02.145TS 2021 HASS Final Report

Social Media Usage Frequency and Tolerance: Does the use of social media result in user's decreased tolerance to differing opinions?

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Abstract

Aggressive argumentative threads are often encountered on social media platforms. Whether they engage in heated debates about political matters or even just about tastes in video game music, such discussions are often bespattered with some insult words and curses. These occurrences are surprisingly quite common on social media. While some might attribute it to the fact that it is much more difficult to convey social cues and voice tonalities through just a written medium such as text, these discussions do make one wonder if there is something about social media itself that causes individuals to become less tolerant of others' perspectives and viewpoints. In this study, we used theories of social media affordances, in-group bias, confirmation bias and cognitive laziness to possibly explain a link between social media and tolerance. We conducted a survey among 101 SUTD and SMU undergraduates in Singapore to investigate this relationship, and we found out that low levels of social media usage positively correlate with tolerance levels in individuals, contradictory to our hypothesis.

1. Introduction

Social media consists of various user-driven platforms that facilitate the spread of compelling content, dialogue creation, and communication to a broader audience. Over time as users generate more content on social media, they are also being exposed to content by their peers. With this vast amount of content, one might not tolerate differing opinions when one sees them.

Based on our literature review, no studies have been done to examine the effects of social media usage on tolerance levels of individuals. Also, we discovered that most studies on opposing views had a political context. For instance, one study showed that American citizens were more likely to be more extremely aligned with a single political side, either a Republican or Democrat over the years. They have also become more stubborn and fixated on their own extreme beliefs towards controversial issues such as inequality, gun control, and immigration (Bail et al., 2018). Another study mapped the Twitter networks of 10 controversial political topics and discovered clusters of groups with similar political orientation. It showed that users tend to form homogeneous clusters, resulting in a low chance of cross-ideological exposure (Himelboim et al., 2013).

Furthermore, there have been few studies conducted outside of the political field. As these are studies conducted in the United States, they might have a very different socioeconomic and political context compared to Singapore.

Hence, in our study, we want to explore the topic of tolerance towards opposing views from a different angle. Instead of in a political context and abroad, we will study the relationship between social media usage frequency and tolerance towards opposing views within Singapore's unique cultural climate.

2. Literature Review

2.1 Tolerance

Tolerance is crucial to the stability of society as history has shown that a lack of it could result in grave consequences. While it is hard to define tolerance due to its broad scope, some researchers have quantified it according to various dimensions. For example, one study (Hjerm et al., 2020) saw tolerance as a "value orientation towards difference". Their definition consisted of three dimensions involving acceptance of, respect for, and appreciation of difference. Another researcher defined four main factors of receptiveness in his study of opposing views (Minson et al., 2020). The four factors were: "displaying negative emotions to disagreement from others, displaying intellectual curiosity towards opposing views, derogating opponents as having poor judgment and the extent to which individuals hold some views that are considered taboo". Minson further defines receptiveness as the willingness to debate our strongly-held beliefs and consider the opposing arguments carefully and justly.

Minson's definition of receptiveness is semantically the same as tolerance. As such, we will use this related concept of receptiveness in our paper to operationalise the idea of tolerance.

2.2 Social Media and Its Affordances

To understand why we chose social media as a point of contention, we point to its definition in this study. According to (Kapoor et al., 2017), “social media consists of various user-driven platforms that facilitate diffusion of compelling content, dialogue creation, and communication to a broader audience. It is essentially a digital space created by the people and for the people that provide an environment conducive for interactions and networking to occur at different levels (for

instance, personal, professional, business, marketing, political, and societal)". This definition describes social media as a platform where people can communicate and share their own opinions and content while networking with a large audience.

There are numerous types of Social Media Platforms, each with its own distinct features. Thus, some researchers have found it useful to use the framework of affordances to analyse social media (Majchrzak et al., 2013; Moreno & D'Angelo, 2019). Affordances can be defined as the "multifaceted relational structure" between an object or a technology and the user which enables or constrains potential behavioural outcomes in a particular context (Evans et al., 2017). It results from the interaction between the user and the given technology.

In our research, we will mainly focus on 5 categories of affordances relevant to social media as defined by researchers who applied the affordances framework on social media (Moreno & D'Angelo, 2019). As specified by the article, the affordances of social media can be categorized into identity, social, cognitive, emotional, and functional affordances.

In terms of identity affordances, social media platforms provide plenty of opportunities for identity development and portrayal, as well as generative role-taking. Individuals can take on the mantle of a separate online identity with separate character traits, identified by certain tangible features online such as their usernames and profile pictures. There are also social media platforms that allow fewer identity clues for the sake of anonymization and privacy.

In terms of social affordances, due to the very nature of social media, most social media offer a sense of belonging to a group depending on their degree of commonality. Moreover, social media may promote network-informed associations and users usually participate in audience management and metavoicing.

In terms of cognitive affordances, some social media platforms provide tools to improve and enhance one's learning, knowledge, and cognitive skills. Some social media platforms allow learning through the reallocation of cognitive resources by allowing them to focus on a very specific aspect of a specific person's presentation. Another related affordance would be triggered attending, exemplified by notifications or alerts.

In terms of emotional affordances, most social media platforms provide certain features that will trigger a user's emotional response through feedback such as "likes" and "upvotes". Certain social media platforms can also generate empathy through sharing of personal stories. However, social media platforms might promote comparison, leading to some users feeling jealous or substandard.

In terms of functional affordances, some social media platforms allow replicability and permanence of messages, while others promote unique and ephemeral messages. Virtually unlimited composition time is provided by most social media platforms.

Therefore, we will be looking at social media as a combination of all these affordances.

2.3 Polarised behaviours resulting from social media use

The aforementioned affordances present in every social media platform can positively reinforce and encourage polarized content consumption and creation, which exacerbate the negative habits of In-Group Bias, Selective Exposure, and Cognitive Laziness in the users. These phenomena are innate tendencies of human nature. In the past, they served as useful social patterns for our ancestors as hunter-gatherers to favour those who are similar (Masuda & Fu, 2015), navigate social realities and influence social structures in accordance with our beliefs (Peters,

2020), as well as to divert more attention to what is more important in the present and make inferred connections to derive implicit connections (Santos & Rosati, 2015), which was an evolutionary advantage in terms of reproduction and survival to be more efficient in conserving energy (Cheval et al., 2018). We will explain further how these three phenomena potentially cause intolerance in social media below.

2.3.1 In-Group Bias

One possible reason social media usage results in decreased tolerance is due to the user's natural habit of forming their own in-group, which results in in-group bias. This causes users to reward viewpoints similar to their in-group. In-group bias is the idea that our desire to be validated pushes us to obtain positive distinctiveness or social identity with others. This cycle of seeking validation within the group reinforces the behaviour of positive distinctiveness. Consequently, a false perception of the in-group having a higher status than the out-group is built (Molenberghs, 2013). The social affordances of social media allow for the creation of communities on that platform providing a sense of belonging. One example would be the use of hashtags on Twitter and Instagram. Content that is labelled with a hashtag is connected with other content on the platforms, which can connect a community of people linked to that hashtag.

Thus, the nature of social media allows individuals to seek out communities and content that resonate with them as a result of their desire to belong to an in-group. We define an in-group as like-minded people in their online community. Hence, when some opinions or actions go against a community, members are more likely to be quick to defend the community's viewpoints due to their perception of higher status than other groups. This can be achieved by the metavoicing affordance of social media, where users engage in the ongoing knowledge conversation by reacting

to others' presence, profiles, content and activities. For example, by liking, sharing or commenting on a piece of content posted by someone, users can indicate their support or disapproval of a piece of content (Majchrzak et al., 2013). To prove this, a study conducted on ethnic minorities in the United States showed a positive and consistent association between group self-definition and social media political expression (Velasquez et al., 2019). This showed that likes, shares, and comments were positive reinforcements for agreeableness within the in-group. With this positive reinforcement in place, it is easy to see why with time, individuals are driven to reward viewpoints similar to theirs or their group and be easily offended by the out-group's opinions and actions. This also leads to a greater extent of derogating opponents as having poor reasoning, which is one of the factors that can contribute to higher levels of intolerance.

2.3.2 Confirmation Bias

Another way in which social media can reduce tolerance is through confirmation bias, which is a theory that suggests people are more likely to seek or interpret knowledge in ways that are in line with their existing beliefs, expectations, or hypothesis (Nickerson, 1998).

Social media helps network people across cultures and represents a collection of different viewpoints with various information from all kinds of sources. It provides exhaustive and detailed information on every opinion and news story. Hence, in theory, social media should make us more open to discussion as it exposes us to more diverse viewpoints. This should help us empathize with others and increase our tolerance to opposing opinions or actions. However, according to past studies (Allcott & Gentzkow, n.d.; Bail et al., 2018; Müller & Schwarz, 2021), the extra step of verification and filtering such vast amounts of information, is difficult for users to take. Hence,

being exposed to more viewpoints does not necessarily mean that users become more tolerant of the opinions of others.

Upon the creation of one's social media account, the platform will encourage users to perform an initial curation of what content they are interested in to entice them to stay on the platform for longer. This can come in the form of following a Facebook group that shares the user's interests or following an Instagram account that posts content that the user likes to see. After this initial curation, the platform's algorithm will then begin to work on suggesting more similar content. Due to the users' reluctance to do the tedious work of vetting through this echo chamber that is forming around them, their viewpoints become more and more polarized as they are driven by the platform to consume content that confirms their existing worldview. Users would resonate more with content that is in line with their views, evoking their emotional response as indicated by the emotional affordances of social media. As a result of the algorithm's ability to push information that aligns with what the individual already believes in and are interested in seeing, users will then begin to reject credible and justified viewpoints as they have been constantly exposed to content that further cements their biases. Thus, extended exposure to social media leads to a reduced intellectual curiosity to opposing views, which increases the likelihood of users becoming less tolerant of differing opinions and actions.

2.3.3 Cognitive Laziness

Furthermore, while social media provides users with a wealth of knowledge in a convenient and easily digestible form, it is also potentially detrimental to one's ability to learn and be critical, hence, diminishing one's tolerance to differing opinions. According to a paper published by the European Parliamentary Research Service, prolonged internet usage could potentially impair one's

metacognitive judgement. This impairment leads to an inflated estimate of one's knowledge and understanding of a subject. The paper postulates that a related factor could be that the increased accessibility to information has also increased the tendency for people to give up when faced with challenges and complexity (Danovitch, 2019). As a result of this "cognitive laziness and shallow information processing" (Wolf & Barzillai, 2009), one has an impaired development of deep reading skills (e.g., inferential reasoning, critical analysis, reflection, etc.) and writing skills.

Supported by the cognitive affordances of social media, access to knowledge and information has become so much easier. This might lead to users assuming any information provided to them is true. As a result, they do not critically process the knowledge that they have received. Even for those who attempt to critically analyze the vast amount of knowledge, it takes a significant mental capacity to verify every single fact that is being thrown around on social media. As mentioned earlier, past studies (Allcott & Gentzkow, n.d.; Bail et al., 2018; Müller & Schwarz, 2021) have shown that the extra step of verification and filtering such vast amounts of information, is difficult for users to take. It is much easier to simply accept what is being shared as the truth, especially if such information comes from "popular" or "amicable" sources. The Dunning-Kruger effect can take place more easily as people believe that they know more and are more capable than they really are. With such a "wealth" of questionable information, social media users would not consider views opposite to what they have accumulated to be worth their time since they have so much more knowledge and information that back them up, even if they do not understand them nor have proven their accuracy. Social media users would thus become less capable of critically understanding and analyzing the knowledge that they have been given, making them more vulnerable to more polarizing and divisive viewpoints and perspectives. Hence, this would lead to greater intolerance.

As previously mentioned, our literature review shows a research gap in the study of the effects of social media usage frequency on tolerance levels of individuals, especially in the Singapore context and in a non-political context. Hence more research would be beneficial to prove or strengthen to study the relationship between social media usage frequency and tolerance levels. With the previously stated theories of in-group bias, selective exposure, as well as cognitive laziness, we hypothesize the following:

H1: Social media usage frequency negatively correlates with tolerance levels among Singaporean university undergraduates.

Due to the wide variety of social media platforms and differences in their effect on users, we, therefore, ask the following research question:

RQ1: How does the use of different social media platforms affect levels of tolerance in Singaporean university undergraduates?

3. Method

3.1 Sample

We plan on conducting an online survey to study the correlation between time spent on social media and the level of tolerance. The survey will be sent to 100 students from SUTD and SMU, using a convenience sampling approach. We chose to conduct the survey in this manner as due to the COVID-19 situation, it is logistically difficult for us to try out other sampling methods.

3.2 Variables

3.2.1 Independent variable: Social media usage

We have decided to measure social media usage based on participants' self-report hours spent on each platform per week. A study conducted by We Are Social And Hootsuite (Kemp, 2021) found that social media use via mobile phones amounted to 98.8%. Many mobile phones have the technology to break down users' time spent on various applications. Thus, the self-report measure of time spent on social media can be highly accurate if participants report the data obtained from their phones.

3.2.2 Dependent variable: Tolerance towards differences

Measuring tolerance towards differing opinions helps to quantify and study how various factors can influence levels of tolerance. Several researchers have researched ways to measure levels of tolerance.

One approach by researchers is to measure tolerance is to gather the views of individuals on a variety of topics or dimensions. Tolerance encompassed five dimensions defined in this study:

interreligious dialogue, women/religion relationship, death/religion relationship (e.g., regarding abortion and euthanasia), multicultural society, and homosexuality (Liberati et al., 2021). However, this scale only focuses on a few specific issues that can potentially divide people. Furthermore, its questions are contextualized to Italy. It will be difficult to find the range of problems that could separate the more tolerant from less tolerant in the context of Singapore.

The second method that aligns more with our theory on tolerance would be the following paper by (Hjerm et al., 2020). This method mentions measuring tolerance in three dimensions: the degree of acceptance, respect, and appreciation of difference. This method is more apt as it defines tolerance as a function of value orientation towards our differences, rather than the ability to put up with something one dislikes. There is a shift of focus from individuals to a more innate trait, measuring our response towards the existence of diversity itself. Using this scale demonstrates convergent validity with various measures of prejudice but is still untested alongside other existing tolerance measures.

Another method researchers take is a more general approach, creating an 18-item self-report measure of receptiveness to opposing views. The scale consists of four factors. The first factor is the pessimistic emotional reactions experienced by individuals when confronted with differing opinions. The second factor focuses on one's curiosity towards opposing views. The third factor studied individuals' tendency to assume those who hold opposing views as having poor reasoning. The last factor addresses the spectrum of opinions that individuals have on taboos. The scale showed good internal consistency with an alpha value of 0.88 based on their study. It also proves to have significant convergent validity, showing positive correlations with related measurements of receptiveness to opposing views. Furthermore, it has also demonstrated appropriate levels of discriminant validity (Minson et al., 2020). While this scale was developed

and tested in the context of the United States of America, the four factors it covers appear to be broad enough to be applicable cross-culturally.

Thus, due to the greater rigour in ensuring the scale's measurement validity, we have decided to use the 18 item "Receptiveness to Opposing Views" scale (Appendix D) for our research.

3.2.3 Confounding variable: Academic background

Given that our research focuses on university undergraduates, participants might generally tend to be more open-minded due to the nature of academics and research. Tertiary students are often encouraged to explore various concepts and theories and show critical judgement through empirical data and experiments. This culture could inevitably lead to university-level participants being more capable of accepting conflicting hypotheses and reconciling opposing arguments. Hence, we could potentially get scores that are higher than the general population. We mitigate this effect by choosing only participants at the university level, which allows us to work within the scope of people of similar backgrounds and reduce the confounding effects on our results. However, we acknowledge that variances out of our control could exist since we collect our data via convenience sampling rather than a probability sampling method.

3.3 Survey Procedure

1. For our convenience sampling, we split the number of participants each of us will contact equally.

2. We sent out the survey to the participants. This survey is a cross-sectional snapshot instead of longitudinal, as our focus is not time-dependent. Hence, participants did the survey only once.
3. The collection of the survey results lasted for a window of two weeks to limit the impact of any changes in the external environment that may affect the participant's history on our survey results.
4. Once all the responses were in, we proceeded to perform our analysis.

3.4 Survey Design

All our participants received the same Google form to fill up. This provided standardization and uniformity of execution throughout the sample. In total, the survey contains 19 questions for the participant, which will take around seven minutes. We kept it short to decrease respondent fatigue. In addition, we did not ask for any personal details that may identify the participant, providing anonymity to protect their identity.

In the first section (Appendix A), we sought their consent before starting our survey.

In the second section (Appendix B), the participants were shown a series of 18 statements to gauge their tolerance to differences (Minson et al., 2020). These questions were posted in randomized order, to mitigate any unknown confounds and response bias that may arise from the question order. The statements are rated on a five-point Likert scale, from "strongly disagree" to "strongly agree". The option of skipping the question was not provided as it will affect our analysis and we believe that the questions are phrased clearly.

In the third section (Appendix C), participants were then asked about their social media usage in a matrix format. Once again, we shuffled row orders to mitigate any unknown confounds. A potential drawback of this structure would be the lack of exhaustiveness, but since we cannot possibly list all social media platforms, we provided them with a supplementary space at the end for any platforms we may have missed. To further mitigate this, we had a few participants do our survey initially. From there, we added the social media that we missed into the list, before releasing the survey to the general school population. Additionally, since social media usage is slightly more sensitive than questions asked in the tolerance scale, we hoped that this foot-in-the-door approach would make them more likely to continue with the survey.

4. Results

4.1 Participants

Over the duration of two weeks, from 14th of November 2021 to 28th of November 2021. We collected 101 responses for our online survey. This exceeded our target of 100 responses. The respondents consist of SUTD and SMU students, aged 18 to 25 years old.

4.2 Post-processing of survey results

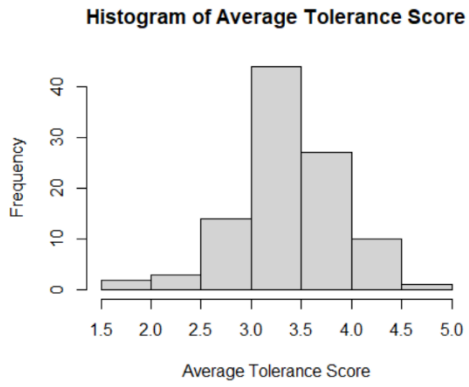
After hitting our target number of responses, there were 10 missing data for Discord's Time Spent. Doing Little's Missing Completely At Random (MCAR) test on the dataset, we obtained a p-value of 0.62. Failing to reject the null hypothesis means that it is likely that the missing data is

MCAR. This allows us to carry out Multiple Imputation to fill out the missing data. Multiple Imputation method keeps the sample size and statistical power of the dataset (McCleary, 2002).

4.3 Measures

4.3.1 Tolerance Scale

Each respondent has an Average Tolerance score. Based on their response to the 5-point Likert scale of 18 items by Minson et al. (2020), with values from 1 (Least Tolerant) to 5 (Most Tolerant) (M = 3.40, SD = 0.50). This scale is reliable as it has a Cronbach's alpha value of 0.82. Normality tests were carried out for this scale, to ensure the normality assumption of regression models is not violated. Based on visual inspection of the Histogram (Figure 1) and QQ Plot (Figure 2). As well as Shapiro-Wilk's Test returned a p-value of 0.28. The normality assumption was not violated for our upcoming analysis.



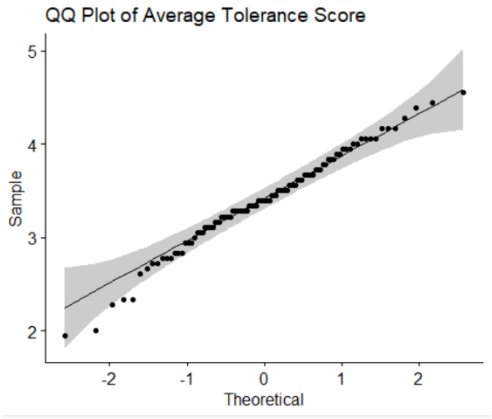


Figure 1: Histogram of Average Tolerance Score Figure 2: QQ Plot of Average Tolerance Score

4.3.2 Social Media Usage

Social Media Usage was measured by asking about their time spent on the 12 different social media platforms. With interval values from 0 (No usage for a particular platform) to 11 (More than five hours of usage for a particular platform). Taking the aggregated social media usage for the 12 different platforms, the mean of this measure is 32.72, which is approximately 16 hours of usage per week (SD = 14.27). The Cronbach's alpha value for this measure is 0.54. Despite not being a reliable measure, it is normally distributed based on the Histogram (Figure 3), QQ Plot (Figure 4) and p-value for Shapiro-Wilk's Test = 0.11.

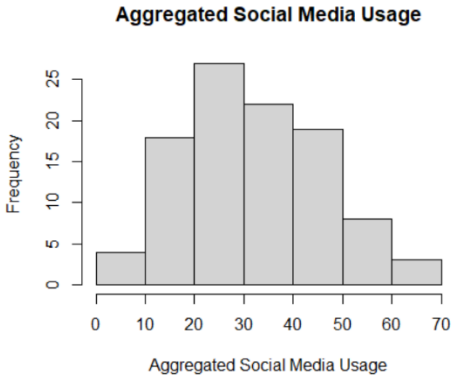


Figure 3: Histogram of Aggregated Usage

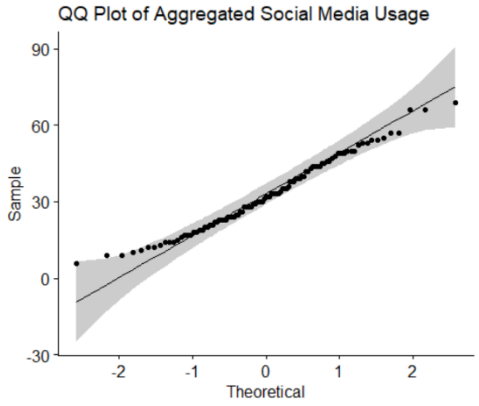


Figure 4: QQ Plot of Aggregated Usage

4.4 Social media usage frequency and tolerance levels

We first focused on H1, which is about the relationship between average tolerance levels and aggregated social media usage. For this hypothesis, we ran regression analysis. From the analysis, the regression has a standardized beta coefficient of -0.03, it is not statistically significant with $R^2 =< 0.01, F(1, 99) = 0.09, p = 0.76$.

Since at the aggregated level it is insignificant to conclude, a median split was done to the responses, to divide into two groups: High Social Media usage users and Low Social Media usage users. A median split was used to preserve the number of responses obtained from the survey results. Based on regression analysis, the results shown in Table 1 tells us that low social media usage users have a significant positive relationship with tolerance levels. This contradicts H1.

Independent Variables	*Standardized Beta Coefficient, β*	R^2	*F(1, 99)*	*p*
Model 1: Low Usage Users	0.33	0.11	5.94	0.02*
Model 2: High Usage Users	<-0.01	<0.01	<0.01	0.98
**p<0.05, **p<0.01, ***p<0.001*				

Table 1. Regression analysis for predicting the tolerance based on high and low usage of social media platforms.

In response to RQ1, we ran a regression analysis on each of the social media platforms individually, most platforms gave statistically insignificant results except for Reddit ($\beta = -0.22,\ R^2 = 0.05,\ F(1, 99) = 5.0,\ p = 0.03$) and WhatsApp ($\beta = -0.20,\ R^2 = 0.04,\ F(1, 99) = 4.3,\ p = 0.04$). Where both platforms negatively correlate with tolerance levels.

5. Discussion

5.1 Hypothesis 1: Tolerance Levels and Social Media Usage

Therefore, we conclude that there is sufficient evidence that social media usage frequency positively correlates with tolerance levels among Singaporean university undergraduates, for the low usage group only ($R2 = .11$, $F(1, 99) = 5.94$, $p = .02$). This trend does not seem to exist for the high usage group ($R2 = <0.01$, $F(1, 99) = <0.01$, $p = .98$). This conclusion contradicts our proposed H1, hence, there seems to be other theories that we did not factor in.

One theory we did not account for could be the effect of users' critical thinking skills on how they use social media. A study done on adolescents in Indonesia found that having good critical thinking skills can help protect users against the vast amounts of information and intolerant viewpoints they consume on social media (Zaenul Fitri, 2021). Thus, the effects of in-group bias, confirmation bias and cognitive exposure might be less apparent in users with greater critical thinking skills. Critical thinking is something we did not measure in our survey, which could explain our results.

However, as the positive correlation between tolerance and social media usage is not significant for the group with higher levels of usage of social media, there may be a limit to which critical thinking can protect users against social media usage. Beyond that limit at high levels of social media usage, the effects of in-group bias, confirmation bias and cognitive exposure could become more noticeable, thus equalizing the effect of critical thinking on social media usage. This could explain why the relationship between tolerance and social media usage is not significant at high levels.

Another theory could be that social media, being a platform for people of different backgrounds, cultures, and experiences to come together to share their thoughts and ideas with everyone else on the platform, allows for users to be exposed to different types of information and resources. This results in users becoming more open to new ideas and hence more willing to discuss their differences, instead of being offended. Prolonged exposure to many kinds of viewpoints, might hence allow users to become more tolerant. This also indicates that the effects of Cognitive Laziness might not be as prevalent as we thought it was.

In addition, the users we sampled from for this experiment are university students who are knowledgeable in technology. Their algorithmic awareness might be higher than average people of this age group. They do not take the content that they consume for granted as they have been better trained to read more critically, and thus they are able to mediate more polarised content and not simply accept such content as what it is. As a result, the effects of the algorithm on them might be lower as they are aware that the information they see might not be truly representative of all the opinions and information in the population. Thus, they might not be as polarised as other segments of the population and that might affect the extent to which the increase in diversity of viewpoints has.

Therefore, our result that tolerance is not positively correlated to social media usage for the group with higher usage might be attributed to some sort of diminishing gain from the increase in exposure. With higher usage of social media, there are no further changes in their polarised behaviour as they are going to be exposed to the same kind of content. There is a limit to how much it will affect the user as original content might not hit as high of a refresh rate as to how fast the user is consuming the content. Hence, with higher usage, there is no further significant changes

as they are most likely to be consuming similar or the same content wrapped in different titles or pictures.

Moreover, although tolerance is positively correlated with social media usage at lower level of usage, our R^2 of 0.11 indicates that there is very high variability between individuals, which shows this trend cannot be used to predict an individual tolerance as there are many other factors at play in affecting tolerance levels that we did not account for. Additionally, the unstandardized beta value of 0.03 for the lower usage group means that for every 30 minutes increase in total weekly social media usage, the tolerance index generally increases by 0.03, up to a total of 16 hours per week. When looking from a macro perspective, it is important for policymakers to consider the effects of social media on the users as it is not as regulated as other sources of information despite it being the largest source. There is indeed a need for more caution and vigilance in terms of monitoring users' content pipelines and understanding how social media affects our society in order to safeguard the users from malicious intent.

Seeing as usage of social media has become an indispensable part of our lives today, it might be necessary to educate students today on how to protect themselves against the negative effects of social media. Our results also show that low levels of social media usage can improve tolerance. This result, coupled with the cognitive affordance of social media suggests that social media can be used to educate people.

5.2 Research Question 1: Relationship between usage of different social media platforms and tolerance

In addition, for our research question, we found that Reddit and WhatsApp yield significant results. For both platforms, the results indicate a negative correlation, contrary to our H1 results.

However, a visual inspection of the histograms reveals that the distributions are not normal, which violates the normality assumption needed for regression analysis. Furthermore, we did not perform a median split according to high social media usage group and low social media usage group. Due to the differences in usage distribution for each platform, if a median split was done, the two groups would not be representative when compared across platforms. Further limiting the types of analysis that could be done.

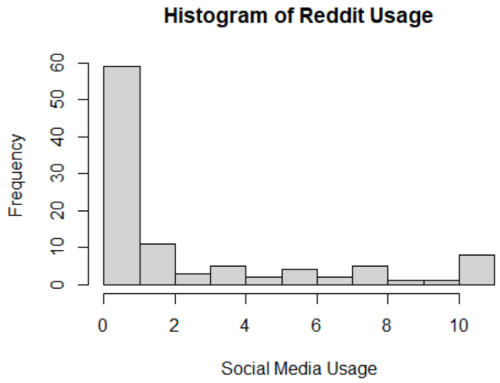


Figure 5: Histogram of Reddit Usage

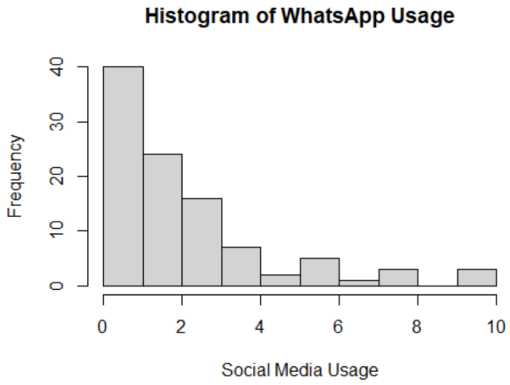


Figure 6: Histogram of WhatsApp Usage

We therefore conclude that there is no signification trend between tolerance and social media usage for all the platforms we measured. Nonetheless, it would be interesting to gather more

data of each individual social media platforms so that we can analyze which platform has a greater correlation to tolerance levels. Hopefully with such an analysis possible, we would be able to isolate the key aspects driving the increase in tolerance with respect to social media usage, providing a more nuanced understanding.

5.3 Limitations

5.3.1 Priming participants with purpose of study

One of the primary limitations behind our experimental method was that there could have been accidental priming to the participants. As the preface to our survey, we wrote "we will be looking at how tolerance and social media usage is related". This is primarily to inform the participants that we would be collecting data related to their tolerance and social media usage. However, a drawback of this is that it might have resulted in social desirability effects among the participants, where they would answer in a manner that makes it seem like they are more tolerant, to look more socially desirable (Paulhus, 1984). This unconscious drive results in unintended manipulation of the results collected. As we did not control for such variability by implementing a scale to measure the tendency for social desirability effects, the results might be artificially higher than they should have been. A suitable scale for measuring this would be the Marlowe-Crowne Social Desirability Scale (Leite & Nazari, 2020). Fortunately, as we kept our survey anonymous, the effect of social desirability on participants' responses might be lower (Joinson, 1999).

However, apart from the effects of social desirability, the priming could also have caused participants to artificially skew the reported answers in a manner that supports their existing

viewpoint. Hence, to avoid these two issues stemming from the effects of priming, future studies can consider concealing the purpose of the study so that the effect of priming can be mitigated.

5.3.2 Convenience sampling

Moreover, another limitation is our convenience sampling technique. We chose participants based on the ease of access. This resulted in just SUTD and SMU students participating as we could only get access to students in these two schools. This presents coverage error as we are studying the relationship between social media and tolerance on Singapore university undergraduates. Including students from other universities would have improved coverage. Additionally, as convenience sampling is a non-probabilistic sampling technique (Bhattacherjee, 2012), we could not ensure that each participant has a non-zero probability of getting selected for the study (Bhattacherjee, 2012). Without using a probabilistic sampling technique in obtaining our sampling frame, we are unable to generalize the results from the sample to the study population as it is not an unbiased approximate (Shadish et al., 2002). Hence, more research could be done to confirm the results of our study.

5.3.3 Measurement of social media

Lastly, in our measurement of social media usage, we collected their self-reported screen time for each social media platform. Although we directed participants to the function that measures their screen time on their phone, they might not have that function on their phone or might not have used those values. One possible solution to this would be to use Screenomics (Reeves et al., 2019) to aid in our collection of average weekly social media usage. This measure

would not be self-reported and hence, more representative of their normal average usage. Additionally, since our Cronbach's alpha value for the measure is 0.54, which is unreliable as a measure, we could have also considered a more validated way, such as using a social media scale (Sigerson & Cheng, 2018). Our scale only measured time spent on various social media platforms. By choosing a more appropriate scale, we would be able to measure the latent usage, such as the level of engagement with social media, providing a potentially more accurate measure of social media usage.

5.3.4 Internal Validity

Another limitation is intrinsic in our choice of using a survey instead of conducting a experiment. This reduces the internal validity of the measurement method as participants are not shielded from external effects, with one example highlighted above. As a result, the R^2 value of 0.11 we have obtained can be argued as relatively low and can be improved with more safeguards to increase the internal validity or to conduct an experiment where we can more readily control for external effects.

5.3.5 Cryptic Tolerance Scale

For some of the participants, the concepts raised for the tolerance scale were quite abstract and nuanced. There was feedback that these questions took up a significant time to answer since they have to put deeper thought into it. This might have resulted in participants giving up halfway while answering, which is something that we did not measure and account for. Moreover, these abstract questions are less easily interpretable by participants too, with one participant raising a

question on what is meant by "strong" in the questions. This might have led to differing perceptions of the concepts asked, leading to less-than-accurate results.

5.3.6 Lack of Control Variables

In our study, we did not collect any personal identifiers like age or gender. Thus, we were not able to control for any variables in our analyses. We could not test that the relationship between social media and tolerance was significant even when we controlled for certain variables. Future studies could collect information like age, gender and algorithmic awareness to act as control variables for the study.

5.4 Future Studies

With our sample being university students in this study, we hope to be able to increase the sample variety and conduct studies on other populations in order to truly conclude the effects of social media usage on tolerance. In addition, in this study, we performed convenience sampling which resulted in a biased sample. Should there be more time and resources, we would like to conduct a more representative data collection and ensure that our sample can be representative of this phenomenon on the general population.

6. Conclusion

In conclusion, while this study might not be representative of this phenomenon on the general population, it does show some evidence of increased tolerance in social media users. This is an interesting finding, and we hope that it inspires more research into this area, looking at the

different factors that result in the increase in tolerance. Hopefully, with greater understanding, policymakers and organisations can control for it to further improve on existing infrastructure to improve on Internet content safety and culture, to make the Internet friendlier for all.

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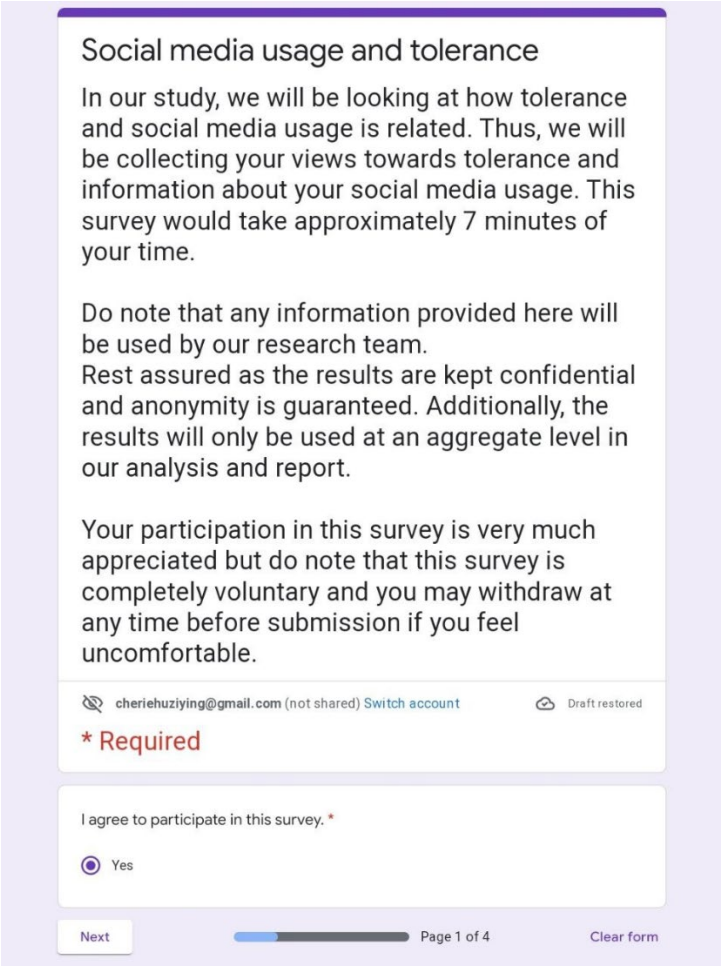
8. Appendices

Appendix A: First question of survey form, asking for consent to participate in survey



Appendix B: Second section of survey, quantifying level of tolerance of respondents

Tolerance Index

The questions below address the manner in which you deal with contrary views and opinions are important to you. When answering these questions think about the hotly contested issues in current discourse. Consider especially the issues that you care about the most.

Please click the appropriate options to indicate the extent to which you agree or disagree with that statement.

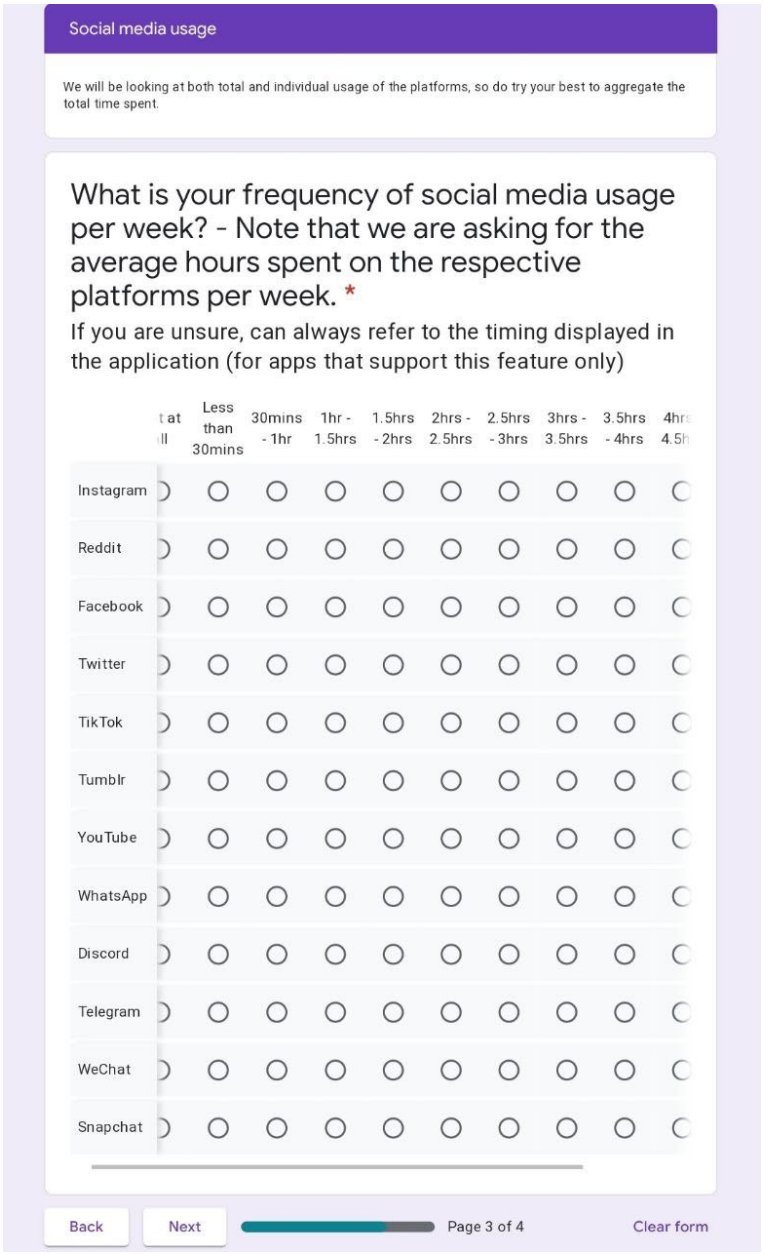
*

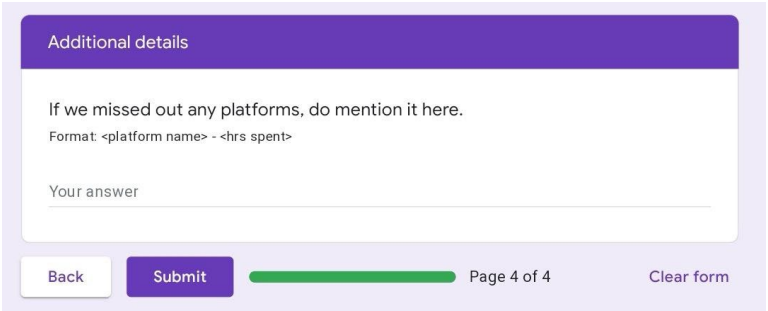
	Strongly disagree	Somewhat disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Somewhat agree	Strongly agree
I often feel frustrated when I listen to people with social and political views that oppose mine.	○	○	○	○	○	○	○
Listening to people with views that strongly oppose mine tends to make me angry.	○	○	○	○	○	○	○
People who have views that oppose mine often base their arguments on emotion rather than logic.	○	○	○	○	○	○	○
Some points of view are too offensive to be equally represented in the media.	○	○	○	○	○	○	○
I am generally curious to find out why other people have different opinions than I do.	○	○	○	○	○	○	○
I am willing to have conversations with individuals who hold strong views opposite to my own.	○	○	○	○	○	○	○
I consider my views on some issues to be sacred.	○	○	○	○	○	○	○
I feel disgusted by some of the things that people with views that oppose mine say.	○	○	○	○	○	○	○
I often get annoyed during discussions with people with views that are very different from mine.	○	○	○	○	○	○	○
People who have opinions that are opposite to mine often have views which are too extreme to be taken seriously.	○	○	○	○	○	○	○
I value interactions with people who hold strong views opposite to mine.	○	○	○	○	○	○	○
I find listening to opposing views informative.	○	○	○	○	○	○	○
People who have views that oppose mine rarely present compelling arguments.	○	○	○	○	○	○	○
Some ideas are simply too dangerous to be part of public discourse.	○	○	○	○	○	○	○
Some issues are just not up for debate.	○	○	○	○	○	○	○
I like reading well thought-out information and arguments supporting viewpoints opposite to mine.	○	○	○	○	○	○	○
Information from people who have strong opinions that oppose mine is often designed to mislead less-informed listeners.	○	○	○	○	○	○	○
People who have views that oppose mine are often biased by what would be best for them and their group.	○	○	○	○	○	○	○

This question requires one response per row

Back Next Page 2 of 3 Clear form

Appendix C: Third section of survey, gathering data on social media use of respondents





Appendix D: Tolerance scale survey and their respective factors, taken from (Minson et al., 2020)

The questions below address the manner in which you deal with contrary views and opinions on social and political issues that are important to you. When answering these questions think about the hotly contested issues in current social and political discourse (for example: universal healthcare, abortion, immigration reform, gay rights, gun control, environmental regulation, etc.). Consider especially the issues that you care about the most.

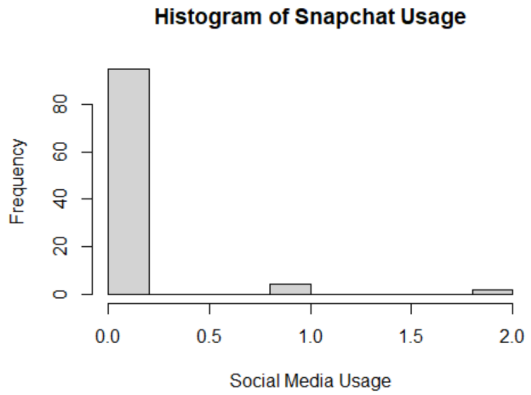
Scale

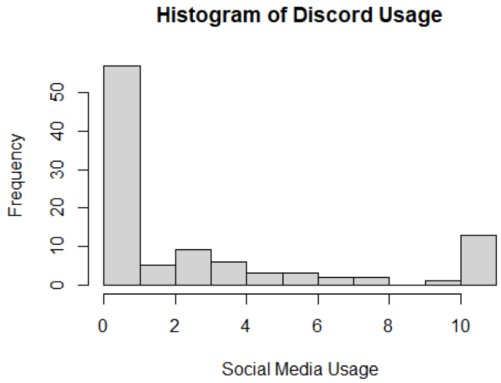
Please click the radio button below each statement to indicate the extent to which you agree or disagree with that statement.

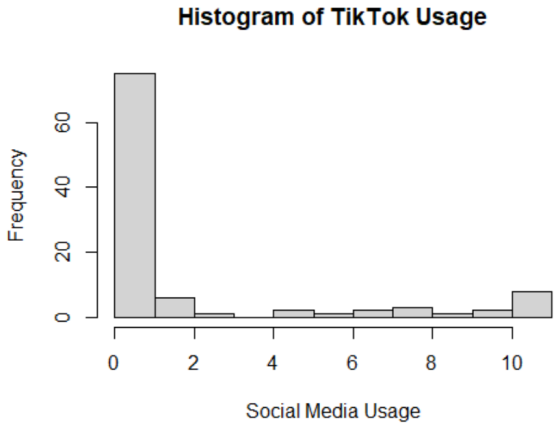
Strongly disagree	Somewhat disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Somewhat agree	Strongly agree

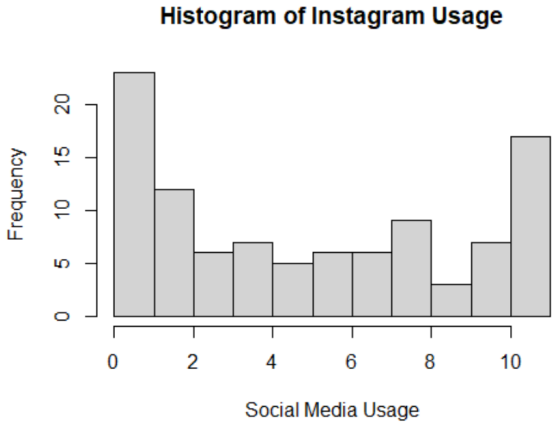
Item	Factor
1. I am willing to have conversations with individuals who hold strong views opposite to my own.	2
2. I like reading well thought-out information and arguments supporting viewpoints opposite to mine.	2
3. I find listening to opposing views informative.	2
4. I value interactions with people who hold strong views opposite to mine.	2
5. I am generally curious to find out why other people have different opinions than I do.	2
6. People who have opinions that are opposite to mine often have views which are too extreme to be taken seriously. (R)	3
7. People who have views that oppose mine rarely present compelling arguments. (R)	3
8. Information from people who have strong opinions that oppose mine is often designed to mislead less-informed listeners. (R)	3
9. Some points of view are too offensive to be equally represented in the media. (R)	4
10. Some issues are just not up for debate. (R)	4
11. Some ideas are simply too dangerous to be part of public discourse. (R)	4
12. I consider my views on some issues to be sacred. (R)	4
13. People who have views that oppose mine are often biased by what would be best for them and their group. (R)	3
14. People who have views that oppose mine often base their arguments on emotion rather than logic. (R)	3
15. Listening to people with views that strongly oppose mine tends to make me angry. (R)	1
16. I feel disgusted by some of the things that people with views that oppose mine say. (R)	1
17. I often feel frustrated when I listen to people with social and political views that oppose mine. (R)	1
18. I often get annoyed during discussions with people with views that are very different from mine. (R)	1

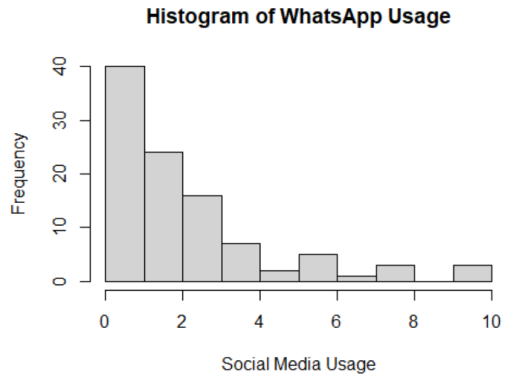
Appendix E: Histograms of Social Media Usage for each Social Media Platform

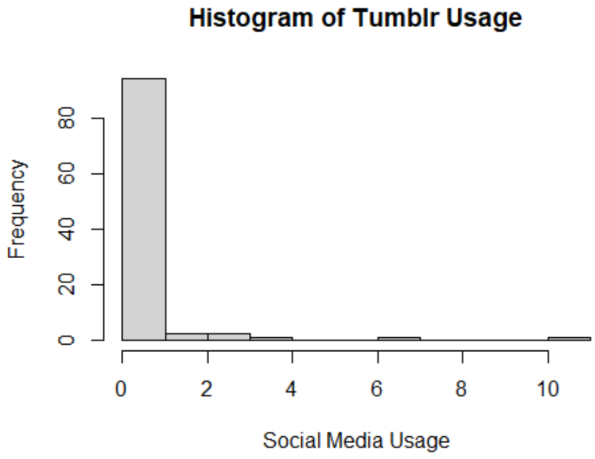


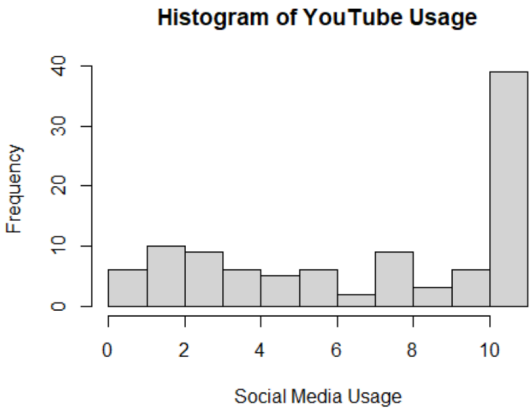


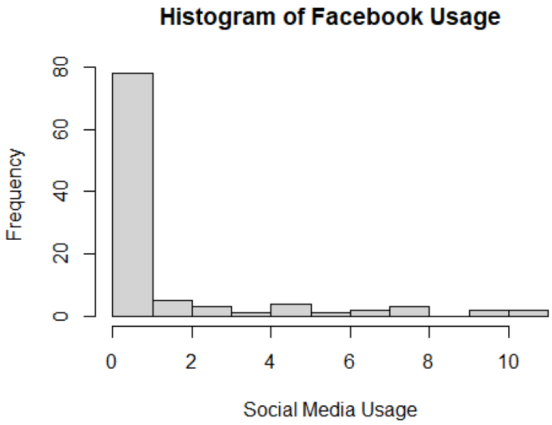


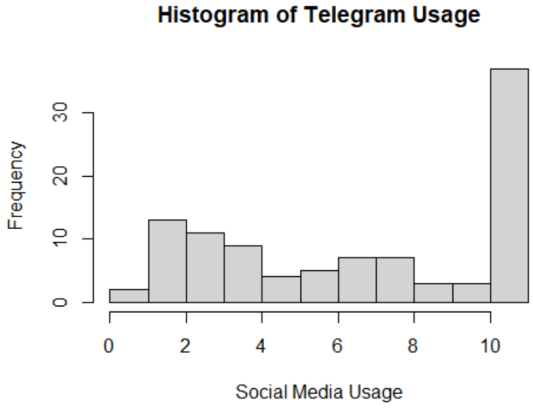


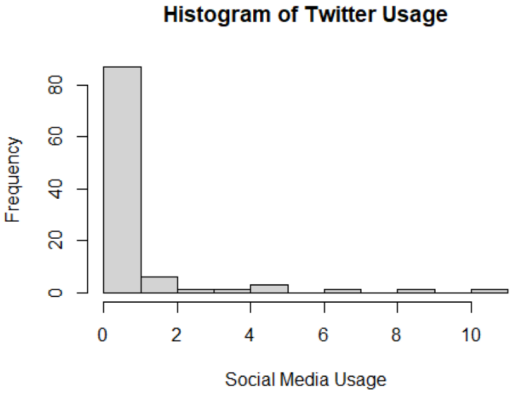





Histogram of YouTube Usage
Frequency
0
10
20
30
40
0
2
4
6
8
10
Social Media Usage


Histogram of Facebook Usage
Frequency
0
20
40
60
80
0
2
4
6
8
10
Social Media Usage


Histogram of Telegram Usage
Frequency
0
10
20
30
0
2
4
6
8
10
Social Media Usage


Histogram of Twitter Usage
Frequency
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6
8
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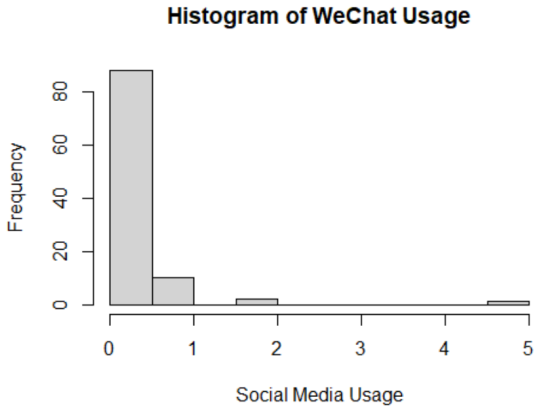
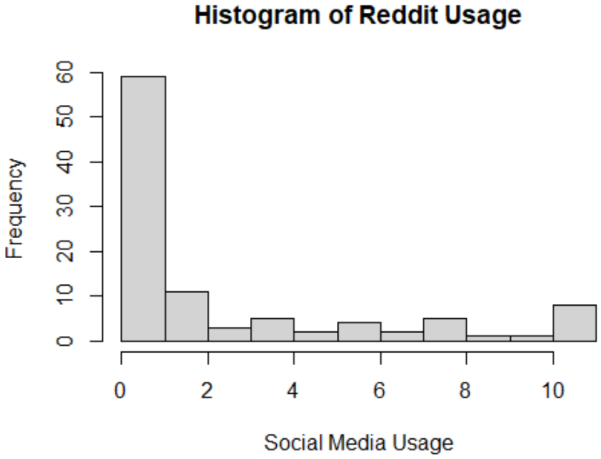
Social Media Usage


Histogram of WeChat Usage
Frequency
0
20
40
60
80
0
1
2
3
4
5
Social Media Usage


Histogram of Reddit Usage
Frequency
0
10
20
30
40
50
60
0
2
4
6
8
10
Social Media Usage

9. Project Workload Contribution Distribution

No.	Task/Component	Team Members
1	Wrote the Abstract	James, Cherie
2	Wrote the Introduction section	Peck Kee
3	Wrote the Literature Review & Concept Explication section	Felice, James, Brennan, Cherie
4	Wrote the Method section	Cherie, Jun Kai
5	Wrote the Results section	Peck Kee, Jun Kai
6	Conducted survey and analyzed survey results	Jun Kai, Peck Kee
7	Wrote the Discussion section	Jun Kai, Felice, Cherie
8	Wrote the Conclusion section	Felice, Jun Kai
9	Rewrote the report as version 2 (after discussion with Prof)	Brennan, James, Felice
10	Did overall scan for grammar, spelling, and final edits	Brennan, James, Jun Kai, Cherie