Sistrunk & McDavid, 1965)—as previously seen in the physical conformity literature.

We note that the relationship between personality traits and conformity is complex and influenced by contextual factors, making it difficult to isolate the specific impact of personality. For example, a person's tendency to conform can vary depending on the social environment or the perceived authority of the group. Moreover, self-reported personality assessments can also introduce bias, as individuals might unconsciously respond in ways that align with social expectations rather than their true traits. Therefore, more research is needed to fully understand how personality influences conformity considering these complexities, and to determine effective methods for accurately capturing and measuring user personality in online contexts.

3.4.4. Effects of age

Despite the reported effects of age on conformity in physical groups (Allen & Newtson, 1972; Costanzo et al., 1968; Costanzo & Shaw, 1966; Klein, 1972; Pasupathi, 1999; Walker & Andrade, 1996), age is one of the less frequently investigated personal determinants in the existing online conformity literature. We found only two papers that test for effects of age on online conformity behaviour by recruiting participants from different age groups and comparing their conformity behaviours within the same experimental setup (see Table 5). For the completeness of this analysis, we briefly discuss their findings next.

The first study that accounted for age differences in conformity behaviour in an online environment was presented by Zhu et al. (2012) in 2012. They deployed a large scale online survey where 433 participants—aged 18–82 years ($M = 27$ years)—were asked to indicate their personal preferences between pairs of photographs, both with and without knowledge of others' preferences. However, while the results of this study indicated conformity rates between 14.1% and 32.5%, the authors reported no statistically significant age differences in conformity behaviour.

Furthermore, a more recent study by Wijenayake, Hu, et al. (2021) investigated effects of user age and age-related stereotypes on user conformity behaviour in an online Instant Messaging platform. They analysed effects of age across three aspects—user's age group (i.e., Generation X or Generation Z), age group composition of peers challenging user responses (i.e., Generation X or Generation Z or mixed), and the stereotypically perceived age of task (i.e., MCQs that are stereotypically perceived to be better known to Generation X, Generation Z, or age-neutral). In other words, the objective of the study was to identify whether age-stereotypical perceptions of self and peer competency that are often reported in online group settings (Gonzalez & Loureiro, 2014; Pak et al., 2014), impact whether or not individuals conform to peer opinions in age-stereotypical tasks. To this end, the researchers assigned each Generation X or Z participant with two confederates, to complete an online MCQ quiz that included age-stereotypical questions based on 1980s history (Generation X questions) and social media and latest technology (Generation Z questions), as well as age-neutral general knowledge questions. The authors further note that user/peer age was only implied using their birth years, which were embedded on to their usernames (e.g., e1p1_1998, e1p2_1965), so that potential confounding effects from other user traits are minimised. The authors found that both Generation X and Generation Z users conform to contradictory responses of peers belonging to the opposite age generation (i.e., Generation Z or X respectively), only when peers' age group aligns with the

stereotypically perceived age demographic of a question. Hence, their findings indicate that people infer peer age using minimal user cues (e.g., birth years) to stereotypically perceive both self and peer competency—especially in stereotypically age-biased tasks. Such perceptions can consequently determine their receptiveness to opposing views of peers in online groups.

The evidence found in this survey with regard to effects of age on conformity in CMC groups—while minimal—encourage further investigation into potential effects of age on conformity across different user cues (i.e., user photographs and anthropomorphic avatars), experimental tasks and age group compositions. Further investigation is also required to determine whether age-stereotypical conformity can lead to adverse effects (e.g., unwarranted biases against certain age generations in online settings (Gonzalez & Loureiro, 2014; Pak et al., 2014)).

3.4.5. Effects of culture

The effects of users' cultural disposition on conformity behaviour is another less frequently investigated personal determinant in online groups. However, cultural differences in how people conform to group opinions have often been observed in physical groups (Bond & Smith, 1996). Therefore, while we note only two studies (e.g., Cinnirella & Green, 2007 and Gaither et al., 2018) that investigates cultural differences in online conformity behaviours, we describe their findings next for the sake of completeness.

The effects of culture on conformity have been investigated most prominently using *Hofstede's* (1984) individualism-collectivism dimension of national culture (Bond & Smith, 1996). In summary, individualistic people tend to prioritise their personal goals over group goals, when there is a conflict between the two—similar to when an individual's personal judgement is challenged by the group majority. Conversely, collectivistic people would prioritise group goals over their personal gain. The literature is clear that in physical settings, individualistic people are much less likely to conform than collectivistic people (Bond & Smith, 1996). However, these cultural differences may not replicate in online environments that are inherently different to physical groups. For example, Cinnirella and Green (2007) compared how people from individualistic and collectivistic countries conform to opposing majorities, when completing Asch's line judgement task in online vs. physical groups. They used country of birth to recruit participants who came from individualistic (e.g., Britain, Italy, France, Germany) or a collectivistic (e.g., South Korea, Greece) national cultures. The authors found that cultural differences in conformity behaviour—captured through the individualism-collectivism dimension—were only significant in physical settings. Participants from collectivistic countries were not likely to conform more than those who came from individualistic countries, when performing the task in online groups. Authors rationalise that the inherent lack of social presence in anonymous, online groups may have diminished the focus on "group" especially for collectivistic participants.

A more recent study by Gaither et al. (2018) analysed effects of user and peer ethnicity, opening a new avenue of research into the effects of culture on conformity behaviour. More specifically, they recruited White US residents and asked them to choose between two college applicants in a virtual group with three "peers" who unanimously supported the clearly weaker applicant. The peers were represented using White avatars (homogeneous condition) or a mix of Black, South Asian and East Asian avatars (heterogeneous condition). This study found that participants were significantly more likely to conform in homogeneous groups with all White avatars, than in the ethnically diverse groups. Thus, contradicting prior findings of Cinnirella and Green (2007), this study shows that in the presence of certain ethnic user cues, in-group and out-group identification can lead to stereotypical conformity behaviour, even in online spaces. Therefore, it is evident that more work is essential to expand when and how different dimensions of culture can impact a person's decision to conform in online groups.

4. Discussion

This survey is the first to systematically review and analyse the literature on occurrences, outcomes and determinants of social conformity behaviour in online settings. We note that over the last two decades, numerous reports of social conformity behaviour have been noted in online groups, with both *positive* and *negative* outcomes, that we summarise in Section 3.2. Consequently, there is a growing interest among researchers to better understand the dynamics of online social conformity in terms of its *contextual* and *personal* determinants. In response, this survey describes the effects of several *contextual* (i.e., majority-minority group composition, experimental task, social presence) and *personal* (i.e., gender, age, culture, self-confidence, personality) determinants of online social conformity in Sections 3.3 and 3.4, to help inform the design of future conformity studies.

Next, we reflect on some of the most commonly encountered challenges when conducting online conformity research and provide suggestions on how to tackle these challenges. Then, informed by our findings, we discuss potential directions for future work in this research area.

4.1. Common challenges in conformity studies

4.1.1. Investigating contextual and personal determinants of conformity in tandem

Our survey findings imply that online conformity behaviour is a function of multiple *contextual* and *personal* determinants. This is based on the frequent interaction effects observed between conformity determinants. In other words, the presence of one determinant can impact whether and how the effect of another is perceived by users. For example, gender-stereotypical conformity was reported in the presence of stereotypically gender-typed experimental tasks and user representations, but not in neutral tasks (Wijenayake

et al., 2019). Similarly, Walther et al. (2002) found that task difficulty moderates the effects of majority group size on online conformity behaviour. However, only 24 out of 77 articles reviewed in this survey have investigated more than one conformity determinant, whereas only 13 out of 77 (i.e., approximately 17%) have investigated *both* contextual and personal conformity determinants in tandem (see Table 2). Therefore, to truly understand the dynamics of conformity, future work should investigate its contextual and personal determinants simultaneously.

4.1.2. Participant deception and ethical concerns

Conformity studies create social pressure by simulating a group "majority" that supports an incorrect or less popular answer that contradicts with participants' personal judgement on the same task. Therefore, simulating the majority's opinion without causing suspicion is critical in conformity studies to ensure that participants behave normally. If participants suspect that the majority is colluding against them, it may cause them to disregard the majority's opinion entirely. For this reason, conformity studies have used approaches *before*, *during* and *after* the experimental task, to ensure that participants perceive the "majority" as real.

Several conformity studies report collecting answers to the experimental tasks in a pilot study conducted *before* the main experiment (Coppolino Perfumi et al., 2019; Kim & Park, 2011; Rosander & Eriksson, 2012; Wijenayake et al., 2019, 2020b). In these cases, a separate set of participants answer the experimental tasks without any peer feedback (or social pressure), which then informs the positioning of the majority (and minorities where applicable). This approach ensures that the opposing majority supports a reasonably acceptable, yet incorrect or "unpopular" response—especially in subjective experimental tasks—hence making the majority more believable. It also prevents participants from completely disregarding the majority's opinion simply because it is too erroneous. This is important as prior work has shows minimal conformity against majorities supporting extremely incorrect or unpopular answers (Campbell & Fairey, 1989).

Additionally, participants in conformity studies are often given a vague description of the study's purpose and are intentionally kept ignorant of its true purpose, in order to ensure natural behaviour (Stang, 1976). For instance, Laporte et al. (2010) instructed participants that they would be completing an online quiz with other users, when in reality each naive participant was confronted by confederates of the research team.

Furthermore, to avoid raising suspicion about the authenticity of peer answers *during* the experiment, the simulated group "majority" can provide correct or popular answers for a good proportion of "filler" trials. Conversely, in "critical" trials, the majority supports a seemingly incorrect or unpopular answer, thereby generating social pressure. In the conformity literature analysed for this survey, the proportion of critical trials vary between 50% and 100% of overall experimental trials. However, the majority has followed standards set by Asch (1951), to include 67% of critical trials (e.g., Hertz & Wiese, 2016; Laporte et al., 2010; Midden et al., 2015; Smilowitz et al., 1988). Alternatively, other studies have positioned the naive participant in the majority group in filler trials, in addition to placing them in the minority group in the critical trials, to avoid suspicion of collusion between group members (e.g., Wijenayake et al., 2019, 2020a, 2020b).

However, despite all efforts, participants may still be suspicious that they were deceived during the experiment—which can result in unnatural behaviour (no conformity or extreme conformity behaviour). Therefore, it is recommended that researchers probe participants for suspicion immediately *after* the experiment and discard their data prior to analysis, to ensure that the final data set is unaffected by suspicious participants.

Importantly, we further emphasise that the "limited disclosure" of a conformity study's true purpose and the deception of the majority's responses can raise ethical concerns. In response, Asch (1951) highlighted that immediately after probing participants for suspicion of the experimental setup, they should be fully informed of the true purpose of the study, the deception used to induce social pressure through confederates (or alternatively a simulated majority), as well as the participant's role in the experiment. They further stress that it is the responsibility of the experimenter to clarify any questions and explain why they were placed in a simulated social pressure situation, which can often be a stressful situation for the participant. Moreover, others recommend seeking consent to use the data collected during the experiment from the participant after debriefing them about the true purpose of the study, and giving them the opportunity to withdraw their data (Coppolino Perfumi et al., 2019; Smilowitz et al., 1988; Wijenayake et al., 2020b).

4.1.3. Tackling the experimenter effect

The "experimenter effect" is described as a participant's tendency to alter their behaviour in the presence of an experimenter, resulting in unnatural behaviour and hence invalid research outcomes (Payne & Payne, 2004). More specifically, participants may adjust their behaviour during the experiment to align with subtle cues they extract from the experimenter regarding their objectives behind the experiment (Walker, 2014; Wijenayake et al., 2020a), or even in response to certain socio-demographic features of the experimenter such as—gender, age and race (Davis & Silver, 2003; Liu & Wang, 2016; Wilson et al., 2002). Therefore, such experimenter effects can introduce confounding influences in conformity studies. For instance, if a participant somehow senses that the experimenter expects to see conformity behaviour, they may feel the need to do so to produce "better" (but unnatural) study results. Furthermore, as studies have also shown that completely removing the experimenter can also cause insincere and satisficing answers, researchers recommend using bots in the place of experimenters in online groups (Van Berkel et al., 2019; Wijenayake et al., 2020a). More specifically, they argue that bots can potentially facilitate a human experimenter's *conversational interactivity*, without unconsciously exposing

subjects to user cues or experimental details that can moderate their behaviour (Wijenayake et al., 2020a).

Several conformity studies (Wijenayake et al., 2020a; Wijenayake, Hu, et al., 2021) have replaced human experimenters using chatbots to avoid experimenter effects. These chatbots assisted participants in familiarising themselves with the platforms used for experiments (e.g., online quizzing tool and a IM platform respectively) and provide step-by-step instructions on how to complete the task without any involvement from the researchers. The authors further report that the use of a bot was well-received by their participants, who also preferred receiving instructions from a bot in comparison to reading them on the screen or on paper. Moreover, a similar bot was used in another online conformity study that investigated the effects of gender and related stereotypes (Wijenayake et al., 2019), where the bot trained participants on how to use the platform, without revealing the experimenters' gender to avoid potential confounding effects.

We emphasise that researchers need to be mindful about how the bots are designed, if they are to be used as a mechanism to minimise experimenter effects in conformity studies. More specifically, the level of anthropomorphism and conversational capabilities of a bot can determine its effectiveness in mitigating experimenter effects. As people often regard computers as social actors in conformity studies and have responded similarly to human peers (Hertz & Wiese, 2016; 2018; Midden et al., 2015), highly anthropomorphic bots with prominent user cues (related to gender, race, etc.) may induce experimenter effects similar to humans (Wijenayake et al., 2020a).

4.2. Future directions of conformity research

This survey set forth several avenues worthy of further investigation by online conformity researchers. First, we highlight often overlooked determinants that are important to better understand the dynamics of conformity behaviour as it continue to proliferate in online groups. Second, there is a lack of research that extends findings of controlled conformity studies to realistic online group settings. Additionally, there is a lack of understanding of the longevity of online conformity behaviour, to differentiate between mere public conformity (compliance) and private acceptance. Lastly, the literature is inadequate to determine whether and how established conformity determinants can be controlled using online platform design, to minimise negative implications of conformity behaviour while capitalising on its positive implications.

4.2.1. Overlooked determinants of online social conformity

This survey finds that overlooked determinants of social conformity, such as users' *culture* and *age* require further investigation in online groups. Despite the plethora of conformity studies based on physical groups that support the presence of cultural and age-based differences in conformity behaviour (Allen & Newtson, 1972; Bond & Smith, 1996; Costanzo & Shaw, 1966; Walker & Andrade, 1996), we found only two studies each, that examined possible effects of culture (Cinnirella & Green, 2007; Gaither et al., 2018) and age (Wijenayake, Hu, et al., 2021; Zhu et al., 2012) in online settings. Therefore, the current literature is insufficient to determine if these effects translate to online spaces.

The effects of *culture* on online conformity may not be apparent in the literature because the majority of online conformity studies have recruited participants from WEIRD (Western, Educated, Industrialised, Rich and Democratic) communities. This may have skewed and reduced the generalisability of current findings as recruitment is limited to only certain communities (Jones, 2010). Furthermore, online groups are inherently distributed and are more likely to contain culturally diverse cohorts of users when compared to physical groups (Oliveira et al., 2018; Pendse et al., 2019; Popov et al., 2014), making cultural effects on conformity behaviour even more significant in the former. Hence, going forward, online conformity studies should investigate and account for cultural differences in conformity behaviour across different communities, and ensure diversity in recruited participants to accurately reflect users that rely on online groups for interpersonal relations (Suarez-Balcazar et al., 2009).

Similarly, users' *age* can vary their susceptibility to social influences in online spaces (Wijenayake, Hu, et al., 2021). We note that prior conformity studies based on physical groups have investigated and observed age differences in conformity behaviour among children, adolescents, and young and older adults (Allen & Newtson, 1972; Costanzo et al., 1968; Costanzo & Shaw, 1966; Klein, 1972; Pasupathi, 1999; Walker & Andrade, 1996). Some others have analysed if age of opposing "peers" can differently impact a person's likelihood to conform (Kumar, 1983). Therefore, as the Internet becomes a way of making new social connections, maintaining relationships and seeking information for age-diverse user groups (Hunsaker & Hargittai, 2018; Morris et al., 2007; Vošner et al., 2016), future work should examine if age-differences in conformity are observed in online groups as well.

4.2.2. Ecological validity of results

A significant 94% (72 out of 77) of the research articles analysed in this survey used either confederates of the research team or simulations to generate an artificial group majority. Only five studies (Gokcekus et al., 2023; Hu et al., 2022; Maruyama et al., 2014; Smith et al., 2020; Wijenayake et al., 2022) have investigated conformity by exposing subjects to naturally occurring group majorities and social pressure situations, without any experimental manipulations. Moreover, the majority of online conformity studies are conducted in laboratory settings that do not accurately represent realistic online group environments, and use experimental tasks that are not representative of naturally occurring social pressure situations. For instance, Coppolino Perfumi et al. (2019) investigated conformity behaviour in subjects who were in a laboratory with a maximum of three experimenters, as they

completed Asch's line judgement task online, with computer-simulated peers. Therefore, it is possible that findings of prior laboratory-based conformity studies do not fully translate to realistic online groups that do not use confederates or simulations to create social pressure.

Moreover, online groups (e.g., social networks, discussion forums) typically have hundreds or thousands of users. However, the group sizes used in the analysed online conformity studies is often varied between 2 and 12 users (Lee, 2004a; Wijenayake et al., 2022). While, using smaller group sizes may have been appropriate in initial studies that primarily focused on understanding effects of conformity determinants in online settings, these studies are not sufficient to determine if these effects will persist across larger groups. Furthermore, while findings of this review suggest that larger online groups will further enhance deindividuation effects and a sense of anonymity in users that can reduce their susceptibility to conformity influences (Coppolino Perfumi et al., 2019; Kim & Park, 2011), these assumptions are yet to be systematically examined in online groups with larger cohorts of users.

Additionally, how the majority–minority group composition is signalled to users in online groups can also vary from one platform to the next (e.g., discussion forums such as Stack Overflow or Quora may signal the "popular" opinion in terms of upvotes, whereas an online poll can indicate the same as percentages of users agreeing with each poll option). Similar differences were noted in this review where the group composition was insinuated to users by sequentially displaying responses of each user (Beran et al., 2015; Colliander, 2019; Wijenayake et al., 2020b; Wijenayake, Hettiachchi, et al., 2021; Winter et al., 2015) and alternatively by using visualisations such as bar charts (Rosander & Eriksson, 2012; Wijenayake et al., 2020a). However, our findings are not sufficient to determine if different signals used to indicate group composition can determine users' receptiveness to conformity pressures, in addition to the majority–minority composition. Moreover, it is probable that the effectiveness of such indicators can also vary if the overall size of the group increases significantly—details of which are still unclear.

Therefore, we encourage future conformity studies to focus more on assessing the ecological validity of findings put forward by prior work. It is particularly important to investigate these questions in realistic online groups. As an exmaple, we point to *Maruyama et al.*'s study where conformity in how people vote in a political election was investigated by exposing participants to a naturally occurring political debate on Twitter, where the majority's opinion was based on the tweets posted by the Twitter community. The study also analysed effects of interactivity on conformity behaviour by instructing subjects to either actively interact with real tweets, or simply observe them. By doing so, the authors confirmed that the level of interactivity between the subject and their online correspondents show a positive effect on their tendency to conform, when subjects are exposed to organic conformity influences occurring in a realistic CMC environment.

However, we note that investigating conformity in uncontrolled, realistic online groups is considerably more challenging, as it requires careful experimental design to account for potential consequences of the uncontrolled nature of the study. For example, if the majority–minority group compositions are allowed to manifest organically in a group of subjects, it is difficult to ensure that all subjects will be in a minority for the experimental tasks (e.g., in a debating platform where majority and minority groups naturally occurred based participants' initial opinions, participants faced social pressure situations in only 25% of the responses (Wijenayake et al., 2022)). Furthermore, potential confounds can also occur between conformity determinants as the uncontrolled nature may not allow for these to be controlled (e.g., when using photographic user representations instead of silhouette avatars, user conformity can be simultaneously impacted by cues such as gender, age and culture (Wijenayake et al., 2019)).

4.2.3. Levels of conformity: Compliance, identification and internalisation

To understand the true implications of conforming behaviour on an individual's personal opinions and behaviour, it is vital to recognise the "level of conformity" that has occurred. There are three distinct levels of conformity—*compliance*, *identification* and *internalisation* (Kelman, 1958; Klein, 1967). *Compliance* is described as superficial, public conformity, without a private change in attitude or behaviour. In other words, an individual who does not believe in the group's judgement may still adjust their public opinion in the presence of an opposing majority, to achieve a favourable reaction from the group, to avoid disapproval, or to gain a specific reward. Furthermore, *identification* occurs when an individual changes their opinions and behaviours to appear similar to a specific group. In such a situation, the person accepts the group's response without actually considering its content, because it is associated with a desired group relationship. Finally, if an individual shows both public and private conformity, because they believe the group's judgement to be accurate, useful or congenial, it is referred to as *internalisation*—which is the highest level of conformity. Behaviours and opinions adopted in this nature, often end up being integrated to a person's own value system and thus results in private conformity.

Therefore, it is reasonable to assume that the *longevity* of conformity behaviour depends on the level of conformity that a person demonstrates in response to social pressure. However, only a few studies have reported investigating the level of conformity induced during the experiment (Laporte et al., 2010; Maruyama et al., 2014; Zhu et al., 2012). For instance, Laporte et al. (2010) reported that subjects who completed a set of factual, moral, and political questions in the presence of confederates and by themselves, showed public compliance in subjective tasks (moral/political questions), but not in objective tasks (factual questions). They argue that in objective questions conformity may have been triggered due to *informational* influences, which could have encouraged subjects to not only conform to the majority but

also to privately accept (or internalise) the majority's answer as "correct." Alternatively, in subjective questions where there is no clear "correct" answer, public conformity can be a result of *normative* influences, that diminish when social pressure is removed. Additionally, studies also note that while online conformity behaviour is highest immediately after being exposed to social pressure, it is also present some time (e.g., 2 weeks) after the initial exposure to social pressure (Maruyama et al., 2014; Zhu et al., 2012).

Therefore, we note that understanding when and why different levels of conformity occur can greatly expand our understanding of the true consequences of conformity behaviour. More specifically, understanding the longevity of social conformity influences can assist researchers to determine when and where its effects are strongest and hence requires more attention. However, prior work on this regard is insufficient to fully determine what factors induce public compliance, identification, and private conformity. Therefore, we encourage future conformity studies to determine what level of conformity occurs within their experiment, using experimental designs that can reasonably distinguish between each level of conformity. With that being said, this can be quite challenging as it requires participants to repeat the experimental task at least twice. Moreover, if participants are asked to repeat the tasks after a longer time interval, researcher will have to put in extra effort to ensure participant retention.

4.2.4. Accounting for conformity in platform design

This survey found that online social conformity can elicit both positive outcomes (i.e., enhanced sense of community (Sharma & De Choudhury, 2018)) and negative outcomes (i.e., undue pressure to conform to incorrect group judgements (Hullman et al., 2011; Wijenayake et al., 2019)). To a certain extent, the literature also indicate out how contextual and personal conformity determinants can enhance or diminish conformity tendencies (e.g., higher social presence can often lead to higher online conformity behaviour (Laporte et al., 2010; Wijenayake et al., 2020b; Wijenayake et al., 2022)).

Therefore, it is possible that future online group settings can be designed to control conformity influences as per the requirements of the platform. More specifically, in group settings where independent or diverse user responses are welcome (e.g., online quizzing platforms, discussion forums (Beran et al., 2015)), the platform design itself should be equipped to discourage conformity behaviour. Conversely, in situations where conformity behaviour is desired to enhance a sense of community and encourage adherence to accepted group behaviours (e.g., online support groups (Sharma & De Choudhury, 2018)), the platform can be designed to encourage user conformity. Preliminary work has shown that enhancing perceived online social presence in an online debating platform through its design can trigger high conformity to the dominant opinion on topics (Wijenayake et al., 2022). There are also reports that *normative* conformity can be encouraged through simple visual, textual, and interaction design elements of website design (Sukumaran et al., 2011). However, while assuring, these findings are inadequate to fully understand how conformity influences can be controlled through online platform design. Therefore, a next step in conformity research would be to explore how conformity determinants can be realistically manipulated through CMC-based platform design to facilitate positive social interactions.

4.3. Limitations

We acknowledge that despite our best efforts, the list of conformity determinants identified in this review may not be exhaustive. The focus of this review is primarily on well-established contextual and personal determinants of social conformity—i.e., group composition, nature of experimental task, online social presence, users' self-confidence, personality, gender, age, and culture. Furthermore, we only considered full research papers, that either reported a manifestation of conformity and/or presented a study specifically designed to investigate contextual and/or personal determinants of conformity in online groups. However, we argue that the selected conformity determinants and the publications venues cover most of the research related to social influences and how they manifest in online groups.

5. Conclusion

With the increasing use of online, computer-mediated technologies for social interactions and communications in recent times, there is significant interest to understand to what extent and why people conform to opposing judgements of their online peers. This review systematically analyse 36 years of literature on online social conformity, to outline its diverse *occurrences* and positive and negative *outcomes* observed in online groups. We then review the reported effects from popular *contextual* and *personal* determinants on online social conformity behaviour, emphasising on the fact that conformity is a function of more than one determinant. The latter part of the review discusses common challenges in social conformity literature, to inform the design of future conformity studies, including the need to investigate contextual and personal determinants of conformity in tandem, and ethical concerns to be mindful of and how to avoid confounding effects from experiment-induced biases when conducting conformity research. The review concludes by setting out several future directions for conformity research that encourage investigation into certain overlooked conformity determinants, longevity of observed conformity behaviours, and organic manifestations of conformity with minimum involvement of the researchers. We emphasise the necessity to account for social conformity influences in the design of the next generation of online social platforms to encourage prosocial behaviours while mitigating negative effects of social conformity.

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