Conformity Behavior in Group Playlist Creation

Christine Bauer
Johannes Kepler University Linz
Institute of Computational Perception & LIT AI Lab
Linz, Austria
christine.bauer@jku.at

Bruce Ferwerda
Jönköping University
Department of Computer Science and Informatics
Jönköping, Sweden
bruce.ferwerda@ju.se

CHI '20 Extended Abstracts, April 25–30, 2020, Honolulu, HI, USA.

ACM ISBN 978-1-4503-6819-3/20/04.
http://dx.doi.org/10.1145/3334480.3382942

Abstract
A strong research record on conformity has evidenced that individuals tend to conform with a group's majority opinion. In contrast to existing literature that investigates conformity to a majority group opinion against an objectively correct answer, the originality of our study lies in that we investigate conformity in a subjective context. The emphasis of our analysis lies on the concept of "switching direction" in favor or against an item. We present first results from an online experiment where groups of five had to create a music playlist. A song was added to the playlist with an unanimous positive decision only. After seeing the other group members' ratings, participants had the opportunity to revise their own response. Our results suggest different conformity behaviors for originally favored compared to disliked songs. For favored songs, one negative judgement by another group member was sufficient to induce participants to downvote the song. For originally disliked songs, in contrast, a majority of positive judgements was needed to induce participants to switch their vote.

Author Keywords
Conformity behavior; social influence; music playlist creation; group music playlists; group recommendation.

CCS Concepts

•Human-centered computing → User studies; Empirical studies in HCI; •Applied computing → Psychology; •Information systems → *Recommender systems;*

Introduction

Social influence and conformity have been studied in face-to-face situations for a long time [32]. While social influence has been studied in online settings as well [40, 39], conformity has received far less attention [32]. Most online conformity research focuses on conformity to group norms in online communities (e.g., [35, 28]) or on conformity in expression in online reviews (e.g., [16]). Yet, there are other forms of online group scenarios that deserve attention. Algorithmic decision-making for groups, for instance, is an increasingly important topic (e.g., [21, 34].

A special form of algorithmic decision-making for groups are so-called *group recommender systems* [26] that compute the most relevant item(s) (e.g., movies to be watched, vacation packages for the next group holiday) for the whole group. A particular challenge of group recommenders is to consolidate the various—possibly contradicting—preferences of the various group members [26, 13]. While studies investigating conformity typically follow a study design where participants have to decide between a correct and a wrong answer, group recommender systems operate on taste, preferences, and relevance where none of the decisions is objectively correct or wrong. Yet, conformity in such settings has not been investigated in depth.

We address this research gap and present first results of our study on conformity, which is part of our ongoing research on group recommender systems. Our online experiment where groups had to create a music playlist contributes to the following research question: *Whether and how do people conform in a group-decision setting of preferences and taste?*

This paper is structured as follows: First, we present the conceptual basis and discuss related work. Then, we detail the study design of our online experiment. After reporting the results, we discuss the findings and implications, and point to future research.

Conceptual Basis and Related Work

Social influence refers to the change in an individual's thoughts, feelings, attitudes, or behavior resulting from the interaction with another individual or a group [37]. Responses to social influence may take forms of conformity or non-conformity [27]. In this work, we focus on conformity which is a concept from social psychology and was coined by Asch [1, 2, 3]. It refers to the phenomenon that individuals tend to forgo their personal strategy (e.g., opinion, preference) and adopt the conflicting majority variant [36].

Studies on Conformity

In context of conformity, Deutsch and Gerard [9] distinguish *informational* and *normative* influence. *Informational influence* occurs if an individual adopts the thoughts and attitudes from the social environment as their own [37]. Frequently, the social environment is used as guidance in uncertain situations [17] in an attempt to be right [38]. *Normative influence*, in contrast, describes that an individual expresses a particular opinion or behavior in order to fit the given social environment without necessarily holding that opinion or believing that the behavior is appropriate [37]. In such cases, conformity is commonly based on a goal of obtaining social approval [32] and motivated by an individual's attempt to fit in with a group [38].

The most influential study of conformity goes back to Asch [1, 2, 3]. In his conformity experiments, a significant proportion

of participants (33.3%) revised their individual judgements to agree with a clearly incorrect, yet unanimous majority. Asch's study design (i.e., a line judgement task) was used by an extensive number of studies (for a meta-analysis see [4]). Crutchfield [8] took a similar paradigm for investigating conformity, yet removing the face-to-face situation and varying the tasks to be performed (e.g., including logical tasks and expressions of attitudes). One major finding of conformity research is that individuals tend to change their personal judgements and opinions when challenged by an opposing majority [1, 4].

Studies on Conformity in Online Settings

Results from studies on conformity in computer-mediated scenarios vary to a great extent. When following the procedure of Asch's original line judgment task in a computer-mediated setting, the majority influence disappeared in an early study [33], whereas the conformity to a majority was clearly observable in later studies, though demonstrating lower effects when compared to a face-to-face condition [6].

Furthermore, individuals from collectivistic cultures were found to manifest greater levels of conformity than those from individualistic cultures in face-to-face settings [5], whereas this effect could not be observed in a computer-mediated setting when using Asch's study design [6]. Yet, online studies investigating conformity outside Asch's paradigm found similar cultural effects to the ones observed in face-to-face settings. For instance, when writing online reviews, consumers from collectivistic cultures are less likely to deviate from the average prior rating in their own reviews [16].

Further studies outside Asch's paradigm have investigated various forms of conformity in online settings. Results indicate that depersonalization and anonymity may lead to a more extreme perception of group norms [20] and may encourage individuals to more strongly conform to those [29, 30]. Studies on social media [25, 24] showcased that people tend to adopt the majority's opinion on social or political issues. A recent study [38] found that the level of conformity to the majority increased as the difference between the majority size and the minority size increased. A study with mixed groups of human and nonhuman agents [15] found different levels of conformity depending on group composition and task type. Carrying out a task where they had to judge emotions led to higher levels of conformity with the group opinion as the number of humans in the group increased. When performing arithmetic operations, such an effect has not been observed.

Studies on Conformity and Music

Studies on conformity related to music preferences are scarce. Inglefield [18] (cited in [14]) found that differences in perceived peer group membership affected changes in preferences across musical styles. Investigating conformity concerning music preferences, Furman and Duke [14] found that participants unfamiliar with orchestral music were significantly influenced by the others' judgements, whereas no conformity effect was observed for participants familiar with such music. With the same study design but for pop music, in contrast, no such effects have been observed.

In an online music listening setting, a study [12] found that feedback—irrespective of the source—significantly influenced participants' judgements, where feedback from other individuals was more influential than feedback allegedly based on a computational analysis of the music. Another study [10] found that popularity influence (i.e., driven by the overall popularity of an item in the whole community) and proximity influence (i.e., driven by the popularity of an item in the immediate social network of friends) are substitutes for one another. Yet, when both are available, proximity influence dominates the effect of popularity influence.

Sidebar 1:
Computation of Bots

The decisions of the bots were programmed in such a way that for the initial response each bot had a 30% chance to vote for a song in a similar fashion as the participant and 70% chance against. For the final response, bots were programmed with a 50/50 chance of only changing in the sub-scale of their initial response (i.e., *yes*/*maybe yes* or *no*/*maybe no*). For the bots, no complete switch in the vote happened.

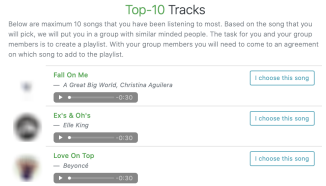

Figure 1: Screenshot with a participant's most played songs for choosing one seed song.

Sidebar 2:
Spotify API
https://developer.spotify.com/

Sidebar 3:
Configuration of the Popularity Parameter
Song suggestions were provided based on the selected seed song by using the popularity parameter of 25 or 75. The popularity parameter switched when participants provided the same initial response to a song for five consecutive times to increase chances of different initial responses.

Social Influence and Recommender Systems
Early work [7] has shown that a system's recommendations may affect users' opinions on the items. Later research could demonstrate that social influence plays a crucial role in recommender systems. For instance, people tend to reverse their rating choices when confronted with other people's ratings, especially when facing a moderate number of opposing opinions [41].

As social factors play a particularly important role in group recommender systems [31], there are attempts to come up with algorithmic mechanisms that account for such factors. For instance, [11] identify group leaders and give respective weight to their preferences in a group music recommender. A work by [22] proposes a conformity modeling technique to improve the accuracy of rating predictions in a movie recommender by anticipating conformity dynamics.

Study Design

In this paper, we present first results of an online experiment where groups of five had to create a group playlist. A majority size of three is sufficient for the full conformity impact [1]. To have full control on the group decisions, the only real person in the group was the participant. Responses of the four bots were calculated given a certain chance (see Sidebar 1 for details on bots programming).

The study started with an introduction to the purpose of the study: to investigate how groups of people create music playlists. After that, we asked participants to provide us access to their Spotify listening history by using the Spotify API (Sidebar 2). By using the "top" endpoint of the participant's Spotify account, we were able to retrieve their top-10 most listened songs. We asked participants to pick one of the top-10 as a seed song (Figure 1) to find (fictitious) group members with a similar music taste, and to find songs to suggest for the playlist. We used the selected seed song to retrieve song suggestions through the "get recommendations" endpoint. By differing the popularity parameter (Sidebar 3) of the personalization endpoint, we were able to suggest songs with different chances to be initially favored or disliked by a particular participant.

The study design required songs that a particular participant would favor for the playlist as well as songs that a participant would dislike. The "get recommendations" endpoint allowed to retrieve songs aligned (or not) to a particular participant's music preferences. A setting with a uniform, randomly selected set of songs for all participants would not have accounted for the specific preferences of the participants. Such a setting would have borne a high probability that many participants would not have encountered a song that they initially liked; our study design, though, required any participant to encounter both scenarios—initially liked and initially disliked songs.

Upon presenting a suggested song for the playlist, participants were asked whether they were familiar with the artist and the song, and whether they would like to have the respective song as a candidate for the group playlist (Figure 2). The response options were *yes*, *maybe yes*, *maybe no*, and *no*. Participants were then put on hold for a random 5–10 seconds for all group members to provide their anonymous response. While presenting the anonymous responses of the group members, participants were asked whether they wanted to change their initial response (Figure 3) and were informed that in the next step all identities with the corresponding final responses would be revealed. Displaying the anonymous group responses in the first step ensured that the study only factors in the concept of "majority size" and that other confounding variables such as gender of group members (e.g., [38]) are avoided. With re-

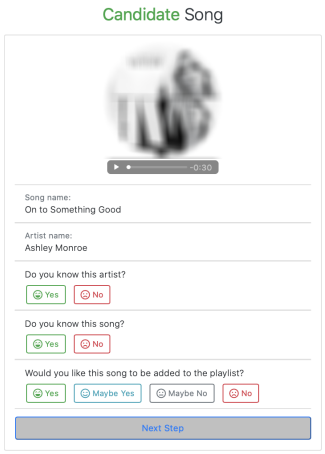

Figure 2: Screenshot with candidate song to be added to the playlist.

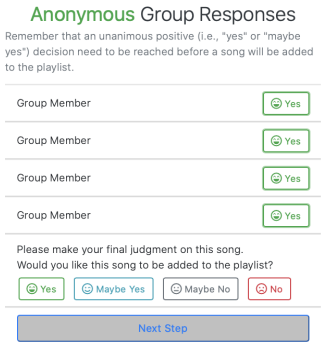

Figure 3: Screenshot showing the group's votes, giving the participant the opportunity to revise their voting.

vealing the identities after the final response, we minimized the depersonalization and anonymity effects observed in online conformity research (e.g., [29, 30]). After a final decision had been made and the whole group agreed to add the song to the playlist (i.e., unanimous decision), the song was added (Figure 4); otherwise, the experiment continued without adding the respective song. Participants were given another song to rate until a playlist of 10 songs was created through an unanimous decision-making with the group (the study came to an end as well when more than 30 songs were passed without coming to a consensus of 10 songs for the playlist).

Results

We recruited 96 participants via Amazon Mechanical Turk (MTurk). Participants were selected based on their Human Intelligence Task (HIT) score with at least 1000 HITs completed and a success rate of 95%. After cleaning the data based on responses to attention questions, we ended with 2047 valid responses of 93 participants. Of those responses, 574 responses were initially negative to adding the suggested song to the playlist and 1473 were positive.

To investigate the conformity effect on the initial responses of participants, two repeated measure ANCOVAs (one on the initial positive and one on the initial negative responses) were conducted to analyze how group responses influence individuals' final decision-making.

A first repeated measures ANCOVA was conducted on the songs that participants initially indicated to want them added to the playlist (i.e., a *yes* or *maybe yes* response). The Greenhouse-Geisser correction determined that mean responses on a song differed statistically significantly between time points (i.e., before and after presenting the group responses): $F(1, .428) = 35.730, p < 0.0005$, as well as when considering the group responses through the interaction effect: $F(32, .428) = 6.688, p < 0.0005$. Post hoc tests using the Bonferroni correction revealed that after receiving the group response, participants significantly changed their final response to a more negative one $(-.281)$: $p < .0001$. Looking at the different combinations in the initial group responses, it seems that at least one negative response within the group is needed for participants to change their minds significantly $(t(32) = 4.563, p < .0005)$. Hence, no majority of negative group responses is needed for participants to change their final response, but solely one negative response is sufficient.

A second repeated measures ANCOVA was conducted on the initial negative response (i.e., a *no* or *maybe no* response) to adding a song to the playlist. Also in this case the Greenhouse-Geisser correction determined that mean responses on a song differed statistically significantly between time points (i.e., before and after presenting the group responses): $F(1, .692) = 68.689, p < 0.0005$. Taking into account the group responses, results showed a significant interaction effect as well: $F(32, .692) = 18.521, p < 0.0005$. Post hoc tests using the Bonferroni correction showed that participants significantly changed their final response to positive (1.012): $p < .0005$. However, when looking at the different combinations of the initial group responses, the results show that participants only changed their final response when there was a majority of votes (i.e., more than half of the group responses were positive): $t(32) = -2.149, p < .001$.

Discussion and Conclusion

Findings and Discussion

The study results indicate different conformity behaviors dependent on a participant's initial liking of a song. First, if a participant originally favored a song, only one negative an-

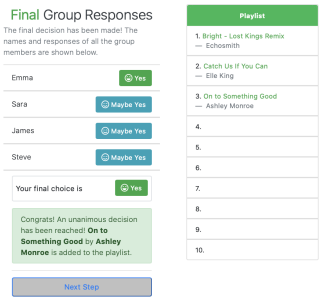

Figure 4: Screenshot showing a first song added to a group's playlist.

swer (i.e., not wanting to add the song to the group playlist) from another group member was needed to increase the probability that a participant would change their final decision (favoring to not favoring the song). Second, in contrast, if a participant originally voted against a song being added to the playlist, a majority of positive answers from the other group members (i.e., at least three of the four other group members wanted to add the song to the group playlist) was needed to make the participant change their final decision (not favoring to favoring the song).

The reasons for such behavior have yet to be investigated in further research. One potential explanation is that the preference in favor of a particular song is not overly strong, so that changing one's mind comes easy. However, in the study design, only an unanimous decision in favor of a song would lead to adding it to the playlist; thus, a participant could keep the positive answer and the song would not be included in the playlist because of someone else voting against it. Hence, we speculate that an individual hesitates to reveal to the group to favor a song that the rest of the group does not like. Another potential reason in the specific experiment setting is that there are lots of song alternatives that could be added to a playlist; in other words, if a favored song does not make it to the playlist, this does not involve a high loss because there is a large amount of equally valuable alternatives available.

The need of a majority in favor of a song to flip the judgement of a participant who dislikes the song could be accounted for strong feelings against a particular song. In contrast to the low loss of a favored song not being added because of the available alternatives, adding a disliked song to the playlist involves accepting a high loss. Yet, it is interesting to observe that a majority in favor of a song seems to induce participants to take this loss.

Implications

As the *switching direction* (in favor or against an item) or the involved *loss amount* seem to play an important role in conformity behavior, our work has theoretical implications for conformity research. Research on conformity following Asch's paradigm investigates whether people conform to a majority group opinion against a clear and objectively correct answer (e.g., lengths of lines). Our experiment using music playlists targets a domain of taste and individual preferences (similar to other domains in entertainment such as movies or the fashion domain). As our results suggest for the music domain, being in favor of or against an item leads to different conformity behavior. The study design of our online experiment also differentiates from the study of conformity in discussions of social issues or in the political discourse. Typically, research in those domains investigate conformity in terms of switching between two mindsets in general (e.g., from a conservative to a liberal mindset, or other way round) (e.g., [23, 19]). Potentially the switching direction (e.g., from conservative to liberal), or the loss amount for accepting or discarding a particular single issue associated within the one or the other mindset, may play a similar role in those domains. To the best of our knowledge there is no work that studies conformity on a more fine-grained level; where not only switching (e.g., conservative to liberal in general) is considered, but voiced opinion changes on single issues (e.g., a specific planned measure to counteract the climate crisis, to mitigate the unemployment problem, to boost economy) are investigated separately. The expected loss involved in advocating or not to such a specific measure may lead to different conformity behavior. Accordingly, differentiated strategies may be needed to address the different opinions and needs.

Our findings have also implications for recommender systems. Typically, group recommender systems take the group

members' preferences as given. Only few studies consider that group members may conform with a majority or an opinion leader. Our findings, though, imply that conformity has to be addressed at on a more fine-grained level, considering the switching direction or the loss amount. Besides its implications for group recommenders, our findings may give new direction for sequential recommendations for individuals as well. For instance, we hypothesize that an individual is more willing to accept that a preferred item is not included than accepting a disliked item. If this proves right, then a sequence or set of recommendations (e.g., music playlist) where all included items are perceived as rather okay would be preferred over a set that may include the individual's most favorite item but also some disliked ones. This perspective would require the development of novel measures capturing satisfaction with a sequence of recommendations.

Future Work

Motivated by these insights, we will continue with an in-depth investigation on further factors potentially influencing conformity. For example, in this study we asked for familiarity questions (artist and song) for the suggested song, as well as satisfaction questions at the end of the study. These factors may provide additional insights on the prerequisites of conformity effects. Additionally, we will investigate cultural differences and further demographics such as gender and age, as these factors have been found influential in earlier research. Furthermore, we plan to analyze whether conformity evolves throughout the group-task process.

Having found that the switching direction leads to different conformity behavior in group playlist creation, we deem worthwhile to investigate whether the direction of opinion or preference change plays a role in other fields, including versatile topics such as the spread of fake news, political debate, and nudging effectiveness. The severity of the expected consequences implied by an opinion change may play a role in future theoretical and empirical pursuits around conformity.

Acknowledgements
This research is supported by the Austrian Science Fund (FWF): V579.

REFERENCES

[1] Solomon E Asch. 1955. Opinions and social pressure. *Scientific American* 193, 5 (1955), 31–35.

[2] Solomon E Asch. 1956. Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychological monographs: General and applied* 70, 9 (1956), 1–17. DOI: http://dx.doi.org/10.1037/h0093718

[3] Solomon E Asch. 1958. Effects of group pressure upon the modification and distortion of judgments. In *Readings in social psychology* (3rd ed.). Holt, Rinehart and Winston, New York, NY, USA, 174–183.

[4] Rod Bond. 2005. Group Size and Conformity. *Group Processes & Intergroup Relations* 8, 4 (2005), 331–354. DOI: http://dx.doi.org/10.1177/1368430205056464

[5] Rod Bond and Peter B Smith. 1996. Culture and Conformity: A Meta-Analysis of Studies Using Asch's (1952b, 1956) Line Judgment Task. *Psychological Bulletin* 119, 1 (1996), 111–137. DOI: http://dx.doi.org/10.1037/0033-2909.119.1.111

[6] Marco Cinnirella and Ben Green. 2007. Does 'cyber-conformity' vary cross-culturally? Exploring the effect of culture and communication medium on social conformity. *Computers in Human Behavior* 23, 4 (2007), 2011–2025.

[7] Dan Cosley, Shyong K. Lam, Istvan Albert, Joseph A. Konstan, and John Riedl. 2003. Is Seeing Believing?

How Recommender System Interfaces Affect Users' Opinions. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '03)*. Association for Computing Machinery, New York, NY, USA, 585–592. DOI: http://dx.doi.org/10.1145/642611.642713

[8] Richard S Crutchfield. 1955. Conformity and character. *American Psychologist* 10, 5 (1955), 191–198. DOI: http://dx.doi.org/10.1037/h0040237

[9] Morton Deutsch and Harold B Gerard. 1955. A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology* 51, 3 (1955), 629–636. DOI: http://dx.doi.org/10.1037/h0046408

[10] Sanjeev Dewan, Yi-Jen Ho, and Jui Ramaprasad. 2017. Popularity or proximity: Characterizing the nature of social influence in an online music community. *Information Systems Research* 28, 1 (2017), 117–136.

[11] Pedro Dias and João Magalhães. 2013. Music Recommendations for Groups of Users. In *Proceedings of the 2013 ACM International Workshop on Immersive Media Experiences (ImmersiveMe '13)*. Association for Computing Machinery, New York, NY, USA, 21–24. DOI: http://dx.doi.org/10.1145/2512142.2512151

[12] Hauke Egermann, Reinhard Kopiez, and Eckart Altenmüller. 2013. The influence of social normative and informational feedback on musically induced emotions in an online music listening setting. *Psychomusicology: Music, Mind, and Brain* 23, 1 (2013), 21–32. DOI: http://dx.doi.org/10.1037/a0032316

[13] Alexander Felfernig and Martijn Willemsen. 2018. Handling Preferences. In *Group Recommender Systems: An Introduction*, Alexander Felfernig, Ludovico Boratto, Martin Stettinger, and Marko Tkalčič (Eds.). Springer International Publishing, Cham, Germany, 91–103. DOI: http://dx.doi.org/10.1007/978-3-319-75067-5_5

[14] Charles E. Furman and Robert A. Duke. 1988. Effect of Majority Consensus on Preferences for Recorded Orchestral and Popular Music. *Journal of Research in Music Education* 36, 4 (1988), 220–231. DOI: http://dx.doi.org/10.2307/3344875

[15] Nicholas Hertz, Tyler Shaw, Ewart J. de Visser, and Eva Wiese. 2019. Mixing It Up: How Mixed Groups of Humans and Machines Modulate Conformity. *Journal of Cognitive Engineering and Decision Making* 13, 4 (2019), 242–257. DOI: http://dx.doi.org/10.1177/1555343419869465

[16] Yili Hong, Ni Huang, Gord Burtch, and Chunxiao Li. 2016. Culture, conformity, and emotional suppression in online reviews. *Journal of the Association of Information Systems* 17, 11, Article 2 (2016), 21 pages. DOI: http://dx.doi.org/10.17705/1jais.00443

[17] Matthew J Hornsey, Louise Majkut, Deborah J Terry, and Blake M McKimmie. 2003. On being loud and proud: Non-conformity and counter-conformity to group norms. *British journal of social psychology* 42, 3 (2003), 319–335.

[18] Howard G. Inglefield. 1972. Conformity behavior reflected in the musical preference of adolescents. *Contributions to Music Education* 1 (Autumn 1972), 56–67. DOI:http://dx.doi.org/10.2307/24127367

[19] Meagan Kelly, Lawrence Ngo, Vladimir Chituc, Scott Huettel, and Walter Sinnott-Armstrong. 2017. Moral conformity in online interactions: rational justifications increase influence of peer opinions on moral judgments. *Social Influence* 12, 2–3 (2017), 57–68. DOI: http://dx.doi.org/10.1080/15534510.2017.1323007

[20] Eun-Ju Lee. 2006. When and how does depersonalization increase conformity to group norms in computer-mediated communication? *Communication Research* 33, 6 (2006), 423–447. DOI:http://dx.doi.org/10.1177/0093650206293248

[21] Min Kyung Lee and Su Baykal. 2017. Algorithmic Mediation in Group Decisions: Fairness Perceptions of Algorithmically Mediated vs. Discussion-Based Social Division. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 1035–1048. DOI: http://dx.doi.org/10.1145/2998181.2998230

[22] Yiming Liu, Xuezhi Cao, and Yong Yu. 2016. Are You Influenced by Others When Rating?: Improve Rating Prediction by Conformity Modeling. In *Proceedings of the 10th ACM Conference on Recommender Systems (RecSys '16)*. Association for Computing Machinery, New York, NY, USA, 269–272. DOI: http://dx.doi.org/10.1145/2959100.2959141

[23] Daniel J. Mallinson and Peter K. Hatemi. 2018. The effects of information and social conformity on opinion change. *PLOS ONE* 13, 5, Article e0196600 (05 2018), 22 pages. DOI: http://dx.doi.org/10.1371/journal.pone.0196600

[24] Misa Maruyama, Scott P. Robertson, Sara Douglas, Roxanne Raine, and Bryan Semaan. 2017. Social Watching a Civic Broadcast: Understanding the Effects of Positive Feedback and Other Users' Opinions. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 794–807. DOI: http://dx.doi.org/10.1145/2998181.2998340

[25] Misa T. Maruyama, Scott P. Robertson, Sara K. Douglas, Bryan C. Semaan, and Heather A. Faucett. 2014. Hybrid Media Consumption: How Tweeting during a Televised Political Debate Influences the Vote Decision. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '14)*. Association for Computing Machinery, New York, NY, USA, 1422–1432. DOI: http://dx.doi.org/10.1145/2531602.2531719

[26] Judith Masthoff. 2015. Group Recommender Systems: Aggregation, Satisfaction and Group Attributes. In *Recommender Systems Handbook* (2nd ed.), Francesco Ricci, Lior Rokach, and Bracha Shapira (Eds.). Springer US, Boston, MA, USA, 743–776. DOI: http://dx.doi.org/10.1007/978-1-4899-7637-6_22

[27] Paul R Nail, Geoff MacDonald, and David A Levy. 2000. Proposal of a four-dimensional model of social response. *Psychological Bulletin* 126, 3 (2000), 454.

[28] JungKun Park and Richard Feinberg. 2010. E-formity: consumer conformity behaviour in virtual communities. *Journal of Research in Interactive Marketing* 4, 3 (2019/12/23 2010), 197–213. DOI: http://dx.doi.org/10.1108/17505931011070578

[29] Tom Postmes, Russell Spears, and Martin Lea. 2000. The formation of group norms in computer-mediated communication. *Human communication research* 26, 3 (2000), 341–371.

[30] Tom Postmes, Russell Spears, Khaled Sakhel, and Daphne De Groot. 2001. Social influence in computer-mediated communication: The effects of anonymity on group behavior. *Personality and Social Psychology Bulletin* 27, 10 (2001), 1243–1254.

[31] Lara Quijano-Sanchez, Juan A. Recio-Garcia, Belen Diaz-Agudo, and Guillermo Jimenez-Diaz. 2013. Social Factors in Group Recommender Systems. *ACM Transactions on Intelligent Systems and Technology* 4, 1, Article 8 (Feb. 2013), 30 pages. DOI: http://dx.doi.org/10.1145/2414425.2414433

[32] Michael Rosander and Oskar Eriksson. 2012. Conformity on the Internet – The role of task difficulty and gender differences. *Computers in Human Behavior* 28, 5 (2012), 1587–1595. https://doi.org/10.1016/j.chb.2012.03.023

[33] Michael Smilowitz, D Chad Compton, and Lyle Flint. 1988. The effects of computer mediated communication on an individual's judgment: A study based on the methods of Asch's social influence experiment. *Computers in Human Behavior* 4, 4 (1988), 311–321.

[34] Martin Stettinger, Alexander Felfernig, Gerhard Leitner, and Stefan Reiterer. 2015. Counteracting Anchoring Effects in Group Decision Making. In *User Modeling, Adaptation and Personalization (UMAP 2015)*, Francesco Ricci, Kalina Bontcheva, Owen Conlan, and Séamus Lawless (Eds.). Springer International Publishing, Cham, Germany, 118–130.

[35] Michail Tsikerdekis. 2013. The effects of perceived anonymity and anonymity states on conformity and groupthink in online communities: A Wikipedia study. *Journal of the American Society for Information Science and Technology* 64, 5 (2013), 1001–1015. DOI:http://dx.doi.org/10.1002/asi.22795

[36] Edwin J.C. van Leeuwen, Rachel L. Kendal, Claudio Tennie, and Daniel B.M. Haun. 2015. Conformity and its look-a-likes. *Animal Behaviour* 110 (2015), e1–e4. DOI: http://dx.doi.org/10.1016/j.anbehav.2015.07.030

[37] Lisa Slattery Walker. 2015. Social Influence. In *The Blackwell Encyclopedia of Sociology*. American Cancer Society. DOI:http://dx.doi.org/10.1002/9781405165518.wbeoss154.pub2

[38] Senuri Wijenayake, Niels van Berkel, Vassilis Kostakos, and Jorge Goncalves. 2019. Measuring the Effects of Gender on Online Social Conformity. *Proceedings of the ACM Human-Computer Interaction* 3, CSCW, Article 145 (Nov. 2019), 24 pages. DOI: http://dx.doi.org/10.1145/3359247

[39] Stephan Winter, Caroline Brückner, and Nicole C. Krämer. 2015. They Came, They Liked, They Commented: Social Influence on Facebook News Channels. *Cyberpsychology, Behavior, and Social Networking* 18, 8 (2015), 431–436. DOI: http://dx.doi.org/10.1089/cyber.2015.0005

[40] Kexin Zhao, Antonis C. Stylianou, and Yiming Zheng. 2018. Sources and impacts of social influence from online anonymous user reviews. *Information & Management* 55, 1 (2018), 16–30. DOI: http://dx.doi.org/10.1016/j.im.2017.03.006

[41] Haiyi Zhu, Bernardo Huberman, and Yarun Luon. 2012. To Switch or Not to Switch: Understanding Social Influence in Online Choices. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. Association for Computing Machinery, New York, NY, USA, 2257–2266. DOI: http://dx.doi.org/10.1145/2207676.2208383