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The Effects of Political Memes: A Longitudinal Field Experiment

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The Effects of Political Memes:
A Field Longitudinal Experiment

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Résumé

Les médias sociaux sont devenus un élément incontournable des sociétés occidentales (et de plus en plus dans les autres régions du monde). Plusieurs études se sont intéressées à leurs impacts et ont trouvé qu'ils peuvent avoir une influence modeste, mais significative sur les attitudes et comportements politiques des citoyens. Sur ces plateformes sociales, les utilisateurs ont adopté divers moyens de communication notamment le mème (« *Internet meme* »). Ce sont des images tirées de la culture populaire agrémentées de texte qui ont comme particularité de pouvoir être imitées ou remixées et de se propager de manière virale sur le web. Bien que ces créations soient habituellement légères et humoristiques, elles sont aussi souvent utilisées par les citoyens et parfois par des acteurs politiques afin de s'exprimer politiquement. En effet, les recherches antérieures soulignent que les mèmes politiques peuvent être le reflet de l'opinion politique de certains groupes. En s'inspirant de la littérature sur l'influence des médias sur le comportement politique et de la psychologique politique, ce mémoire avance que ces images peuvent avoir un impact sur l'idéologie et les sentiments intergroupes. Pour vérifier cette affirmation, ce mémoire utilise une expérience aléatoire contrôlée, directement sur Facebook. Avec cette méthode, l'analyse révèle que les effets sont en général très limités. Cependant, elle démontre que les mèmes politiques peuvent contribuer à la polarisation des opinions, notamment chez les individus qui sont attachés à un parti politique.

Mots clés : médias sociaux, mèmes, méthode expérimentale, opinion publique, psychologie politique.

Abstract

Social media have become a central part of western societies (and more and more in other world regions). Many studies have examined the link between social media and political behaviours and attitudes, and have found modest but significant impacts. On social platforms, users have adopted many communication styles, notably, the *Internet meme*. These are images drawn from popular culture with original text which have the property of being imitated or remixed and spread virally on the web. Usually, those creations consist of light humour, but they can be used by citizens and sometimes political actors to express political ideas. Recent research has shown that political memes can reflect the opinions of certain groups in society. Drawing on the literature in political behaviour and political psychology, this thesis argues that political memes can have a potent effect on ideology and intergroup feelings. To assess this claim, this thesis employs a randomized experiment, directly on Facebook. With this method, the analysis reveals that political memes generally have a limited impact. Nonetheless, it shows that memes can contribute to attitude polarization, notably among those who feel close to a political party.

Keywords: Social media, Memes, Experimental method, Public opinion, Political psychology

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Introduction

Social media have definitively changed the political communication game. An increasing proportion of citizens are present on social media, which is especially true for younger citizens (Poushter, Stewart, and Inquiries 2018). Because citizens are massively present online, virtually every political campaign has a social media management branch. Social networks offer many new opportunities to a politician, such as reaching a vast audience without being mediatized by broadcast news journalists or having to follow cable news channel guidelines. Data gathered by social media companies are handy to target potential voters specifically (Bossetta 2018). On the flip side, social media allow users to express themselves about any subject, including politics. This discursive space appears to be top-down and bottom-up at the same time.

A now abundant content published on social media is internet memes (Algaba and Bellido-Pérez 2019). In essence, memes are an intertextual mixture of a popular culture picture, Gif, or screenshot, with a small amount of impact text. The overall tone of memes is often humoristic and satirical. This cultural artifact is a remixable frame that virally spreads over the internet (Shifman 2014). Everything is subject to be 'memefied', especially political discourse. Many political pundits argue that political memes can significantly impact the outcome of political campaigns. For example, McIntosh (2019) claims that the 2019 Canadian elections could have been affected by the presence of memes. Justin Trudeau's blackface was heavily memefied, and the New Democratic Party leader, Jagmeet Singh, used many meme templates from TikTok to propagate his political

discourse (Zhou 2019)[1]. Such claims go even further back in time; some journalists have argued that this type of communication helped frame the 2016 American presidential election (Paul 2016; Haddow 2016; Denisova 2016). Today, some political campaigns are ready to massively invest in memes to reach electors (AFP 2020). The claim that memes could have a significant effect is not far-fetched. In 2017, 84% of Canadians had a Facebook account, and 79% of them used it daily (Gruzd et al. 2018), meaning that users have a high likelihood of stumbling on memes while browsing social media. Very little research has empirically assessed their influence over citizens' political preferences and attitudes.

This situation begs the questions of *whether*, *why*, and *how* political memes can impact citizens' political preferences and attitudes. To ascertain whether political memes have a potent effect, this research will employ the gold standard of causal inference: the experimental method. Also, it will focus on the psychological mechanisms that could be responsible for the effects of memes. Another critical aspect is to specify which social media features can enable these psychological mechanisms. Not all social media work the same way because they display different digital architectures (Bossetta 2018). In this research, the spotlight will be directed toward Facebook because it is the most widely used platform.

This work will have the following structure. First, the literature review will cover the conceptualization of memes, the political effects of social media, the structural features of social media, and potential psychological mechanisms. This leads to theoretical

[1] During the 2019 Canadian federal elections, *Time* magazine published an article showing that in 2001, Prime Minister Trudeau wore a black/brown face during a party at a private school where he was teaching (Purna Kambhampaty, Carlisle, and Chan 2019).

expectations about the impact of memes on political opinion change. Then, this work will undertake the challenge of empirically assessing the impact of political memes on citizen's political attitudes by leveraging Facebook's group function and thus creating a three-month field experiment. Details of the experimental protocol will be outlined in the third chapter. Using this method, the results in Chapter 4 show that memes have very limited effects. They do not seem to have a persuasive effect, but they can induce attitude polarization among certain individuals, such as those who possess less political knowledge or those who consider themselves close to a political party.

Chapter 1. Literature Review

1.1 What Are Memes?

In the beginning, memes theory did not envisage those small funny pictures. The concept was employed to compare the fundamental goal of genes, which is their reproduction and the spread of social and cultural practices in societies. Richard Dawkins (1976) was the first to establish the concept of "meme." The term is a neologism derived from the Greek *mimeme,* meaning an imitated thing (Wiggins 2019). According to Dawkins (1976), memes are small cultural units of transmission, spread from person to person by imitation. Memes are reproducing and evolving over time. However, only the strongest will be able to thrive (Denisova 2019). For example, fashion can be a meme because individuals copy styles in slightly different ways, but only specific genres will stay relevant because of particular attributes. Idioms are also memes because the language is reproduced with geographical variations. In the more recent iteration of the concept, it is now possible to find the *Internet meme* – the real matter of this work – which is the viral picture on social media that can be remixed or mimicked (Shifman 2014). One aspect that makes the Internet meme so tightly related to Dawkins's theory is that it spreads from mind to mind very rapidly. It appears natural to integrate it into cognitive and behavioural practices. However, the difference with Dawkins's idea is that the mimicry does not happen in a random fashion; it is a deliberate action made by the one wielding the meme.

According to many studies, Internet memes are a mirror of culture and social attitudes (Wiggins 2019) and thus can display political stances and opinions. Political memes can relate to political issues, political leaders, political personality, opinion leaders, and political events. Those political ideas are conveyed with a humorous or satirical discourse

by the presence of the background image constituting the visual component of the meme. Wiggins argues that memes are "visual arguments, which are semiotically constructed with intertextual references to reflect ideological practices" (2019, 9). She claims that memes have a discursive power. They have a function in the social structure. In her study of memes, Limor Shifman (2014) underlines that some memes display playful messages, whereas others have a serious political message.

> "[W]hile some political memes are framed in a humorous manner, others are deadly serious. But regardless of their emotional keying, political memes are about making a point—participating in a normative debate about how the world should look and the best way to get there." (Shifman 2014, 120)

She defines them as artifacts that share common characteristics of content or form, and the creation of a meme is mostly done with the awareness of other memes. A meme is also circulated, imitated, and transformed by users (Shifman 2014). The process of understanding a political meme has then, inherently, a function of ideology formation (Wiggins 2019). Memes display a semiotic meaning because every remix can create an ideological meaning. For example, the 'Doge' meme (an image of a Shiba) can contribute to the ideological debate depending on the image's captions. Milner (2013) demonstrates that memes were heavily used during the 2008 economic crisis. Two ideological movements – the Tea Party and Occupy Wall Street – used memes to create a discourse about current political events. The two opposite sides used memes to express their opinions and criticisms about the government's actions and the arguments presented by the other side. The conversation was mostly made by remixing memes to each side's advantage. For example, some 'memers' recreated the template but changed the meaning. The ideology was mediated through a cheap and oversimplified discourse, because memes display a

small amount of information (about two lines of text and an image) (Milner 2013; Heiskanen 2017). Moreover, memes' imagery is often powerful as it conveys emotions and touches a wide variety of concepts. Memes appear to act as a broad conversation between social media users. A meme can be remixed to fit the ideological goal of a group. To put it plainly, memes may not seem to change the world, but they certainly act as a reflection of the opinions of particular groups or collective identities as they promote or oppose specific ideas while entertaining (Algaba and Bellido-Pérez 2019; Denisova 2019).

The closest analog to political memes would be editorial cartoons. They share visual representation, text, and humour with a rhetorical argument aiming to criticize in the same fashion as a meme (Huntington 2019). While memes are analogous to editorial cartoons, a vital feature of the Internet meme is that most citizens with Internet skills can make one, whereas cartoons are made mostly by professionals. Every citizen can share their input on a given subject through memes (Shifman 2014). However, this is only possible with broadband access (Shifman 2014; Beskow, Kumar, and Carley 2020). Internet access opened opportunities for political participation for many citizens. Making a political meme is an easy way for anyone to express their opinions. One of the advantages of the Internet is being able to remain anonymous. Another thing that can hinder production is the individual's knowledge of memes. To create a digital artifact like a meme, the individual must possess the right referential codes, the right quote with the right picture. Politically engaged users can leverage this non-conventional practice to spread awareness of alternative ideas to other Internet users – more specifically, mostly social media users (Heiskanen 2017). Memes can appeal to the masses by arousing emotional components through amusing text and images and, as a by-product, make the receiver of that message

acknowledge a political idea. In sum, political memes have six main functions: attract the user's attention, activate political participation and social criticism through humour, create group bonds, foster individual creativity, offer a reflection of the *zeitgeist*, and expose the diverting or parodic nature of humanity (Algaba and Bellido-Pérez 2019). The next section will summarise studies that show that memes are political tools.

1.2 Examples of Memes as Political Tools

On the conceptual dimension, memes have the power to constitute political speech. Are they being used as political tools of persuasion? Nee and Maio (2019) found that memes were employed to spread attacks and false information about Hillary Clinton during the 2016 presidential election. To arrive at this conclusion, the authors gathered memes posted on Twitter during the election and ran a content analysis to extract the most prominent themes. Most of the memes focused on negative female gender stereotypes such as she was weak and ill or dictatorial and unqualified. According to their analysis, memes fill a propagandistic role because they aim to manipulate behaviour while being dishonest and astringent (Nee and Maio 2019). This kind of subtle sexism is possible with memes because users who post them can hide behind the argument that it is only a joke (Greene 2019).

Memes also seem useful in defining political concepts and creating a sense of identity among partisans (Moody-Ramirez and Church 2019). Memes circulate among closed groups and often refer to inside jokes. Social media users with common interests flock to groups to connect. Moody-Ramirez and Church (2019) analyzed the type, tone, facial expression, and sentiment toward the candidates in Facebook meme pages during the previous U.S. presidential election. A slight majority of the pages depicted a negative tone. Most pages acted as an amplifier of the candidates' attributes. In the positive pages, Trump

was characterized as patriotic and Clinton as a leader, while the negative pages emphasized both candidates' scandals. They seem to reinforce the existing discourse around the candidates. They also magnified the political discourse's contradictions and raised awareness about omitted aspects of the 2016 campaign (Heiskanen 2017). Meme sharing on social media implies that it avoids the usual gatekeepers such as journalists. Thus, the visual representation can involve more extreme images than the ones habitually used by legacy media.

One group of social media users that largely relies on memes is the alt-right. Greene (2019) analyzed how the alt-right weaponized memes to create a collective identity and to recruit individuals – young men mostly – into the movement. They use political satire as a political tactic. This strategy is employed to widen or shift the 'Overton window', which constitutes the range of acceptable political speech. Irony and satire are very effective methods of bringing backstage content to the frontstage without bearing the consequences and real implications of such messages (Greene 2019). Publicizing their message on the frontstage is very useful as it increases visibility, allowing them to reach more individuals. Greene (2019) underlines that social media are an excellent place for this kind of strategy because, on the Internet, it is hard to specify the intent of the message. Hence, it is the receiver's task to assess if the meme is serious or satiric. The meaning can also change according to the discursive community where the meme is posted. When an alt-right meme is published inside a community of like-minded 'alt-rightists', the meme has a serious political function where the target is to nurture in-group solidarity, and their aesthetic makes them stand out as well (Lamerichs et al. 2018). Many memes glorified Trump as the ultimate saviour of "White America" (Lamerichs et al. 2018). Memes are seen as having a

framing power, which appears to be very important in political communication (Iyengar 1994; Iyengar et al. 1984; Lakoff 2009; Soroka et al. 2016). The frame sets the field of play and the argument possibilities. In other words, the framing directs which kinds of ideas will come faster to mind while thinking about a certain political issue (Lakoff 2009; Iyengar and Kinder 1987; Tversky and Kahneman 1981). Lamerich and colleagues (2018) claim that this kind of visuals has the power to help political groups persuade other individuals. Another study also focuses on the potential effect of memes on the right side of the political spectrum (DeCook 2018). It argues that extreme-right groups use political memes as propaganda to recruit mostly young men. The rationale is that young citizens overwhelmingly use social media as a basis of social identity. Right-wing movements would use social media to offer a kind of fraternity bonding experience to seemingly vulnerable youth that already considers Western culture is crumbling. According to DeCook (2018, 485), "memes have become a means of spreading propaganda, and are bite-sized nuggets of political ideology." In this sense, memes are employed to construct, reinforce, and validate a collective identity. DeCook builds her argument on Bourdieu's (1991) framework, which specifies that every linguistic interaction – in this case, memes – even if mundane, contributes to a social structure. DeCook collected memes by following specific extreme right hashtags and then conducted a content analysis. She found that the Proud Boys movement used many themes that referred to fascist ideology and Western supremacist theories.

While much evidence comes from the United States, memes are also used in other contexts. Memes were employed in Spain during the 2017 election and the Catalan referendum (Algaba and Bellido-Pérez 2019). According to the analyses, memes posted by

users sought to express their political alignment. For example, memes signalled people's stance on the Catalan referendum. Using content analysis, the authors find that most memes employed Spanish references instead of "mass popular culture" references. However, memes that reused mass culture references such as *The Simpsons* were more prevalent in terms of likes and shares. While this study can assess the overall style and positions of memes created during those two political events, it cannot shed light on the memes' intent or their effects.

Overall, memes seem to represent a considerable part of the content that users see during recent elections. Nevertheless, they remain a minor part of the Internet. Beskow and colleagues (2020) rely on deep learning to study memes spread during the 2018 U.S. midterm election and the 2018 Swedish election. Even if the number of memes is small compared to typical images, 175 000 unique memes were made during the American election, and 1500 unique memes were created in Sweden. Beskow et al. (2020), however, found that political memes spread more over the Internet than non-meme images. Memes beneficiate from a four to one margin in terms of diffusion on unique web domain names. Thus, even if there are fewer unique meme images, citizens have a higher likelihood of coming across them. This study appears to support Milner's (2013) argument because the deep learning model found that meme templates are used in a conversation both between and within political parties. There seems to be a dialogue dynamic going on between Democrats and Republicans using memes. The research also suggests that memes aim to create a group bond (Lamerichs et al. 2018; Wiggins 2019; Denisova 2019; Beskow, Kumar, and Carley 2020).

1.3 Can Social Media Impact Offline Behaviour?

The extent of social media's impact on real-world behaviour has been the target of many recent studies. Many large-scale experiments suggest that social media have a small but significant effect. Bond et al. (2012) ran in 2010 a 61-million-person experiment to assess the effects of friends who declared having voted on Facebook on the turnout of other friends who use Facebook. While the average treatment effect is relatively small, it is statistically significant. Moreover, the treatment effect was four times larger among close friends. Another massive scale experiment (n=689 003) conducted by Kramer et al. (2014) used Facebook to discover whether emotional contagion can happen online. The team of researchers manipulated the emotional valence of the user's news feed for a week. The persons whose feed was less positive posted more negative status than the control group, and those whose feed was less negative posted more positive content than the control group. This evidence demonstrates that information seen on social media can affect users' feelings and, even if those feelings are unrelated to politics, they can influence political behaviour (Healy, Malhotra, and Mo 2010).

Small scale studies have been conducted to assess the impact of social media on political behaviour. For instance, Feezell (2018) found that incidental exposure to constant news themes can have an agenda-setting effect. The treated individuals reported finding the manipulated political issues as more important. Using panel data, Dimitrova et al. (2014) found that social media could significantly increase offline political participation. By intrinsically being interactive, they argue that social media rank high on involving, connecting, and mobilizing political communication functions. While this study cannot assess the user's initial motivation, there is still a clear correlation between social media

use and political participation. Although turnout has already been studied by Bond et al. (2012), Bode (2016) explores a different set of social media mechanisms, namely the intensity of Facebook use. More intense users were more likely to report having voted. Additionally, a meta-analysis reports that most of the studies displayed positive correlations between social media use and participation in civic and political life (Boulianne 2015). However, this meta-analysis specifies that about half of the coefficients reported were not significant. Interestingly, when the studies look at differences according to age, youth categories report more significant effects. The logical explanation would be that younger individuals could be shaped more by social media than older people because, compared to them, they have underdeveloped political identities and rely more on social media than older generations (Boulianne 2015).

1.4 Experimental Evidence on Political Memes

The scientific literature on political memes has used chiefly observational data to study the phenomenon. However, two very recent experiments have tried to assess the impact of memes. The first one looked at memes in the Dutch context and tried to measure the impact of populist memes on cynicism and sympathy toward Dutch politicians (Klein 2019). The study was conducted in a laboratory setting where half of the group saw the populist memes and the other half saw nothing. The statistical analysis did not reveal any post-experiment difference between the groups, suggesting that memes did not have any effect on the dependent variables. However, the study was conducted with a tiny sample (n=92), which could lead to a type two error (false negative), and it used a one-shot exposure, which could not capture effects occurring over a longer time.

The other experimental study is more robust than Klein's experiment. Huntingdon's (2019) research concluded that when individuals come across political memes, they engage in motivated reasoning. The motivated reasoning theory states that when individuals come across information, they have two primary processing motivations: accuracy and partisanship (Lodge and Taber 2013). The accuracy motivation means that the individual is motivated to acquire all pertinent information to reach the right conclusion or opinion. Conversely, the partisan motivation is where the individual seeks to protect and retain her prior opinions and beliefs. Biased information processing results from emotional treatment that occurs before rational reasoning (Zajonc 1980; Lodge and Taber 2013; Burdein, Lodge, and Taber 2006). There are three partisan bias mechanisms: selective exposure, selective perception, and selective judgment (Huntington 2019; Taber and Lodge 2006; Redlawsk 2002). As previously shown, memes particularly arouse emotions because they display pictures and ideas. Hence, they are a prime medium for motivated reasoning. Huntington's results show that memes created motivated judgment (motivated skepticism) and selective judgment. Those who saw a meme with which they agree (the participant has the same ideology as the meme displayed) rated it as more effective and engaged in less argument scrutiny. On the flip side, when they saw a meme with which they disagree, they rated it as less convincing and engaged in more argument scrutiny. Even if the empirical results are compelling, the method looks at memes in an unnatural setting, that is, an online survey. This methodology does not respect the structure of social media, such as Facebook. Also, the results are drawn from self-reports of message effectiveness and argument quality which can be prone to rationalization bias. Finally, the study does not show whether memes can influence a citizen's political opinions.

1.5 Conclusion

This chapter has shown that memes are used to express political ideas, and observational studies constantly underline their potential impacts on citizen's political attitudes. Nonetheless, few studies have assessed this claim, and those that tried have major methodological flaws. There is a lack of knowledge regarding: do political memes influence individual's political attitudes and feelings? Hence, this is why this thesis will try to measure the political effects of memes through an experiment.

Chapter 2. Theoretical Framework

2.1 Social Media Structure

The structure of social media enables and constrains behaviour (Bossetta 2018). This work focuses on Facebook, and it is essential to distinguish it from other social media by underlining its unique digital architecture. According to Bossetta (2018), Facebook is one of the most user-friendly social media because most users employ their real name. Public figures or accounts are mostly unidirectional relationships where the user must follow a page. However, when a person wants to be a 'friend' of a person or join a group, the connectivity is dyadic because the other party must accept the request.

Once the user has 'friended' some people and followed pages and groups according to her interests, she receives the most relevant publications in her news feed. Facebook's most crucial feature for this work is the fact that it is a highly filtered platform. By default, the news feed is set to show what Facebook's algorithm thinks is the most relevant for the user (Bossetta 2018). Thus, it is thought that most content that the user will see on her feed will be in line with her prior interests (Pariser 2012; Sunstein 2018).

Finally, a content producer who owns public pages or groups can consult comprehensive analyses to assess their content's performance. The analytical data helps them figure out what is the type of content that appears to be the most effective in terms of likes, shares, and comments. To increase their reach – the number of users who see a publication – page owners can purchase publicity from Facebook, which increases the probability that other Facebook users will stumble upon their content.

Another way that users accidentally encounter publications is when one – or many – of their friends with whom they interact intensively either shares or likes a publication. If the publication is judged relevant, it can appear in one's news feed. Based on prior activities, Facebook can make recommendations to its members. For example, if one likes a page about the rock group AC/DC, Facebook would likely recommend Guns N' Roses because there is a good probability that the user will also like this band's page. This process happens for all types of content, namely, political content. The algorithmic filters reflect past choices and determine those of tomorrow (Pariser 2012). This structure is what enables the next section's mechanisms.

2.2 By-Product Learning, Repetition, Incidental Exposure, and Persuasion

While a large proportion of citizens is not interested in politics (Achen and Bartels 2016), they are nevertheless exposed to politics as a by-product of other activities. The concept of by-product learning in the political context was developed by Matthew A. Baum (2002; 2003). Most citizens seek enjoyment or entertainment over politics (Arceneaux, Johnson, and Cryderman 2013). However, even if citizens adopt suboptimal behaviour not meant for gathering political information, individuals still accidentally receive some. For example, when television was not conventional in households, people would go to the movie theatre, and before the main program began, a newsreel was presented (Prior 2007). Thus, while searching for entertainment, the citizen receives a small amount of political information.

This type of effect was reported for soft news on television, such as talk shows hosted by Oprah Winfrey or Ellen DeGeneres. Those who are the least politically interested would benefit the most from watching soft news (Baum and Jamison 2006; Baum 2003). This

effect was also found on social media by Bode (2016). Using an experiment, Bode manipulated a Facebook feed and sought to assess the recall rate of neutral information versus a political one. She shows that political information was more retained than neutral information (Bode 2016). No other factor, such as political interest and political ideology, could explain the treatment effect. This suggests that social media users are prone to a by-product learning situation. While looking for entertainment on social media, they can retain some political information that is also present. Moreover, it is essential to recall Feezell's (2018) study, which showed that incidental exposure to specific news themes on social media could have an agenda-setting effect (see section 1.3).

One of the important features of social media in the persuasion framework is that the same arguments can be seen multiple times in different formats. Political groups and pages on Facebook tend to post content with the same ideological slant regularly. The repetition and insistence on a specific message are the bread and butter of political campaign strategies because repetition is thought to create a mere exposure effect and to persuade more than a single message (Zajonc 1968; Cacioppo and Petty 1989; Bornstein and D'Agostino 1992; Miller 1976). This effect was established by Zajonc (1968) with four studies where participants were either exposed to a stimulus (a word or a picture with no apparent meaning) once or multiple times. When individuals were exposed multiple times to the stimuli, they became more positive about it than the group that was only exposed a single time. The theory here is that people become more positive when they are familiar with a stimulus, even if there was only a small exposure. The mechanism is seen as a natural human cognition function since familiarity even increases liking among toddlers (Bornstein and D'Agostino 1992). The mere exposure effect can also manifest itself

unconsciously; even when participants could not recall being exposed, they were more positive about a stimulus than those who were not exposed (Bornstein and D'Agostino 1992). Besides, Hansen and Wänke (2009) found that the mere exposure effect can also happen while individuals are distracted. This result is particularly interesting because, when Facebook users browse their news feed, it is often the case that they do so in a distracted way jumping from publication to publication aimlessly (Alhabash and Ma 2017).

While the evidence presented here strongly suggests that the mere exposure effect exists, it is crucial to verify whether it can happen with political preferences. Miller (1976) conducted a within-subject experiment where his team put political posters displaying a negative message toward U.S. foreign aid and liberal foreign policy in an undergraduate dormitory. They found that moderate exposure significantly reduced positive attitudes toward foreign aid. However, overexposure to the message created a reactance effect that had a smaller but still significant impact. Kam and Zechmeister (2013) showed that name recognition could increase support for a given political candidate in a low information election. Familiarity with statements can also increase the likelihood of finding them truthful (Hasher, Goldstein, and Toppino 1977). More specifically, within social media and the fake news phenomenon, a single prior exposure to a piece of fake news can increase the perception of accuracy (Pennycook, Cannon, and Rand 2018). This illusory truth effect created by a mere exposure effect can last for a week, and the impact is even more substantial if the message is presented a second and third time (Pennycook, Cannon, and Rand 2018). Repetition seems to have a potent effect. It would be plausible that political memes could have the same effect when viewed in a semi-continuous stream on social media, just as the foreign aid experiment.

According to McLoughlin and Southern (2020), memes could yield a similar effect. These researchers found that the massive amount of political memes created during the 2017 U.K. general election were circulated on social media by non-political Facebook pages. According to their analysis, most engagements with political memes stemmed from citizens who had not opted into political content but rather more general meme-based content. Users browsing their news feed without seeking political content got exposed to some extent. This leads to the first hypothesis, which states that being exposed to political memes will have a persuasive effect. Those seeing left-wing memes become more left-leaning, and those seeing right-wing memes become more right-leaning – through by-product exposure and repetition (H1). While this is a persuasion effect, it remains indirect because political memes affect how an issue, or an idea, is represented in one's mind. It can influence the salience of an ideological concept, for instance, the place of the government in society, or feelings about a minority group. This expectation echoes Feezell's (2018) study where exposition to news articles on social media (Facebook) contributed to shifting individuals' political priorities (agenda-setting). Increasing the number of messages supporting that a certain issue is important to society on Facebook persuaded – indirectly – citizens to think that they should also find it notable. Essentially, the literature supports the idea that when the number of messages with specific ideas increases, individuals will tend to shift their opinions following these messages creating an indirect persuasion effect (McCombs and Shaw 1972; Iyengar and Kinder 1987; Krosnick and Kinder 1990; Zaller 1992; Zaller and Feldman 1992; Iyengar 1994; Soroka 2002). Thus, media can have some persuasive effects.

However, most studies that focus on social media effects tend to find minimal influence or no consequence at all (Boulianne 2015). It could stem from the fact that social media remains only a part of one's media diet and that the manipulated or observed message is one out of multiple stimuli to which the individual is exposed. This situation has also been observed in more general persuasion studies. It appears challenging to create a direct persuasion effect that can change one's political opinions (Kalla and Broockman 2018; Coppock, Hill, and Vavreck 2020). Indeed, even professionally crafted advertisements have a hard time convincing citizens to vote for a certain candidate or increase their favourability toward a politician (Coppock, Hill, and Vavreck 2020). Essentially, massive homogenous persuasive effects have been discredited. While this is true, political memes are usually aimed at younger individuals who have more malleable attitudes because they are still in construction compared to older citizens whose attitudes are settled (Achen 2002; Boulianne 2015; Feezell 2018). Hence, persuasion remains possible here.

While memes might not have a homogenous persuasive effect on the general population, particular subgroups tend to be more persuadable. Under the proper conditions, when exposed to the right messages, with the appropriate tone, and in a precise context, persuasion is possible (Zaller 1992; Fournier, Cutler, and Soroka 2013; Hill et al. 2013; Hillygus and Shields 2014; Dobrzynska and Blais 2008; Kalla and Broockman 2018). The two-moderator model of persuasion is formalized by Zaller (1992), but it draws on Converse (1962) and McGuire (1969). This model is useful to understand that attitude change comes from the probability of reception of a given political message and the likelihood of its acceptance by an individual. Reception and acceptance are two factors that

are inversely related to political awareness, usually measured as political knowledge or interest. On the one hand, when political awareness is low, the probability of accepting a message is high because the individual has little political information to rely upon for resisting. However, there is a small chance of encountering political messages in the first place, resulting in new information not having a substantial effect on the attitudes of the less aware. At the other end of the political awareness scale, a highly informed individual is seen as motivated to seek out and acquire new political information (Zaller 1992). Thus, the likelihood for that type of individual to come across new political messages is high. However, they benefit from a great deal of political arguments making their opinions sturdier and allowing them to reject new messages that are at odds with their prior beliefs. Therefore, the more aware are also unlikely to be persuaded. The central argument of this model is simple: those who are somewhat politically aware have the largest chance of both receiving and accepting persuasive political messages at odds with their predispositions. Hence, those with moderate levels of political sophistication are the prime candidates for more influence from political memes (H2).

It is important to keep in mind, however, that the two-factor model is skewed in an experimental setting because all the individuals are equally exposed to political stimuli. Still, while exposure is virtually equal, another aspect of reception – message comprehension – is conditioned by political sophistication. Hence, there should be a non-monotonic influence where those who are moderately informed are more likely to follow the message's ideological stance when the message is incongruous with the individual's ideological predispositions. Also, Zaller's (1992) model points out that highly informed individuals should be keener to accept messages who are in line with their ideology.

Substantially, the idea is that there is a positive and linear relationship between the message acceptance and political awareness when the message concords with prior beliefs.

2.3 The Echo Chamber Counter-Attitudinal Messages, Polarization and Partisanship

According to many scholars, social media's biggest problem is that their algorithms reinforce the echo chamber. An echo chamber is an environment where individuals are insulated from opposing views and live in a consensual political information environment. This concept is seen as reinforcing selective exposure – a systematic bias in the audience composition (Sears and Freedman 1967). For instance, left-leaning individuals will gravitate toward media that have an ideological slant to the left, whereas right-leaning individuals will seek right-wing media. The mechanisms behind selective exposure appear to be an effort to avoid cognitive dissonance, the unpleasant feeling of being contradicted, and an effort to maintain prior opinions or to support choices made in the past (Sears and Freedman 1967). Using an experimental design, Iyengar and Hahn (2009) showed that Republicans were more prone to select Fox News, while Democrats were more likely to select MSNBC. The rationale is that prior attitudes and feelings encourage bias.

While the echo chamber concept is not new, algorithms increase the likelihood of being in one (Flaxman, Goel, and Rao 2016). Before the Internet, people who wanted to gain information had many choices – radio, television, and newspaper – and they had to listen, watch or read through parts of the medium to eventually reach a part that interested them (Pariser 2012). With a more personalized experience in social media, individuals can navigate more efficiently to the desired news. Whereas in the pre-Internet days, the consumer had to pull the news from the media, now the information is pushed toward him (Pariser 2012). According to Pariser (2012), personalization creates a systematic bias in

the news being pushed and would homogenize the ideological slant of news. Social media filtering can also help like-minded people to assemble. Indeed, social contacts between individuals with the same ideological slant are made easier because social media architecture allows interactions between users who read the same news (Sunstein 2009). While personalization can be great to filter the astronomical amount of information, filters tend to overfit tendencies. In a sense, they can stereotype individuals and homogenize the user's news feed (Noble 2018; Settle 2018).

> "On social media, especially the Facebook News Feed, the most ubiquitous forum for online interaction. The News Feed serves as the home page for each Facebook user's personally tailored experience on the site, delivering a distillation of the information posted and shared by the people and groups to whom a user is connected." (Settle 2018, 7)

Stereotypes and homogenization can affect how social groups perceive each other. They can create a skewed view of reality because the algorithms can highlight stereotypes and emphasize a limited number of aspects (Noble 2018). According to social psychology research, perceiving being part of a group can create a bias toward other groups (Sherif 1956; Tajfel 1970). Outgroup bias can manifest itself as negative feelings and behaviours toward the persons who belong to the outgroup. Mason (2018) has gathered compelling evidence suggesting that increased homogeneity in a political group can create more entrenched opinions. Individuals who have less cross-cutting ties tend to be more hostile toward other political partisans and more positive about their own political identity (Mason 2018). In a U.S. based study, Flaxman Goel and Rao (2016) found that social media seem to increase ideological news segregation, especially opinion articles. Although segregation could come from the member's homophily or the algorithm, the evidence suggests that social media can fuel ideological polarization. Many experts normatively judge

polarization as a negative outcome because the commons that hold society together become thinner (Settle 2018; Sunstein 2018; 2009b; 2009b; Bishop and Cushing 2009; Mason 2018; Levitsky and Ziblatt 2018). While the problems stay the same, ideologically distant individuals have difficulty agreeing because they frame the problems differently (Lakoff 2009). While most of the evidence comes from the United States, the picture seems comparable in Canada. Though the evidence is limited to a study focusing on Twitter – which tends to be more about information gathering than social interactions – it can be assumed that the same phenomenon is also present on Facebook. Indeed, Gruzd and Roy (2014) found much more activity between the supporters of one party than between individuals supporting different parties during the 2011 Canadian election. The authors note that individuals identifying with the Conservative Party were much less likely to interact with another party's partisans. Additionally, 47 percent of the interactions between ideologically distant users appeared hostile and did not invite attitude change or allegiance shifting. The authors conclude that contact between partisan Twitter users does not help.

According to some experiments, discussions between like-minded individuals made their opinions more entrenched than before these interactions (Sunstein, Hastie, and Schkade 2007; Myers 1975; Baron et al. 1996). Discussing matters online seems to have the same effect, where users become more polarized in their positions (Quattrociocchi, Scala, and Sunstein 2016). Because algorithms and selective exposure reinforce the echo chamber, users receive a disproportionately large number of arguments favouring one side of an issue and a fraction of that number for the other side (Sunstein 2018). This situation creates a limited pool of arguments, where the alternative is less present. Even if they know that counter-arguments exist, many persons will refrain from expressing them online,

fearing to be judged and isolated (Noelle-Neumann 1974; Sunstein 2018; Asch 1952). Another bias in a filter bubble that could create polarization is that most people agree with the information. Thus, individuals perceive it as more trustworthy (Turcotte et al. 2015). Hence, the arguments presented are perceived as more confident. The apparent hypothesis here is that political memes would influence more those who already lean toward the ideology embodied by those memes, thus having a reinforcing effect, or in other words, stimulate attitude polarization. Even if the general evidence is compelling, messages that matches one's ideology, still have difficulty creating a persuasion effect (Arceneaux, Johnson, and Cryderman 2013; Coppock, Hill, and Vavreck 2020). Hence while political memes concord with a participant's ideology, the reinforcing effect is not guaranteed. Nonetheless, political memes should stimulate attitude polarization, making right-wing opinions become even more conservative and left-wing opinions become even more progressive (H3).

While there is evidence suggesting that the filter bubble and echo chamber exist, Bakshy, Messing, and Adamic (2015) claim that the ideological environment online is not as airtight as it seems. The researchers analyzed how 10 million U.S. Facebook users engaged with the news on social media. They show that the main explanatory variables that affect whether a user sees cross-cutting content are the user's friends' ideological slant and platform use intensity. The probability of 'clicking' on cross-cutting content is low, but it is still there. Thus, it is plausible that users still encounter information that goes against their prior attitudes because their social network is not strictly homophilous (Bakshy, Messing, and Adamic 2015). Other studies suggest that the extent of echo chambers is also overstated (Eady et al. 2019; Guess 2020), because it depends on other factors like political

interest (Dubois and Blank 2018). Since user behaviour can be responsible for echo chambers, the tendency to filter political speech could have a moderating effect.

Many political pundits and scholars claim that seeing cross-cutting content could be a solution to increase civility and mutual understanding (Pariser 2012; Sunstein 2009b; 2009a; 2018; Mason 2018; Benedictis-Kessner et al. 2019). Cross-cutting information could challenge prior beliefs and help build bridges. This could be plausible according to on-line reasoning (Lodge, Steenbergen, and Brau 1995). Following this theory, political attitudes are a function of a constantly updating judgment. Because memory is limited, citizens would only remember the general emotion linked to a target. For example, if they cross a piece of positive information about a politician, they will be more inclined to report liking this politician more, and vice versa. Closely related to this theory, Feldman and Zaller (1992) show that opinions are mostly dependent on the balance of considerations, which is the net amount of arguments in favour minus those against. This balance is subject to variation according to the salience of considerations, which underlines the unstable and mixed nature of attitudes. While it would be reasonable to think that new information going against someone's prior ideas would tend to make them change opinion, it seems unlikely. The reason is that individuals do not usually process information objectively. Most tend to resist new information when linking their ideological predispositions to the message (Zaller 1992; Lodge and Taber 2013). For example, someone with conservative attitudes that sees a message with left-wing arguments and can identify them will try to resist and defend their prior attitudes because of the affective response to challenging information. Lodge and Taber (2013) show that incongruent arguments stimulate far more thoughts than congruent messages. Those thoughts are in line with the expectation of a disconfirmation bias.

Furthermore, these authors measured that participants of their experiment spent more time reading incongruent arguments. Ultimately, this research concludes that those with strong prior opinions tend to polarize when exposed to new information regardless of whether it is congruent or incongruent. The reasoning behind the finding is that even if citizens are trying to judge fairly new information, their prior attitudes unconsciously act as an anchor when evaluating new information (Lodge and Taber 2013, 150).

Some studies have looked at the effect of counter-attitudinal information on opinion change. Müller et al. (2017) ran a panel survey in Berlin, London, Paris, and Zurich to assess the impact of populist statements in the news media. They hypothesized that populist statements would increase support for populist attitudes. They also expected that prior attitudes would moderate the effect of populist messages. Those with weak populist attitudes would become even less populistic, and those with strong populist attitudes would become more populistic. The article shows that only those with weak attitudes became less populistic, reinforcing the thesis that individuals resist messages inconsistent with their prior beliefs. Bail et al. (2018) carried out an experiment where the manipulation was to expose participants to a political Twitter bot for one month. While the experiment was conducted on Twitter, the psychological mechanism should be the same for Facebook: exposure to ideologically opposing views. The results show that viewers polarized, but only on the republican side. It could then be hypothesized that intensely partisan individuals would have more reasons to manifest resistance to a message and thus exhibit a backfire effect from opposing memes. This would be congruent with Huntingdon's experimental findings, which show that memes can create motivated reasoning and selective judgement. Thus, the third hypothesis predicts that political memes will have a polarizing effect

depending on their compatibility with the participant's pre-existing attitudes (H3). It would also be natural to expect that this polarization would happen more strongly among more partisan individuals (H4).

2.4 Other Moderating Variables

Political memes often relate to complex political ideas in simplistic ways or adopt a Manichean view of politics (Milner 2013). In other words, memes often take a juvenalian humorous tone with merciless and uncivilized rhetoric (Shifman 2014). This type of humour might be discounted as mere jokes by more politically knowledgeable individuals who are equipped to navigate those narrative frames (Young 2008). On the flip side, this type of humour could be more influential for individuals who do not possess the knowledge or cultural codes to discount political humour as simple jokes or a form of play (Innocenti and Miller 2016). It would be plausible to think that less knowledgeable citizens would react more strongly than more knowledgeable individuals when political memes attack their political identity. Thus, it should be expected that political knowledge will have a moderating effect on polarization. In other words, memes should particularly affect the least informed (H5).

Filtering is a large component of social media. While algorithmic filtering does exist, it relies heavily on human input (Bakshy, Messing, and Adamic 2015). Although algorithms filter the user's web experience, their deliberate choice, feeds the machine and those choices come before the algorithmic filtering in the causal chain. This kind of behaviour could have a moderating effect; those who filter to avoid exposure to counter-attitudinal content will have a stronger tendency to polarize (H6).

According to Denisova (2019), memes can create deep emotional reactions, and many studies in political science show that emotions are an essential component in attitude change (Marcus, Neuman, and MacKuen 2000; Lodge and Taber 2013; Innocenti and Miller 2016). For example, anxiety-inducing stimuli are thought to encourage information-gathering behaviour, while enthusiasm is seen as reinforcing reliance on political habits (Marcus, Neuman, and MacKuen 2000). The expectations here are two-fold. First, the memes' ideological compatibility will create different emotional reactions; congruent memes will increase positive emotions, and incongruent memes will stimulate negative emotions (H7). Second, emotions should condition the effects of memes on attitude change. The expectation for negative feelings is that – following Lodge and Taber (2013) – higher self-reported levels of anger, disgust and contempt should increase attitude entrenchment (H8a). The hypothesis concerning enthusiasm is guided by Marcus et al. (2000). They prescribe that higher levels of this emotion should be linked to reliance on habits, therefore partisan identity and ideology. Higher levels of enthusiasm should stimulate polarization (H8b). Finally, humour could create heterogeneous effects. Lower levels of amusement should be understood as participants perceiving memes seriously, while higher levels are interpreted as participants finding memes as a form of play. Finding memes serious should increase attitude polarization, while higher funniness scores should do the opposite (H8c).

Need for cognition, a psychological trait that defines people who like to perform intellectual tasks, could play an interesting moderating role. Arceneaux, Johnson and Cryderman (2013) found that those high in need for cognition tend to display an increased level of polarization when exposed to opinionated news programming. The rationale is that those who enjoy intellectual activities are more prone to engage in motivated reasoning.

Thus, the polarizing effect of political memes should be magnified among people with a higher need for cognition (H9).

Age could potentially affect the impact of memes as well. Memes are definitively a new type of communication that requires some referents to understand. For instance, some meme templates can be hard to grasp due to the usage of acronyms, the lack of proper grammar, or the heavy reliance on irony. Younger individuals have an easier time relating to memes because they tend to be the ones who produce and consume them. Young adults' political attitudes are also significantly shaped by digital media (Bennett et al. 2012). Younger individuals could also be more impacted because they are less inclined to have developed a robust partisan identification (Boulianne 2015). Therefore, the impact of memes should be stronger among the young (H10).

2.5 Summary of Hypotheses

H1: Political memes will have a persuasive effect; those who see left-wing memes will become more left-leaning, while those who see right-wing memes will become more conservative.

H2: Political memes will have a stronger persuasive effect among the moderately informed.

H3: Political memes will stimulate attitude polarization, making right-wing opinions become even more conservative and left-wing opinions become even more progressive.

H4: Political memes will have a more potent polarization effect among strong partisans.

H5: Political memes' polarization effect will be stronger among the least informed.

H6: Individual who tends to filter their social media will tend to become more polarized by memes.

H7: Concordant political memes will create positive affect (enthusiasm, funniness), and discordant political memes will stimulate negative emotions (anger, disgust, contempt).

H8: a. Higher levels of negative emotions will stimulate polarization.

b. Higher levels of enthusiasm will increase polarization.

c. Higher levels of funniness will decrease polarization.

H9: Those with higher levels of need for cognition will display more attitude polarization from memes.

H10: The polarizing effect of memes will be stronger among younger individuals.

Chapter 3. Methodology

3.1 Experimental Design

This research was conducted by tweaking Feezell's (2018) innovative longitudinal experiment design, which leverages Facebook's Group function coupled with a pre-post survey ($N = 192$). The basic idea was to recruit individuals for the first survey and ask them to join a Facebook group randomly assigned by the survey platform used, that is, Qualtrics. Then, political memes which constitute the treatment were distributed directly in the Facebook groups over 82 days (09/14/2020 to 12/04/2020). Participants were finally asked to complete a second survey.

In this study, there were three groups. Two of them were experimental, and one was the control. One of the treatment groups featured left-wing memes, while the other showed right-wing memes. Members of the control group were given apolitical memes. Those non-political memes were also distributed in the treatment groups, in addition to political memes. The non-political memes in the treatment groups acted as decoys to avoid a Hawthorne effect. Memes were posted every day around noon to reach a maximum of participants (considering time zones). No more than one meme per day was posted in each group, and during the first weeks, no memes were posted on weekends. In total, treatment group participants saw 37 apolitical memes and 37 political memes for a total of 74, whereas only the 37 non-political memes were shown in the control group. The recruitment advertisements announced a research project about social media and political attitudes in general. The groups had very generic names: *Memes* (control), *Memes Community* (left) and *Memes Group* (right). The only substantial difference between the control and treatment groups was theoretically the ideological slant of memes. The variation between

the two waves in terms of environmental factors was controlled through the control group. Thus, if there is a one-unit change in the control group and a five-unit change in one of the treatment groups, all in the same direction, the causal effect of political memes is four units. Theoretically, if the treatment group had not seen the treatment, their attitude change should have been the same as in the control group. The treatment is responsible for the difference between the two groups.

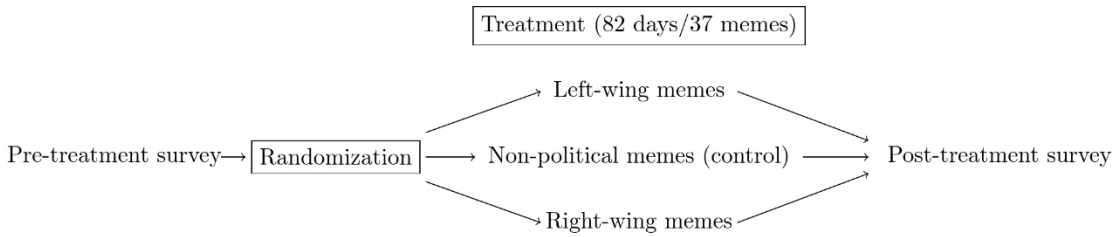
The main advantage of this methodology is that it circumvents the usual external validity concerns. A majority of laboratory or survey-based experiments use *one-shot* exposures and are conducted in unnatural settings, leading to external validity problems. This experiment, however, distributed the treatment naturally, directly on Facebook. Participants were treated through their everyday use of social media. Since the treatment is one political meme every day, it was considered very subtle. The experimental setting closely resembled the mundane act of joining a group or liking a Facebook page or the behaviour of that friend who posts or shares political memes. In short, the experiment mimics a real-life situation.

Another advantage of the Facebook group function is that it allows the researcher to distribute the treatment without having to 'friend' participants. It also allows the researcher to act under the cover of a Facebook page. The groups are set to private, thus preventing participants from sharing the treatment. Comments are deactivated to make sure that only memes are influencing the group members. This also prevents the unfortunate situation where people would post their own memes in the comment section or harass other participants by replying to their comments.

Participants were recruited for this experiment with different methods during the summer of 2020. Most of them came from Canadian political science departments' emailing lists. Others were recruited through the researcher's Facebook community. Finally, participants were also recruited through various Reddit communities (Canadian, U.S. and international subreddits like /r/memes). The recruitment message offered participants the chance to win one 500$ prize or one of ten 100$ prizes. During the treatment phase, participants were free to leave the experiment by simply quitting the group. Initial recruitment gathered a total of 809 participants divided into three groups. 316 individuals completed the post-experimental survey (attrition rate of 60.9%). Of those participants, only 192 wave one and wave two surveys were successfully matched. While the initial recruitment was successful with a respectable initial sample the matching procedure did not go as planned. Unfortunately, this sample size creates a statistical power problem, leading possibly to a type two error (false negative). Indeed, a power analysis revealed that each group should have contained about 600 participants to detect a tiny effect robustly. Matching participant's answers was complex because Qualtrics' anonymous survey links do not attribute a unique code to each participant. The strategy was for the participants to create a unique and anonymous code through simple questions (first letter of the first name, first letter of the birthday month, and the four last digits of the usual phone number). This method was principally used to comply with the anonymity norms. While straightforward, those questions were at the end of the survey and could have been filled carelessly due to survey fatigue. Also, reminders to fill the second survey were done through the Facebook groups, which can more easily be missed than direct messages or emails. Those two reasons can explain the massive attrition problem of this study. Since

the recruitment was done among university students and social media, the sample is younger (mean is 23.2 years old), more educated (mean = some university), and highly skewed toward the left (mean ideological self-placement is 0.33 on a 0-1 left-right scale; standard deviation = 0.21). It is essential to keep in mind that the conclusions from this experiment are constrained to such a portion of the population. While the assignment to the groups was random, some biases emerged in the response rate. More women and educated participants in the right-wing treatment group responded to the second survey. The regression analyses take into account this imbalance by including these two control variables. Nonetheless, both types of models (uncontrolled and controlled) yield about the same results. Figure 1 summarises the steps of the experimental protocol graphically.

Figure 1: Study Design



3.2 Treatments and Variables

Before the experiment, the researcher asked five expert coders to classify the treatment corpus that was selected in advance by the researcher. This classification was used to ascertain the ideological slant and other attributes such as clarity[2]. Only memes coded 0 – signalling no ideology – by all the coders were used for the control group.

[2] Expert coders were political science graduate students from the Université de Montréal.

However, the criterion was relaxed for the political memes due to their ambiguous nature, the five coders did not have to agree. Memes that were coded as too ideologically vague by the expert coders were removed from the initial treatment corpus because they were not usable. On other metrics, the coders revealed that the memes were clear, giving an average clarity score of 7.85 out of 10 to the left-wing memes (with a standard deviation of 1.76) and 7.67 to the right-wing memes (with a standard deviation of 1.61). Those coders found that the memes were equivalent in terms of funniness, with leftist memes receiving a mean score of 4.64 (with a standard deviation of 1.81) and the rightist memes receiving a score of 4.23 out of 10 (with a standard deviation of 1.48). These numbers show that both the left-wing and right-wing are comparable. However, the large standard errors indicate that not all expert coders agreed. This was to be expected because humour is a matter of personal taste. Each meme's average clarity and funniness score helped select the best memes to use during the treatment. When choosing the daily meme, careful attention was given to clarity and funniness scores to have equal treatment for both experimental groups. Except for one, no meme featured a political leader (Justin Trudeau). The meme corpus did not include Donald Trump or any reference to him. It neither had memes on COVID-19. After the experiment, it was deemed essential to conduct a content analysis about the memes' broad themes. While expert coders classified the memes' ideology, clarity and funniness in the pre-treatment phase, the content analysis of themes was done by the researcher himself. Table 1 summarises the data for each treatment group. It reveals that the left-wing treatment group saw much more memes that tapped into the economic dimension than the social one, while the other group had a more balanced selection across these two categories. Much of the memes featured negative arguments toward their

political adversary, criticizing or making fun of their beliefs. The content analysis categories are not mutually exclusive, and some memes did not have an economic or social theme. A certain number of memes touched on other issues such as the environment, free speech or were just a mean joke about the left or the right (see right-wing meme #71, for example, in the supplementary material). The emotional keying – positive/negative – is also not mutually exclusive because several memes were both positive about their own ideological camp while demeaning the other, making the totals of the last four rows of Table 1 exceed 37.

Table 1: Content Analysis of Treatment Memes

Themes	Treatment left	Treatment right
Economic	24	16
Social	7	15
Positive about the left	4	0
Negative about the left	0	36
Positive about the right	0	6
Negative about the right	35	0

The main independent variable is the ideological slant of the memes presented. This independent variable is operationalized in two ways. First, a measure captures whether the participants received left-wing or right-wing memes. Second, a measure focuses on the compatibility between the treatment and the participants' prior attitudes. For example, if someone with leftist attitudes saw left-wing memes, it is considered a pro-attitudinal treatment. Conversely, someone with leftist attitudes that saw right-wing memes is considered to be in the counter-attitudinal treatment. In both operationalizations, the control group stays the same.

Political memes touch many aspects of political life, namely ideology and group identity. We thus examine five main dependent variables to assess memes' impact. The question wording of these variables (and other variables) is presented in the Appendix, and the full survey is available in the supplementary material. The first variable is an eleven-point left-right self-placement scale. This measure is often used to see where individuals locate themselves in the ideological space. Second, since ideology involves more than a single dimension, it is important to assess the two most common axes: economic conservatism and social conservatism. Both concepts were measured with scales based on the work of Gidengil et al. (2012). While they were initially devised to measure ideology in Canada, they arguably should work elsewhere because the questions assess opinions on broad issues relevant in many contexts. Besides, the bulk of the sample comes from Canada. The economic conservatism scale captures attitudes toward free enterprise, the government's role on socio-economic issues, and individual responsibility with five items. The social conservatism scale addresses gender issues, attitudes toward gays and lesbians, and feelings towards feminists with four items. These were coded so 0 represents progressive attitudes, and 1 captures conservative attitudes. Both scales in the pre- and post-surveys exhibit a decent Cronbach's alpha higher than 0.70. When performing an item analysis, the graphical output fills the monotonicity assumption needed for a summated rating model. Lastly, two original questions were designed to assess affective evaluations of people with liberal or progressive values and those who have conservative beliefs. Their question wording is based on the feeling thermometers from the Canadian Election Study, and the target group was replaced with the desired ones. While ideology and group identity are both fairly stable over an individual's life and constitute core values, political memes

are usually addressed to younger individuals who are still building their political identity. Hence it is important to know if political memes can affect ideology. Another reason motivating the choice of observing the effect of political memes on ideology and group perceptions is simply that both of those variables are important factors strongly related to crucial democratic behaviours such as vote choice, participation and so on.

Like the independent variables, these dependent variables are also operationalized in two ways. The first one relies on a measure of change (delta), created by subtracting the first wave's score from the one of the second wave. This approach allows investigating the persuasion hypothesis (H1). If memes indeed have a persuasive effect, the opinion change will reflect the treatment's ideological slant. For example, left-wing treatment would reveal a negative effect on conservatism, while the right-wing treatment should show a positive effect. The second operationalization is more complex than the first. The variables are folded in half so that both ends of the spectrum are relocated at a high score.[3] In this conceptualization, a high score reveals that the individual has more extreme ideas about politics. A low score indicates moderate views without regard to the nature of their political ideology. The same subtracting procedure was done to arrive at measures of change (deltas). This approach allows us to examine the polarization effect of memes (H3). Regression analyses employ rescaled coefficients (0-1) for a more direct comparison of effect magnitude between the polarization and persuasion models. Otherwise, it would have been necessary to multiply the second approach's coefficients by a little more than two to have comparable effects. Tables 2 and 3 summarise the deltas for each group and

[3] Variables were first cut in half, creating two new variables, one omitting the lower end of the range and one omitting the higher range. Then, the variable with the lower end was reversed so that the highest value now represents more extreme views (0 becomes 1). Both variables were then reassembled together.

both conceptualizations. Most opinion change deltas are near zero, meaning that the treatment did not have substantial impacts. The differences between the treatment groups and the control group are also slight.

Table 2: Opinion Change Deltas

	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Δ Economic conservatism (control)	60	0.001	0.11	-0.25	-0.07	0.07	0.32
Δ Economic conservatism (left)	57	-0.01	0.07	-0.20	-0.07	0.07	0.20
Δ Economic conservatism (right)	52	0.001	0.10	-0.20	-0.07	0.07	0.27
Δ Social conservatism(control)	59	-0.001	0.10	-0.35	-0.02	0.06	0.25
Δ Social conservatism (left)	63	0.01	0.10	-0.25	-0.04	0.05	0.31
Δ Social conservatism (right)	58	-0.01	0.10	-0.46	-0.06	0.04	0.24
Δ Feelings toward the left (control)	63	-0.03	0.18	-0.47	-0.12	0.05	0.50
Δ Feelings toward the left (left)	58	-0.00	0.19	-0.70	-0.12	0.10	0.69
Δ Feelings toward the left (right)	58	-0.00	0.19	-0.70	-0.12	0.10	0.69
Δ Feelings toward the right (control)	63	0.04	0.18	-0.35	-0.08	0.15	0.62
Δ Feelings toward the right (left)	64	0.02	0.18	-0.40	-0.07	0.09	0.60
Δ Feelings toward the right (right)	58	0.01	0.12	-0.30	-0.05	0.10	0.25
Δ Left-right self-placement (control)	72	-0.003	0.09	-0.20	0.00	0.00	0.20
Δ Left-right self-placement (left)	64	-0.003	0.10	-0.40	0.00	0.00	0.30
Δ Left-right self-placement (right)	56	0.01	0.10	-0.20	-0.02	0.00	0.30

Table 3: Polarization Deltas

	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Δ Economic conservatism folded (control)	62	-0.02	0.10	-0.32	-0.07	0.05	0.20
Δ Economic conservatism folded (pro)	53	0.005	0.07	-0.20	-0.07	0.07	0.20
Δ Economic conservatism folded (counter)	62	0.01	0.08	-0.25	-0.02	0.07	0.20
Δ Social conservatism folded (control)	60	0.0004	0.09	-0.18	-0.06	0.02	0.33
Δ Social conservatism folded (pro)	60	-0.01	0.10	-0.31	-0.05	0.04	0.25
Δ Social conservatism folded (counter)	62	0.01	0.10	-0.24	-0.03	0.06	0.46
Δ Feelings toward the left folded (control)	75	-0.003	0.14	-0.37	-0.10	0.09	0.31
Δ Feelings toward the left folded (pro)	73	-0.001	0.12	-0.30	-0.07	0.05	0.30
Δ Feelings toward the left folded (counter)	61	0.005	0.12	-0.30	-0.05	0.06	0.32
Δ Feelings toward the right folded (control)	77	-0.01	0.15	-0.50	-0.10	0.09	0.33
Δ Feelings toward the right folded (pro)	64	-0.01	0.13	-0.30	-0.06	0.06	0.30
Δ Feelings toward the right folded (counter)	72	-0.004	0.12	-0.30	-0.06	0.05	0.34
Δ Left-right self-placement folded (control)	72	-0.003	0.09	-0.20	0.00	0.00	0.20
Δ Left-right self-placement folded (pro)	63	-0.003	0.07	-0.10	0.00	0.00	0.20
Δ Left-right self-placement folded (counter)	66	0.005	0.09	-0.30	0.00	0.07	0.20

Political knowledge was assessed using party placements. Respondents were asked to locate Canadian federal parties on the 11-point left-right scale (only Canadian respondents were asked these questions).[4] The political knowledge score is the sum of accurate answers for placing the Liberal Party, the Conservative Party, the New Democratic Party, and the Green Party. Placement of the Bloc Québécois was omitted since this party is challenging to place on the left-right scale, particularly for non-Quebeckers.

[4] For each right answer, the value 1 was given, while a wrong answer was coded 0 (don't know was also coded as 0). A correct answer for the Conservative Party was a score of 7 or higher on 10. For the Liberal Party, a correct answer was a score between 4 and 6. For the Green Party and the New Democratic Party, a correct answer was a score of 3 or less. This codification is based on two considerations. First, it was made by following how Canadian citizens placed the parties in the 2019 Canadian Election Study (CES). In the CES, the average score of the Liberal Party is 4.3, the Conservative Party is 6.9, the NDP 2.6 and the Green Party 2.5. Second, it was important to evaluate the relative place of each party in the ideological space. For example, the NDP is left of the Liberal Party, and the Conservative party is at the right of the Liberal Party.

Emotions were measured using questions with an 11-point scale asking participants whether the memes made them feel anger, enthusiasm, contempt, and disgust, and how funny they found the memes. While the five main dependent variables were measured twice, emotions were only measured in the second wave. Table 4 shows that negative emotions such as anger, disgust and contempt were much more prevalent in the counter-attitudinal group and less reported in the pro-attitudinal group than in the control condition. On the flip side, positive emotions (enthusiasm and funniness) were generally more widespread in the pro-attitudinal condition. There was no considerable difference in the mean level of political knowledge across the three groups.

Table 4: Emotions and Political Knowledge

	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Anger (control)	69	0.12	0.20	0.00	0.00	0.10	0.80
Anger (pro)	58	0.15	0.22	0.00	0.00	0.30	0.80
Anger (counter)	65	0.31	0.29	0.00	0.00	0.60	1.00
Enthusiasm (control)	69	0.34	0.24	0.00	0.20	0.50	1.00
Enthusiasm (pro)	57	0.41	0.27	0.00	0.20	0.60	1.00
Enthusiasm (counter)	65	0.28	0.27	0.00	0.00	0.50	1.00
Disgust (control)	68	0.16	0.25	0.00	0.00	0.30	1.00
Disgust (pro)	57	0.12	0.21	0.00	0.00	0.20	1.00
Disgust (counter)	65	0.33	0.33	0.00	0.00	0.60	1.00
Contempt (control)	68	0.16	0.25	0.00	0.00	0.30	1.00
Contempt (pro)	57	0.12	0.21	0.00	0.00	0.20	1.00
Contempt (counter)	65	0.33	0.33	0.00	0.00	0.60	1.00
Funny (control)	72	0.45	0.24	0.00	0.27	0.60	1.00
Funny (pro)	60	0.59	0.25	0.10	0.48	0.80	1.00
Funny (counter)	69	0.43	0.27	0.00	0.20	0.60	1.00
Political knowledge (control)	69	0.38	0.26	0.00	0.25	0.50	0.75
Political knowledge (pro)	61	0.35	0.26	0.00	0.25	0.50	1.00
Political knowledge (counter)	60	0.38	0.23	0.00	0.25	0.50	0.75

The main goal of this work is to assess the impact of memes on political ideology. However, since there are so few experimental studies of memes, it is important to consider two other outcome variables. While the treatment does not focus on or mentions political parties, it might change how participants view the locations of political parties in the ideological space. It could be expected that memes will increase the perception of polarization in party positions. Another interesting research avenue is to test whether exposition to political memes can influence political interest. Exposition to political issues through memes could spark interest in politics.

Table 5: Political Interest and Party Placement Deltas

	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Δ Interest (control)	64	-0.002	0.14	-0.40	-0.10	0.10	0.40
Δ Interest (treatment)	128	-0.01	0.14	-0.80	0.00	0.00	0.40
Δ Liberal Party (control)	62	-0.01	0.08	-0.20	-0.10	0.00	0.20
Δ Liberal Party (pro)	55	-0.00	0.09	-0.20	-0.10	0.10	0.20
Δ Liberal Party (counter)	54	0.01	0.09	-0.20	0.00	0.07	0.20
Δ Conservative Party (control)	62	-0.01	0.12	-0.30	-0.10	0.00	0.30
Δ Conservative Party (pro)	56	-0.02	0.09	-0.20	-0.10	0.00	0.20
Δ Conservative Party (counter)	53	-0.02	0.10	-0.30	-0.10	0.00	0.30
Δ NDP (control)	60	-0.01	0.09	-0.30	-0.02	0.02	0.10
Δ NDP (pro)	54	0.004	0.10	-0.30	-0.07	0.00	0.30
Δ NDP (counter)	52	0.01	0.09	-0.20	0.00	0.10	0.20
Δ Green Party (control)	58	-0.02	0.12	-0.50	-0.10	0.00	0.30
Δ Green Party (pro)	52	-0.004	0.11	-0.40	-0.10	0.10	0.20
Δ Green Party (counter)	50	0.03	0.12	-0.30	0.00	0.10	0.30

Table 5 displays descriptive statistics for the other dependent variables. Political interest does not appear to have been affected by the treatment. The treatment even shows a negative mean change, indicating that those exposed to political memes became less

interested in politics. Table 5 also shows the polarization deltas for party placements. The average changes are all relatively small.

Before diving into the results, it is essential to present the manipulation check. The last question of the second survey asked the participants to estimate on a 0 to 10 scale, where 0 means left and 10 means right, what was the memes' ideological leaning. Table 6 shows that participants were able, on average, to correctly identify the ideology represented in the memes, meaning that participants did see the treatment on their news feed. Both treatment groups' averages are significantly different from the control group's average ($p<0.01$). However, there can be no certainty about the number of memes seen in total. Hence, some people might have seen all 37 political memes, while others might have seen fewer. Since groups had more than 250 members, it was impossible to use the Facebook tool *seen by*, like in Feezell's article (2018), to estimate a more precise "treated on treated" model. Nonetheless, this disadvantage can arguably produce conservative estimates.

Table 6: Manipulation Check

	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Perceived ideology (control)	61	5.28	1.27	2.00	5.00	6.00	10.00
Perceived ideology (left)	56	3.02	1.66	0.00	2.00	4.00	7.00
Perceived ideology (right)	56	7.11	1.72	4.00	5.75	8.00	10.00

Chapter 4. Results

The analytical strategy is quite simple. Ordinary least-square (OLS) regression estimates compare the attitude change in the treatment groups to the attitude change in the control group. It is important to remember that what matters is the difference in deltas across the two waves between the treatment and the control groups, not the change in the treatment group. If everyone had seen the non-political memes like the control group, the whole sample would theoretically have had about the same change in attitudes. The main reason there is a difference in the magnitude of attitude change is because of exposure to political memes.

4.1 Persuasion

Table 7 tests whether memes were able to persuade participants. If this is true, the left-wing treatment should display negative coefficients, meaning a change toward the left, and the right-wing treatment should display the opposite pattern for the ideological measures. Concerning the group evaluations, the left-wing treatment should increase positive feelings toward the left and decrease feelings toward the right, and vice-versa for the right-wing condition. In fact, Table 7 reports entirely null results. No coefficient reaches statistical significance, leading to the rejection of the persuasion hypothesis (H1). Nonetheless, Models 1, 3, 4 and 5 show the correct direction for the left-wing treatment, while only Model 5 displays the right-wing treatment's expected direction.

Table 7: Treatment's Effect on Persuasion

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Left-wing treatment	-0.013	0.008	0.020	-0.016	-0.008
	(0.018)	(0.019)	(0.030)	(0.029)	(0.017)
Right-wing treatment	-0.002	-0.010	0.032	-0.023	0.003
	(0.018)	(0.019)	(0.031)	(0.030)	(0.018)
Woman	0.00000	-0.0001	-0.0001	-0.0003	-0.00005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
Education	0.032	-0.004	-0.083	0.069	-0.015
	(0.039)	(0.040)	(0.062)	(0.061)	(0.038)
Constant	-0.018	0.001	0.021	-0.005	0.014
	(0.027)	(0.027)	(0.043)	(0.042)	(0.026)
N	169	180	185	185	183
R^2	0.009	0.006	0.015	0.011	0.003

$^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$

Table 8 assesses the moderating role of political awareness measured with political knowledge. According to the persuasion framework outlined by Zaller (1992), those who are somewhat aware should be more prone to be influenced by the treatment. Table 8 breaks downs the treatment's effect among three knowledge groups. Only one result fits H2's expectation where those who are somewhat politically informed will be persuaded. Model 2's right-wing treatment condition shows that there was a significant opinion shift toward the right by 9 percentage points on the economic conservatism scale. While this result supports the hypothesis, statistically significant differences with the control group which do not fit with the expectation were also detected. The subgroup analysis shows that, in Model 1's two treatment groups, the least informed became more progressive by about 5 percentage points. Although the result for the left-wing treatment makes sense, it does not

for the right-wing condition. Surprisingly, Model 2's left-wing treatment had a positive effect on those in the middle, meaning that they became more conservative on the economic dimension. This result is at odds with the theoretical expectation. In the interaction models in the Appendix (see Table A1, where the information variable is dichotomous, 1 for those in the middle and 0 for other knowledge scores), the persuasion effect in Model 2 is also conditional on political knowledge, but the results follow the same pattern where both treatments induced a conservative shift among those with middle levels of political information. Since the evidence is limited and very mixed, it is not possible to reject the null hypothesis concerning the interaction between persuasion and political knowledge.

Table 8: Treatment's Effect on Persuasion by Knowledge Groups

	Δ Economic conservatism			Δ Social conservatism			Δ Feelings toward left			Δ Feeling toward right			Δ Self-placement		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Left-wing treatment	-0.050*	0.064*	0.034	0.034	-0.011	-0.048	-0.019	0.093	0.042	-0.026	-0.014	-0.021	-0.009	-0.005	-0.039
	(0.028)	(0.036)	(0.035)	(0.033)	(0.032)	(0.039)	(0.043)	(0.072)	(0.050)	(0.044)	(0.055)	(0.069)	(0.027)	(0.036)	(0.034)
Right-wing treatment	-0.056*	0.092**	0.064	-0.006	-0.019	0.024	-0.017	0.068	-0.055	0.006	-0.034	0.035	0.003	-0.001	0.064
	(0.031)	(0.034)	(0.044)	(0.034)	(0.030)	(0.053)	(0.047)	(0.069)	(0.066)	(0.048)	(0.053)	(0.090)	(0.030)	(0.034)	(0.045)
Woman	-0.0001	-0.039	0.00002	0.0002	-0.0004	-0.0004	0.0002	0.002	-0.0004	-0.001	-0.001	0.001	-0.0002	-0.001	0.0002
	(0.001)	(0.028)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	0.037	0.086	0.009	-0.109	0.0005	-0.092	0.007	0.010	0.327**	0.020	0.378***	-0.104	0.120*	-0.071	-0.133
	(0.070)	(0.080)	(0.101)	(0.085)	(0.070)	(0.112)	(0.106)	(0.160)	(0.149)	(0.107)	(0.121)	(0.202)	(0.066)	(0.081)	(0.100)
Constant	0.009	-0.105*	-0.008	0.035	0.020	0.083	-0.009	-0.079	-0.255**	0.011	-0.201**	0.094	-0.061	0.040	0.084
	(0.046)	(0.062)	(0.063)	(0.053)	(0.052)	(0.071)	(0.067)	(0.120)	(0.094)	(0.068)	(0.091)	(0.128)	(0.042)	(0.061)	(0.064)
N	70	47	28	74	49	30	75	50	32	75	50	32	74	51	32
R^2	0.068	0.179	0.124	0.048	0.015	0.085	0.003	0.052	0.172	0.014	0.203	0.029	0.052	0.035	0.162

*p < .1; **p < .05; ***p < .01

4.2 Polarization

To test for attitude polarization, Table 9 reports the effect of pro- and counter-attitudinal content on the dependent variables' folded form. Pro- and counter-treatment conditions were determined using each dependent variable's pre-treatment value. For example, if a participant had an economic conservatism score of 0.51 in wave 1 and saw left-wing memes, she is coded as receiving a counter-attitudinal treatment because the prior attitude and treatment are incompatible. When the pre-treatment attitude and memes are compatible, someone with an economic conservatism score of 0.49 in the left-wing treatment, individuals are coded as receiving a pro-attitudinal treatment. Participants whose score was 0.5 in the pretreatment are omitted because it is impossible to determine the type of treatment they saw. This procedure is done for the five dependent variables. A positive coefficient can be understood as a polarizing effect because it represents a movement toward a more extreme position (whether it occurs toward the left or the right).

While eight out of the ten coefficients in Table 9 are in the expected positive direction, consistent with a polarizing effect, only one is statistically significant. The counter-attitudinal treatment induced polarization on the economic conservatism index (p-value = 0.09). Being exposed to memes incongruent with their prior economic opinions reinforced people's views on this topic, leading them to develop slightly more extreme positions over time than the control group. Substantively, there is a five-percentage point increase. The coefficient of the pro-attitudinal treatment on the economic conservatism scale is also noteworthy, showing a four-point increase in polarization. Considering most political memes dealt with economic issues (see Table 1), it makes sense that their most

considerable impact relates to economic conservatism. These results tend to support the polarization hypothesis (H3).

Table 9: Treatment's Effect on Polarization

	Δ Economic conservatism (folded)	Δ Social conservatism (folded)	Δ Feelings toward left (folded)	Δ Feelings toward right (folded)	Δ Self-placement (folded)
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.041	-0.007	0.005	0.007	-0.002
	(0.031)	(0.023)	(0.035)	(0.030)	(0.030)
Counter treatment	0.049*	0.018	0.011	0.015	0.017
	(0.030)	(0.023)	(0.038)	(0.029)	(0.030)
Woman	-0.00001	-0.0001	-0.001	-0.0001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.087	0.008	0.015	-0.095	-0.002
	(0.065)	(0.049)	(0.079)	(0.062)	(0.065)
Constant	0.633***	0.395***	0.510***	0.613***	0.580***
	(0.044)	(0.034)	(0.053)	(0.042)	(0.044)
N	174	179	173	171	174
R^2	0.027	0.008	0.008	0.016	0.007

*p < .1; **p < .05; ***p < .01

The fourth hypothesis stated that the polarization effect would be more prominent among strongly partisan individuals because they might be keener to accept congruent messages and reject those that are at odds with their ideological leanings. Table 10 shows a subgroup analysis where the participants are divided by their partisanship strength.[5] Individuals who had no attachment or stated that they were not really close to a party were grouped in the low partisan strength category. Those who indicated that they felt somewhat close or very close to their party were coded as highly partisan. Table 10 shows that the

[5] Full interaction regressions are available in the Appendix (Table A2).

counter-attitudinal treatment significantly increased polarization among the highly partisan on the economic and social conservatism scales by 9 points and 13 points, respectively (Models 2 and 4). Model 1 shows that the pro treatment increased polarization on economic conservatism among the low partisan strength category ($p=0.089$). Model 5 indicates that the same type of persons, when viewing compatible memes, became less extreme on evaluations of left-wing individuals. In other words, the less partisan became more moderate compared to the control group. At first view, the evidence in support for hypothesis H4 is quite mixed. While two results do not fit with the original expectation (Models 1 and 5), two results follow the anticipated pattern (Models 2 and 4). There are signs that memes can create motivated reasoning when strongly attached individuals see political memes incompatible with their political beliefs. These individuals sought to protect their identity by counterarguing the memes' message and ultimately polarized. Model 5's results could potentially be explained by the fact that those without a strong party attachment did not identify with the congruent memes because they found their ideas too extreme, thus leading them to revise their evaluation of people who hold left-wing or progressive attitudes. Overall, Table 10 offers some support H4. On the one hand, one of the odd results can be explained. On the other, two results clearly fit the expectation where highly partisan exhibit more motivated reasoning.

Table 10: Treatment's Effect on Polarization by Partisan Strength

	Δ Economic conservatism (folded)		Δ Social conservatism (folded)		Δ Feelings toward left (folded)		Δ Feelings toward right (folded)		Δ Self-placement (folded)	
	Low	High	Low	High	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Pro treatment	0.127*	0.042	-0.043	0.073	-0.232***	0.056	-0.112	0.006	-0.032	0.018
	(0.073)	(0.042)	(0.052)	(0.050)	(0.079)	(0.050)	(0.101)	(0.042)	(0.062)	(0.045)
Counter treatment	0.024	0.087**	-0.025	0.128**	-0.058	0.067	-0.018	0.002	0.040	0.017
	(0.070)	(0.043)	(0.049)	(0.052)	(0.076)	(0.055)	(0.080)	(0.041)	(0.057)	(0.045)
Woman	0.001	-0.0001	-0.0002	-0.0003	-0.0002	-0.002	0.001	-0.00003	-0.001	0.0004
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Education	-0.088	-0.125	0.006	0.029	-0.215	0.139	-0.147	-0.125	-0.145	-0.053
	(0.152)	(0.102)	(0.108)	(0.129)	(0.156)	(0.138)	(0.164)	(0.110)	(0.126)	(0.111)
Constant	0.635***	0.653***	0.360***	0.324***	0.585***	0.420***	0.606***	0.658***	0.588***	0.587***
	(0.103)	(0.067)	(0.074)	(0.083)	(0.106)	(0.089)	(0.114)	(0.071)	(0.086)	(0.072)
N	55	92	59	91	52	95	52	92	56	92
R^2	0.074	0.056	0.014	0.069	0.170	0.041	0.044	0.015	0.057	0.006

*p < .1; **p < .05; ***p < .01

Table 11 tests the idea that political memes are more effective at polarizing individuals with low political knowledge because these people may not discount memes as a form of play like more informed individuals. Results indicate that attitude polarization occurs at a statistically significant level among the lower information tier only on the economic ideological dimension (Model 1). The pro-attitudinal treatment increased polarization among the less knowledgeable by 13 percentage points, while the counter-attitudinal treatment increased polarization by almost 15 points among this subgroup. Appendix Table A3 confirms this heterogenous effect by showing statistically significant and negative interactions between knowledge and each treatment, meaning that as the political information score increases (continuous variable), the polarization effect diminishes. While the results seem robust for economic conservatism, there is no evidence of polarization for any of the other dependent variables among any of the political knowledge subgroups. Once again, considering that economic themed memes were more prevalent in the treatment, these results make sense and support H5's expectation.

Table 11: Treatment's Effect on Polarization by Knowledge Groups

	Δ Economic conservatism (folded)			Δ Social conservatism (folded)			Δ Feelings toward left (folded)			Δ Feelings toward right (folded)			Δ Self-placement (folded)		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Pro treatment	0.129**	-0.072	-0.091	-0.036	0.029	0.127	-0.084	0.018	0.104	0.002	-0.033	-0.094	-0.016	0.033	0.040
	(0.049)	(0.066)	(0.106)	(0.043)	(0.073)	(0.093)	(0.061)	(0.088)	(0.114)	(0.054)	(0.082)	(0.119)	(0.042)	(0.087)	(0.112)
Counter treatment	0.145***	-0.091	-0.163	0.017	0.054	0.038	0.015	-0.006	0.008	0.006	0.022	-0.118	0.003	0.102	-0.158
	(0.052)	(0.064)	(0.132)	(0.044)	(0.070)	(0.111)	(0.062)	(0.091)	(0.148)	(0.049)	(0.080)	(0.140)	(0.046)	(0.078)	(0.126)
Woman	0.0003	0.067	-0.0004	-0.0003	-0.001	0.0004	0.0001	-0.002	-0.001	0.001	-0.001	-0.002	0.0002	-0.002	-0.001
	(0.001)	(0.051)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Education	-0.075	-0.339**	-0.064	0.162	0.001	-0.124	0.020	0.025	0.238	-0.088	-0.513***	0.084	-0.026	-0.062	0.354
	(0.116)	(0.146)	(0.311)	(0.111)	(0.159)	(0.242)	(0.155)	(0.204)	(0.347)	(0.127)	(0.189)	(0.322)	(0.101)	(0.205)	(0.313)
Constant	0.567***	0.816***	0.673***	0.302***	0.493***	0.420**	0.463***	0.548***	0.339	0.613***	0.738***	0.604***	0.600***	0.485***	0.442**
	(0.074)	(0.113)	(0.195)	(0.069)	(0.119)	(0.156)	(0.097)	(0.152)	(0.218)	(0.080)	(0.140)	(0.204)	(0.064)	(0.150)	(0.197)
N	72	48	30	74	48	30	69	47	31	68	47	30	70	48	31
R^2	0.136	0.164	0.099	0.054	0.018	0.085	0.042	0.025	0.056	0.018	0.195	0.066	0.006	0.073	0.100

*p < .1; **p < .05; ***p < .01

Social media could reinforce echo chambers, but one of the key factors in their appearance is human behaviour (Bakshy, Messing, and Adamic 2015). In the survey, participants were asked if they had ever blocked or deleted a person, a page or a group from their social media because of their political views and opinions. From a descriptive point of view, it is interesting to see that about 51% of the sample declared having adopted this behaviour. Table 12 investigates whether this kind of behaviour moderates the polarization impact. Results are primarily null except for Model 2's counter-treatment condition. The subgroup analysis reveals a significant effect of the counter-attitudinal treatment on economic conservatism among those who have filtered (p-value = 0.06). However, the interaction model in the Appendix (Table A4) indicates a non-significant interaction between the treatment and filtering behaviour for that dimension. Nonetheless, it shows that there is a significant interaction for the social conservatism dimension in the pro-treatment condition (p-value = 0.067). This result would mean that those who tailor their social media to fit their political views tend to polarize when seeing congruent memes. Still, Table 12 hardly reveals any pattern suggesting that the filtering behaviour has a moderating effect. Polarization is only observed for one dependent variable among people who tend to filter their social media. Nonetheless, because participants received more memes with the economic theme, the first result with the subgroup analysis can still make sense. Nonetheless, the evidence is flimsy at best, which leads to a situation where the null hypothesis can not confidently be rejected.

Table 12: Treatment's Effect on Polarization by Filtering Behaviour

	Δ Economic conservatism (folded)		Δ Social conservatism (folded)		Δ Feelings toward left (folded)		Δ Feelings toward right (folded)		Δ Self-placement (folded)	
	Low filter	High filter	Low filter	High filter	Low filter	High filter	Low filter	High filter	Low filter	High filter
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Pro treatment	0.076	0.006	-0.058	0.065	-0.003	0.045	-0.031	0.002	-0.018	-0.023
	(0.046)	(0.052)	(0.050)	(0.043)	(0.052)	(0.058)	(0.054)	(0.062)	(0.043)	(0.054)
Counter treatment	0.018	0.085*	0.0005	-0.001	0.021	0.013	-0.029	0.032	0.042	-0.032
	(0.049)	(0.045)	(0.051)	(0.042)	(0.063)	(0.057)	(0.057)	(0.057)	(0.046)	(0.050)
Woman	0.043	-0.0002	-0.0002	0.0002	-0.002	-0.001	-0.001	0.0003	-0.002	0.0003
	(0.038)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.137	-0.022	0.018	-0.040	0.045	-0.124	-0.285**	-0.151	-0.055	-0.032
	(0.095)	(0.109)	(0.104)	(0.091)	(0.126)	(0.125)	(0.119)	(0.127)	(0.091)	(0.119)
Constant	0.571***	0.596***	0.498***	0.439***	0.433***	0.624***	0.639***	0.524***	0.608***	0.519***
	(0.068)	(0.072)	(0.074)	(0.061)	(0.087)	(0.083)	(0.083)	(0.085)	(0.065)	(0.078)
N	80	84	81	87	73	87	72	86	76	87
R^2	0.082	0.051	0.028	0.038	0.025	0.024	0.090	0.020	0.063	0.007

*p < .1; **p < .05; ***p < .01

The seventh hypothesis posits that memes would create different emotional reactions. The emotional response should depend on the compatibility between the person's prior attitudes and the treatment type. The type of treatment was coded using the 11-point ideological self-placement. While funniness is not usually studied in emotional frameworks, it was essential to add this component because memes typically adopt a humorous frame (Shifman 2014). Table 13 shows that there are significant differences in emotional reactions. As predicted, the three negative emotions – anger, disgust and contempt – were significantly more reported in the counter-attitudinal treatment condition than in the control group. However, they were not significantly less reported in the pro-treatment condition. On the positive side, funniness was more reported in the pro-attitudinal treatment. While not statistically significant, enthusiasm' coefficients follow the logical directions, positive for the pro treatment and negative for the counter treatment. If we use the economic or social conservatism variables to identify what content is pro- or counter-attitudinal, results are very similar to those reported here. In sum, there is robust evidence that supports the idea that memes can stimulate strong emotional reactions by their viewers, thus backing H7.

While it is clear that memes can create emotional responses, results regarding the interaction between such emotions and polarization outcomes are much fuzzier. Table 14 examines the impact of the treatment on polarization for economic and social conservatism among four emotional subgroups. Since other emotions and dependent variables did not produce statistically significant results in the subgroup analysis, they were omitted from

the main body of the thesis for clarity and conciseness (though, the more robust interaction analyses are available in the Appendix).

Table 13: Treatment's Effect on Emotions

	Anger	Enthusiasm	Disgust	Contempt	Funniness
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.034	0.081	-0.053	0.078	0.169***
	(0.047)	(0.051)	(0.051)	(0.052)	(0.049)
Counter treatment	0.222***	-0.068	0.192***	0.188***	-0.027
	(0.045)	(0.049)	(0.049)	(0.050)	(0.047)
Woman	0.002	0.0001	0.001	0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	0.150	-0.067	0.115	0.007	-0.118
	(0.098)	(0.107)	(0.107)	(0.109)	(0.103)
Constant	0.006	0.379***	0.076	0.137*	0.495***
	(0.068)	(0.074)	(0.073)	(0.075)	(0.070)
N	159	158	157	158	162
R^2	0.183	0.056	0.168	0.097	0.116

*p < .1; **p < .05; ***p < .01

Models 1 to 4 present analyses for low and high levels enthusiasm. Enthusiasm is cut according to the mean value. Results conform to the affective intelligence model, because those who expressed feeling more enthusiasm became slightly more polarized (see Models 2 and 4 in the counter-treatment condition). On the flip side, those who experienced less enthusiasm became less polarized in Model 3's pro-treatment condition. While those results appear clear, Appendix Table A6 does not display any significant interaction between enthusiasm and the treatment variables. The only other emotion that returns statistically significant results in the subgroup analysis is meme funniness (Models 5 to 8). Contrary to enthusiasm, this emotion is separated according to the first and fourth quartiles.

Model 5 shows that those who found the memes unfunny became more polarized in the counter-attitudinal treatment compared to the control group. This result makes sense since finding memes unfunny translates to a first-degree comprehension. Model 7 indicates that those who felt that memes were not funny in the pro-treatment condition became less polarized. It could be speculated that these people perhaps found the memes too extreme and felt that they had to dissociate themselves from those ideas and become more centrist. Just like the interaction models for enthusiasm, the findings in Appendix Table A9 show that funniness does not exhibit a significant interaction effect. In fact, no interaction is statistically significant for any emotion.

Arcenaux et al. (2013) demonstrated that individuals who had a higher level of need for cognition tended to polarize when exposed to opinionated news programs. Hypothesis H9 posited that this type of individual should also be more prone to polarize when viewing political memes. The need for cognition was assessed using two agree/disagree questions with a 4-point scale ("Thinking is not my idea of fun", "I like to have responsibility for handling situations that requires a lot of thinking"), which were then assembled into a scale. Table 15 tests the hypothesis with a subgroup analysis. It does not show any statistically significant estimate of a treatment effect, nor does it display any conclusive pattern. The interactive test available in the Appendix (Table A10) shows, however, a negative interaction term for the left-right self-placement variable indicating that a higher need for cognition would be, in fact, associated with a reduced impact of pro-attitudinal treatment on polarization. This finding is incongruent with hypothesis H9.

Table 14: Treatment's Effect on Polarization by Emotional Groups

	Δ Economic conservatism (folded)		**Δ** Social conservatism (folded)		**Δ** Economic conservatism (folded)		**Δ** Social conservatism (folded)	
	Low enthusiasm	High enthusiasm	Low enthusiasm	High enthusiasm	Low funniness	High funniness	Low funniness	High funniness
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pro treatment	0.085	0.013	-0.104*	-0.008	0.068	-0.039	-0.169**	0.005
	(0.054)	(0.056)	(0.058)	(0.040)	(0.078)	(0.077)	(0.080)	(0.067)
Counter treatment	0.029	0.135**	-0.031	0.088*	0.126**	-0.033	-0.017	0.038
	(0.043)	(0.066)	(0.046)	(0.050)	(0.055)	(0.089)	(0.056)	(0.080)
Woman	-0.001	0.002	0.0003	0.0001	-0.0002	0.002	0.0004	0.0001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Education	-0.053	-0.090	-0.095	0.108	-0.115	-0.129	-0.059	0.096
	(0.089)	(0.143)	(0.097)	(0.098)	(0.139)	(0.136)	(0.142)	(0.117)
Constant	0.611***	0.521***	0.623***	0.347***	0.548***	0.599***	0.423***	0.506***
	(0.062)	(0.099)	(0.068)	(0.068)	(0.090)	(0.103)	(0.092)	(0.089)
N	87	67	91	68	52	45	55	46
R^2	0.038	0.096	0.043	0.082	0.105	0.040	0.088	0.027

*p < .1; **p < .05; ***p < .01

Table 16 explores the moderating effect of age. While the tenth hypothesis expected younger individuals to be more affected by memes, the results do not support a moderating effect because most of the interaction terms are non-significant. In Model 5, the counter-attitudinal treatment's interaction shows that as people get older, they get significantly less polarized by memes with which they don't agree. In a subgroup analysis not reported, 18 to 21 years old became significantly more polarized by ten percentage points on the left-right self-placement when exposed to incongruent memes (p-value = 0.04). While this is interesting, the age division was arbitrary. No other subgroup or dependent variable returned statistically significant results. Finally, it is essential to note that the sample's mean age was 23 years old with a standard deviation of about five years. Thus, other patterns might have emerged with a more diverse sample.

Table 15: Treatment's Effect on Polarization by Need for Cognition Groups

	Δ Economic conservatism (folded)		Δ Social conservatism (folded)		Δ Feelings toward left (folded)		Δ Feelings toward right (folded)		Δ Self-placement (folded)	
	Low	High	Low	High	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Pro treatment	0.027	0.063	-0.009	-0.013	-0.011	0.016	0.022	0.017	0.051	-0.069
	(0.046)	(0.062)	(0.047)	(0.039)	(0.051)	(0.060)	(0.044)	(0.065)	(0.043)	(0.060)
Counter treatment	0.034	0.085	0.030	0.013	0.023	0.016	0.051	-0.002	0.060	-0.030
	(0.048)	(0.054)	(0.048)	(0.037)	(0.057)	(0.062)	(0.045)	(0.059)	(0.047)	(0.052)
Woman	-0.001	0.002	-0.0003	-0.00004	-0.001	-0.001	-0.0005	0.0002	0.0001	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Education	-0.111	-0.114	0.004	0.034	0.154	-0.123	0.057	-0.430***	0.015	-0.105
	(0.104)	(0.119)	(0.103)	(0.083)	(0.116)	(0.137)	(0.094)	(0.131)	(0.099)	(0.121)
Constant	0.653***	0.547***	0.556***	0.313***	0.384***	0.605***	0.506***	0.771***	0.523***	0.594***
	(0.064)	(0.088)	(0.064)	(0.061)	(0.072)	(0.099)	(0.058)	(0.096)	(0.061)	(0.088)
N	90	79	92	84	88	79	86	79	86	81
R^2	0.020	0.054	0.009	0.011	0.030	0.023	0.023	0.128	0.026	0.034

*p < .1; **p < .05; ***p < .01

Table 16: Treatment's Effect on Polarization and Age Interaction

	Δ Economic conservatism (folded)	Δ Social conservatism (folded)	Δ Feelings toward left (folded)	Δ Feelings toward right (folded)	Δ Self-placement (folded)
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.003	-0.022	0.031	0.027	0.008
	(0.042)	(0.031)	(0.047)	(0.042)	(0.041)
Counter treatment	0.044	0.021	0.084	0.013	0.090*
	(0.047)	(0.037)	(0.061)	(0.043)	(0.047)
Age	-0.184*	-0.107	0.185	0.043	0.085
	(0.107)	(0.085)	(0.127)	(0.103)	(0.106)
Woman	-0.00002	-0.0001	-0.001	-0.00003	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.031	0.046	0.0002	-0.105	0.034
	(0.074)	(0.056)	(0.088)	(0.069)	(0.075)
Pro treatment*age	0.196	0.074	-0.126	-0.108	-0.046
	(0.151)	(0.116)	(0.175)	(0.150)	(0.148)
Counter treatment*age	-0.018	-0.043	-0.383	0.030	-0.433**
	(0.218)	(0.168)	(0.267)	(0.190)	(0.219)
Constant	0.636***	0.393***	0.482***	0.610***	0.541***
	(0.049)	(0.037)	(0.058)	(0.046)	(0.049)
N	174	179	173	171	174
R^2	0.048	0.022	0.027	0.020	0.031

*p < .1; **p < .05; ***p < .01

4.3 Additional Dependent Variables

While the political memes in the experiment only manipulated political ideology and did not refer to political personalities or parties, it is essential to consider a wider spectre of dependent variables, given the few studies on this subject. First, treatments could induce changes in individuals' perceptions of political parties' locations in the ideological space. This effect could be consistent with the heuristics theory, where individuals come up with opinions using other judgements and feeling (e.g., Sniderman, Brody, and Tetlock 1991; Lupia 1994). Hence, do political memes increase polarization in the positioning of political parties? Table 17 tests this idea for each Canadian political party, excluding the Bloc Québécois, because it is particularly challenging to place on a left-right ideological scale, especially for non-Quebeckers. The dependent variables here are folded versions of the party placements, and they were created in the same fashion as the main dependent variables in the previous analyses. The independent variables are the pro and counter treatments which are determined using the 11-point self-reported ideology. Model 4 displays the only statistically significant result, where the counter-treatment increased polarization toward the Green Party. This condition increased polarization by 6.6 percentage points compared to the control group. Table 17 also shows an interesting tentative pattern: left or center-left parties (LPC, NDP, GP) were perceived as slightly more extreme by viewers of political memes at the end of the experiment, while the Conservative party, the only right-wing party, was placed in a very slightly more moderate spot compared to the control group.

Second, exposition to political content should raise participants' political interest. Since any type of content is expected to be relevant, the two treatment groups were combined

into a single dichotomous variable. Table 18 finds no support for this idea, the model displays a null effect. Even when employing other operationalizations of the treatment (polarization or persuasion), the conclusion stays the same. It is interesting that political memes do not have the same effect as other types of political content found on social media such as news articles. Still, it is essential to note that participants of this experiment were already highly interested in politics. Thus, a different pattern might emerge from a more balanced sample.

Table 17: Treatment's Effect on Polarization Toward Political Parties

	Δ LPC	**Δ** CPC	**Δ** NDP	**Δ** GP
	(1)	(2)	(3)	(4)
Pro treatment	0.038	-0.010	0.022	0.019
	(0.047)	(0.034)	(0.033)	(0.030)
Counter treatment	0.058	-0.008	0.038	0.066**
	(0.047)	(0.035)	(0.033)	(0.030)
Woman	-0.0001	-0.002**	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Education	0.124	-0.130	-0.038	-0.062
	(0.115)	(0.083)	(0.079)	(0.071)
Constant	0.388***	0.582***	0.512***	0.638***
	(0.076)	(0.055)	(0.053)	(0.047)
N	144	144	145	139
R^2	0.020	0.049	0.018	0.056

*p < .1; **p < .05; ***p < .01

Table 18: Treatment's Effect on Political Interest

	Δ Interest
Treatment (dichotomized)	-0.009
	(0.022)
Woman	0.0005
	(0.001)
Education	-0.009
	(0.052)
Constant	0.003
	(0.036)
N	192
R^2	0.004

$^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$

Chapter 5. Conclusion

Memes can be used with a political goal (Shifman 2014; Denisova 2019; Greene 2019; Moody-Ramirez and Church 2019; Wiggins 2019; Nee and Maio 2019; Beskow, Kumar, and Carley 2020). Political memes are employed in many national contexts and are thought to have many functions such as expression, group bonding, and attitude formation (Algaba and Bellido-Pérez 2019; Beskow, Kumar, and Carley 2020; Huntington 2019; McKelvey et al. 2019; Lalancette and Small 2020; McLoughlin and Southern 2020). Prior to this research, many observational data studies investigated the political use of memes but were not able to estimate their effect of political attitudes. This thesis contributes to the literature on political memes by experimentally assessing their impact in a natural setting.

This thesis undertook the challenge of experimentally estimating political memes' effects on people's political attitudes, such as ideology and group evaluations. This research used a three-month experiment directly on Facebook to assess the impacts of political memes on social media. On the one hand, results show that political memes did not have an homogenous persuasive effect, echoing social media litterature and more general persuasion studies (Boulianne 2015; Coppock, Hill, and Vavreck 2020). On the other hand, there are indications that memes induce mild polarization effects, prompting individuals' attitudes to become more extreme. Those polarization effects were more commonly detected among participants with a strong attachment to a political party. The latter finding is one of the most significant in this study because it perfectly fits with Huntingdon's (2019) article, which finds that memes can stimulate motivated reasoning among partisan identifiers. The results clearly fit in the motivated reasoning framework outlined by Lodge and Taber (2013) where prior attitudes act as "anchors" for individuals

to judge new information. Another key finding of the study is that counter-attitudinal memes displayed more substantial effects than pro-attitudinal memes. This result clashes with the usual social media narrative that political attitudes are reinforced by constant exposure to compatible political content. This effect might come from the fact that negative messages (most memes offered a negative framing) tend to create a more significant psychophysiological reaction (Hibbing, Smith, and Alford 2014; Fournier, Soroka, and Nir 2020). A more intense psychophysiological reaction might contribute to the effect found concerning counter-attitudinal messages. Nonetheless, more research is needed on that theory. While the usual reinforcement narrative often attributes significant impacts to social media, limited and insignificant effects are commonly observed in this field (Boulianne 2015).

Feelings are often cited as drivers of choices or political judgment (Marcus, Neuman, and MacKuen 2000; Healy, Malhotra, and Mo 2010; Fridkin et al. 2019; Tversky and Kahneman 1981). This study hardly finds any links with emotions. The only potent results are consistent with Marcus, Neuman and MacKuen (2000), which state that higher levels of enthusiasm increase reliance on habits and here lead to polarization. Lower levels of enthusiasm conform to the effect of anxiety described by Marcus et al. (2000), which stimulates information-seeking behaviour and thus depolarization. The results here also suggest that, even though humorous, memes do not contribute to a better mutual understanding because those who saw incongruent memes and found them unfunny became about nine percentage points more extreme.

Memes did not affect intergroup feelings. Since comments were deactivated during the study to prevent contamination, it could be hypothesized that those components might

be affected by a discussion with other users. The treatment also had null effects on political interest. Since memes convey political ideas in a non-serious or silly way, they might even contribute to political cynism. Still, the broad picture of the experiment suggests that memes principally stimulate attitude entrenchment. It is interesting to note that liberal individuals are usually perceived to be more open to different ideas, but the (mostly liberal) sample did, in fact, become slightly more extreme. Although some of the results presented are statistically significant, it is important to remember that the vast majority of coefficients are null, suggesting minimal or no effects.

5.1 Limits and Future Research

While this study provided much-needed insights into political memes' effects, it suffers from many limitations. Arguably, the most critical shortcoming is the sample. According to a power analysis, the sample size required to detect a small effect (expected when the treatment is subtle) would have needed to be ten times larger. Matching the pre- and post-experimental surveys turned out to be problematic, resulting in large attrition rates. Another problem with the sample is that it is not diverse given the recruitment environment.[6] It means that the conclusions hold only for young individuals who have mostly liberal views, are more educated than the general population, and are more interested in politics.

The language of the fieldwork might constitute an additional limit because most of the sample was French-Canadian, while the memes' text was in English. Even though the study's advertisement and information indicated that English proficiency was required, it

[6] A power analysis is a statistical procedure that can help determine how many participants are required given the expected difference between the treatment and the control group. It tells the researcher the probability of detecting an effect, given that the effect is really there.

is possible that language comprehension was a factor that contributed to finding very small effects. Indeed, understanding humorous frames in a second language can be especially challenging for non-native speakers.

It is essential to mention that the experiment was running during heavy political confrontations and debates along the lines of political ideology's social axis. Movements like #metoo, Black Lives Matter and events such as the U.S. presidential elections and the COVID-19 pandemic were at the forefront during the autumn of 2020. This "interference" with the treatment might have blurred the results for the social axis.

Finally, the experiment's data cannot indicate the amount of exposure to memes. The manipulation check clearly shows that the participants saw the memes, but it would have been interesting to explore the treatment effect according to exposure intensity.

Although this work sought to explore the impacts of political memes, a good deal of research remains to be done relative to that form of political expression. For instance, the study did not explore the influence of "memefied" political leaders. The treatment was only composed of memes devoid of important political figures – to have a cleaner treatment – such as presidents, prime ministers, or opposition leaders. However, the study would have gained from a more concise manipulation, focusing on one issue or one axis of ideology. For example, some memes had an economic theme, and others focused on social issues. However, considering the predominant economic theme in the political memes, it is possible to observe a good fit between the manipulation and the results. The economic dimension has revealed potent results compared to the other dependant variables. One could state that the treatment could have been more precise, considering the experimental method usually aims to manipulate only one component at a time. However, the treatment

ought to be as natural as possible. In other words, the goal was to emulate the behaviour of an actual meme page. In addition, having multiple ideological themes made the treatment more subtle. Thus, participants were less prone to suspect what the experiment wanted to influence. Considering that the results fit with the treatment – economic themed memes had an impact on the economic axis of ideology – if the treatment corpus would have been more inclined toward social theme, the same effect should have theoretically occurred.

Since this work has shown that political memes can affect core political attitudes such as ideology, they should technically have the power to influence opinions toward political leaders and specific issues even more. Indeed, items such as ideological self-placement can be challenging to influence because they are at the center of one's political identity and are relatively stable over time. Nonetheless, future research could also focus on whether memes have an agenda-setting function. Assuming that citizens use this communication format to raise attention about issues they care about, it would be interesting to determine if viewing memes increases attention to new or overlooked matters. Finally, since memes could theoretically have agenda-setting power, they might as well produce priming or framing effects. Essentially, classical concepts in political science must be revisited and applied to the study of political memes because this style of communication appears to be long-lasting and is increasingly adopted by political actors.

Appendix

Question Wording

Economic Conservatism Scale

1. When businesses make a lot of money, everyone benefits, including the poor.
2. The government should leave it entirely to the private sector to create jobs.
3. If people can't find work in the region where they live, they should move to where the jobs are.
4. People who don't get ahead should blame themselves, not the system.
5. How much do you think should be done to reduce the gap between the rich and the poor?

Social Conservatism Scale

1. How much do you think should be done for women?
2. Society would be better off if fewer women worked outside the home
3. In general, how do you feel about the following groups? Use any number from 0 to 100. Zero means you really dislike the group, and 100 means you really like the group.
    a. Gays and lesbians (LGBTQ)
    b. Feminists

Group Feelings

1. In general, how do you feel about the following groups? Use any number from 0 to 100. Zero means you really dislike the group, and 100 means you really like the group.
    a. People who hold right-wing and conservative beliefs and values
    b. People who hold left-wing and conservative beliefs and values

Self Reported Ideology

1. In politics, people sometimes talk of left and right. Where would you place yourself on the scale below? (0-10 scale)

Political Knowledge

1. Using the same scale, where would you place the political parties?

Interest

1. How interested are you in politics generally? Use a scale from 0 to 10, where 0 means no interest at all and 10 means a great deal of interest.

Partisanship Strength (after identifying to a political party)

1. How close do you feel to this party?

Emotions

1. How did the memes featured in the study made you feel in general? For each emotion below, use a scale from 0 to 10, where 0 means not at all and 10 means a lot.
    a. Anger
    b. Enthusiasm
    c. Contempt
    d. Disgusted
2. How funny did you find the memes? (0-10 scale)

Filtering

1. Have you ever deleted or blocked a person, a page or a group from your social network because of their political opinions?

Authoritarian Personality

1. Here are some qualities that children can be encouraged to learn. Which one do you think is more important?
    a. Section 1
        i. Independence
        ii. Respect for authority
    b. Section 2
        i. Obedience
        ii. Self-Reliance

Need for Cognition

1. Please indicate if you strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, or strongly agree with the following statements.
    a. Thinking is not my idea of fun
    b. I like to have responsibility for handling situations that requires a lot of thinking.

See supplementary material for the full survey and coding script.

Link to treatment memes, dataset, survey and script:

https://doi.org/10.5683/SP2/XNQYPN

Sample of control and treatment memes used in the experiement

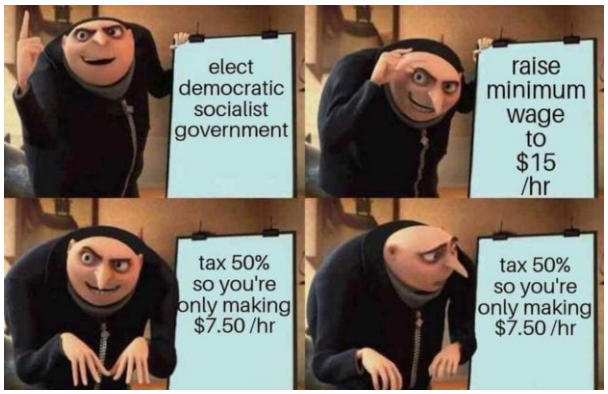
Left economic:


Government
Small business
Big
Business
Government

Left social:


Faith Naff
@FaithNaff
Follow
Gay man: "My partner and I were denied to adopt because we're a same-sex couple."
Black man: "A cop pulled a gun and threatened me during a routine traffic stop."
Jewish man: "My house of worship was vandalized by Nazis."
White man: "The next Marvel movie is about a girl!"
9:29 AM - 23 Feb 2019
6,583 Retweets 22,833 Likes
209
6.6K
23K

Right economic:



when you buy something

Right social:

Control:


Your dog when someone rings the doorbell
peace was never an option


When you hide something from your siblings so well you can't find it yourself
DJ KHALED
SUFFERING FROM SUCCESS


Google
french weapons in history
TUTTI
IMMAGINI
SHOPPING
MAPS

Table A1: Treatment and Political Knowledge Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Left-wing treatment	-0.026	0.006	-0.001	-0.026	-0.015
	(0.022)	(0.024)	(0.036)	(0.035)	(0.021)
Right-wing treatment	-0.027	-0.014	-0.011	-0.004	0.018
	(0.025)	(0.026)	(0.041)	(0.040)	(0.024)
Knowledge	-0.090***	0.033	-0.050	0.013	-0.017
	(0.031)	(0.034)	(0.053)	(0.052)	(0.030)
Woman	-0.00001	0.00002	0.00005	-0.0002	-0.0001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
Education	0.055	-0.049	0.052	0.114	0.022
	(0.047)	(0.051)	(0.077)	(0.075)	(0.045)
Left-wing treatment*knowledge	0.092**	-0.021	0.097	-0.011	0.019
	(0.042)	(0.045)	(0.071)	(0.069)	(0.041)
Right-wing treatment*knowledge	0.110**	-0.010	0.088	-0.046	-0.018
	(0.043)	(0.045)	(0.072)	(0.070)	(0.042)
Constant	-0.013	0.020	-0.056	-0.038	-0.005
	(0.031)	(0.033)	(0.051)	(0.049)	(0.030)
N	145	153	157	157	157
R^2	0.066	0.023	0.022	0.028	0.021
Adjusted R^2	0.018	-0.024	-0.024	-0.017	-0.025
Residual Std. Error	0.094 (df = 137)	0.102 (df = 145)	0.162 (df = 149)	0.157 (df = 149)	0.095 (df = 149)
F Statistic	1.374 (df = 7; 137)	0.486 (df = 7; 145)	0.485 (df = 7; 149)	0.622 (df = 7; 149)	0.453 (df = 7; 149)

*p < .1; **p < .05; ***p < .01

Table A2: Treatment and Partisan Strength Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feeling toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.110	-0.030	-0.105	-0.027	-0.045
	(0.074)	(0.053)	(0.107)	(0.116)	(0.074)
Counter treatment	0.018	-0.059	0.061	-0.020	0.025
	(0.070)	(0.051)	(0.104)	(0.090)	(0.069)
PID strength	-0.005	-0.030	0.009	0.024	-0.026
	(0.028)	(0.021)	(0.041)	(0.037)	(0.029)
Woman	0.0001	-0.0002	-0.001	0.0002	-0.0003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Eductation	-0.100	0.021	-0.025	-0.147	-0.080
	(0.077)	(0.057)	(0.104)	(0.096)	(0.077)
Pro treatment* PID strength	-0.028	0.025	0.071	0.001	0.031
	(0.040)	(0.029)	(0.056)	(0.059)	(0.040)
Counter treatment* PID strength	0.029	0.058**	-0.015	0.009	-0.001
	(0.040)	(0.029)	(0.057)	(0.050)	(0.040)
Constant	0.637***	0.429***	0.471***	0.505***	0.659***
	(0.067)	(0.050)	(0.097)	(0.088)	(0.067)
N	146	150	130	127	144
R^2	0.060	0.041	0.050	0.033	0.024
Adjusted R^2	0.012	-0.007	-0.004	-0.024	-0.026
Residual Std. Error	0.163 (df = 138)	0.119 (df = 142)	0.196 (df = 122)	0.192 (df = 119)	0.162 (df = 136)
F Statistic	1.254 (df = 7; 138)	0.857 (df = 7; 142)	0.918 (df = 7; 122)	0.584 (df = 7; 119)	0.475 (df = 7; 136)

*p < .1; **p < .05; ***p < .01

Table A3: Treatment and Political Knowledge Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.163***	-0.046	-0.099	0.006	0.002
	(0.058)	(0.045)	(0.074)	(0.062)	(0.056)
Counter treatment	0.179***	0.018	0.016	0.051	0.002
	(0.060)	(0.046)	(0.078)	(0.065)	(0.066)
Knowledge	0.183**	-0.088	-0.213**	0.063	0.005
	(0.084)	(0.068)	(0.100)	(0.083)	(0.083)
Woman	0.0001	-0.0002	-0.001	-0.0001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.128*	0.053	0.045	-0.172**	-0.016
	(0.077)	(0.061)	(0.099)	(0.081)	(0.078)
Pro treatment*knowledge	-0.303**	0.125	0.245	-0.053	-0.009
	(0.126)	(0.095)	(0.153)	(0.128)	(0.120)
Counter treatment*knowledge	-0.334**	0.010	0.018	-0.096	0.053
	(0.131)	(0.101)	(0.170)	(0.142)	(0.139)
Constant	0.583***	0.403***	0.574***	0.640***	0.587***
	(0.059)	(0.047)	(0.074)	(0.061)	(0.060)
N	150	152	147	145	149
R^2	0.089	0.034	0.058	0.042	0.013
Adjusted R^2	0.044	-0.013	0.011	-0.007	-0.036
Residual Std. Error	0.161 (df = 142)	0.125 (df = 144)	0.195 (df = 139)	0.162 (df = 137)	0.158 (df = 141)
F Statistic	1.986* (df = 7; 142)	0.717 (df = 7; 144)	1.224 (df = 7; 139)	0.856 (df = 7; 137)	0.267 (df = 7; 141)

*p < .1; **p < .05; ***p < .01

Table A4: Treatment and Filtering Behaviour Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.069	-0.050	-0.009	-0.020	-0.016
	(0.044)	(0.033)	(0.052)	(0.044)	(0.043)
Counter treatment	0.013	0.0003	0.027	-0.015	0.048
	(0.047)	(0.034)	(0.063)	(0.046)	(0.046)
Filter	0.011	-0.035	0.034	-0.0002	0.030
	(0.044)	(0.033)	(0.052)	(0.042)	(0.042)
Woman	-0.0002	0.00004	-0.001	-0.0002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.067	-0.003	-0.050	-0.154**	-0.038
	(0.067)	(0.048)	(0.084)	(0.065)	(0.066)
Pro treatment*filter	-0.060	0.084*	0.052	0.025	0.001
	(0.065)	(0.046)	(0.073)	(0.061)	(0.061)
Counter treatment*filter	0.075	-0.001	-0.018	0.045	-0.067
	(0.062)	(0.045)	(0.080)	(0.061)	(0.061)
Constant	0.612***	0.421***	0.530***	0.661***	0.592***
	(0.053)	(0.038)	(0.065)	(0.051)	(0.052)
N	164	168	160	158	163
R^2	0.056	0.031	0.031	0.042	0.024
Adjusted R^2	0.014	-0.012	-0.013	-0.003	-0.020
Residual Std. Error	0.161 (df = 156)	0.118 (df = 160)	0.194 (df = 152)	0.155 (df = 150)	0.157 (df = 155)
F Statistic	1.325 (df = 7; 156)	0.722 (df = 7; 160)	0.704 (df = 7; 152)	0.936 (df = 7; 150)	0.537 (df = 7; 155)

*p < .1; **p < .05; ***p < .01

Table A5: Treatment and Anger Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.027	-0.037	0.039	0.040	-0.011
	(0.039)	(0.028)	(0.044)	(0.037)	(0.038)
Counter treatment	0.044	-0.021	0.015	0.025	-0.020
	(0.041)	(0.032)	(0.058)	(0.043)	(0.043)
Anger	0.098	0.078	0.192	0.048	-0.013
	(0.124)	(0.087)	(0.137)	(0.112)	(0.118)
Woman	-0.0002	-0.0003	-0.001	0.0001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.089	-0.022	-0.006	-0.088	-0.005
	(0.069)	(0.050)	(0.083)	(0.065)	(0.070)
Pro treatment*anger	0.104	0.112	-0.311	-0.118	0.116
	(0.180)	(0.138)	(0.198)	(0.169)	(0.165)
Counter treatment*anger	-0.066	0.022	-0.143	-0.032	0.123
	(0.144)	(0.103)	(0.169)	(0.136)	(0.142)
Constant	0.627***	0.415***	0.505***	0.592***	0.581***
	(0.049)	(0.036)	(0.058)	(0.046)	(0.049)
N	155	160	158	157	157
R^2	0.046	0.054	0.024	0.023	0.021
Adjusted R^2	0.001	0.011	-0.022	-0.023	-0.025
Residual Std. Error	0.165 (df = 147)	0.123 (df = 152)	0.195 (df = 150)	0.160 (df = 149)	0.168 (df = 149)
F Statistic	1.020 (df = 7; 147)	1.248 (df = 7; 152)	0.516 (df = 7; 150)	0.506 (df = 7; 149)	0.456 (df = 7; 149)

*p < .1; **p < .05; ***p < .01

Table A6: Treatment and Enthusiasm Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.097	-0.082*	-0.047	0.024	-0.039
	(0.063)	(0.044)	(0.069)	(0.061)	(0.062)
Counter treatment	-0.003	-0.022	0.004	0.051	0.039
	(0.050)	(0.037)	(0.060)	(0.049)	(0.052)
Enthusiasm	-0.016	0.048	0.113	0.068	-0.010
	(0.094)	(0.070)	(0.109)	(0.091)	(0.098)
Woman	0.0001	-0.0001	-0.001	0.0001	-0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.052	0.003	0.003	-0.087	-0.006
	(0.068)	(0.050)	(0.083)	(0.065)	(0.071)
Pro treatment*enthusiasm	-0.111	0.111	0.089	-0.011	0.100
	(0.132)	(0.094)	(0.150)	(0.129)	(0.135)
Counter treatment*enthusiasm	0.201	0.143	0.102	-0.073	-0.081
	(0.132)	(0.101)	(0.163)	(0.127)	(0.131)
Constant	0.619***	0.392***	0.481***	0.573***	0.583***
	(0.057)	(0.042)	(0.068)	(0.055)	(0.059)
N	154	159	157	156	156
R^2	0.064	0.093	0.057	0.026	0.016
Adjusted R^2	0.019	0.051	0.013	-0.020	-0.030
Residual Std. Error	0.164 (df = 146)	0.121 (df = 151)	0.193 (df = 149)	0.161 (df = 148)	0.168 (df = 148)
F Statistic	1.422 (df = 7; 146)	2.222** (df = 7; 151)	1.293 (df = 7; 149)	0.566 (df = 7; 148)	0.353 (df = 7; 148)

*p < .1; **p < .05; ***p < .01

Table A7: Treatment and Disgust Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.028	-0.033	0.020	0.030	-0.018
	(0.039)	(0.029)	(0.044)	(0.038)	(0.038)
Counter treatment	0.028	-0.025	-0.017	0.006	-0.014
	(0.042)	(0.033)	(0.057)	(0.041)	(0.043)
Disgust	-0.094	0.034	-0.013	0.030	0.004
	(0.098)	(0.072)	(0.112)	(0.092)	(0.097)
Woman	-0.0001	-0.0001	-0.001	-0.00002	-0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.080	-0.008	-0.00002	-0.103	0.019
	(0.069)	(0.051)	(0.084)	(0.066)	(0.070)
Pro treatment*disgust	0.117	0.090	-0.234	-0.003	0.166
	(0.195)	(0.138)	(0.204)	(0.172)	(0.173)
Counter treatment*disgust	0.112	0.045	0.073	0.044	0.069
	(0.119)	(0.088)	(0.144)	(0.114)	(0.120)
Constant	0.643***	0.412***	0.528***	0.600***	0.571***
	(0.050)	(0.037)	(0.059)	(0.047)	(0.049)
N	153	158	156	155	155
R^2	0.034	0.035	0.021	0.030	0.020
Adjusted R^2	-0.013	-0.010	-0.025	-0.017	-0.027
Residual Std. Error	0.167 (df = 145)	0.124 (df = 150)	0.196 (df = 148)	0.161 (df = 147)	0.166 (df = 147)
F Statistic	0.725 (df = 7; 145)	0.776 (df = 7; 150)	0.462 (df = 7; 148)	0.641 (df = 7; 147)	0.423 (df = 7; 147)

*p < .1; **p < .05; ***p < .01

Table A8: Treatment and Contempt Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.019	-0.028	0.035	0.039	-0.014
	(0.045)	(0.031)	(0.047)	(0.041)	(0.042)
Counter treatment	0.046	-0.015	-0.025	-0.001	-0.022
	(0.043)	(0.033)	(0.058)	(0.044)	(0.044)
Contempt	-0.023	0.083	-0.039	-0.011	-0.025
	(0.106)	(0.079)	(0.124)	(0.102)	(0.105)
Woman	0.0001	-0.0002	-0.001	-0.0001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.078	-0.003	0.011	-0.095	0.024
	(0.069)	(0.051)	(0.083)	(0.065)	(0.069)
Pro treatment*contempt	0.109	-0.022	-0.163	-0.051	0.059
	(0.147)	(0.106)	(0.166)	(0.145)	(0.143)
Counter treatment*contempt	0.010	-0.0005	0.110	0.083	0.111
	(0.128)	(0.096)	(0.157)	(0.126)	(0.130)
Constant	0.632***	0.402***	0.525***	0.602***	0.572***
	(0.050)	(0.037)	(0.059)	(0.047)	(0.050)
N	154	159	157	156	156
R^2	0.032	0.039	0.030	0.029	0.013
Adjusted R^2	-0.015	-0.006	-0.016	-0.017	-0.033
Residual Std. Error	0.167 (df = 146)	0.124 (df = 151)	0.195 (df = 149)	0.160 (df = 148)	0.166 (df = 148)
F Statistic	0.682 (df = 7; 146)	0.865 (df = 7; 151)	0.652 (df = 7; 149)	0.640 (df = 7; 148)	0.286 (df = 7; 148)

*p < .1; **p < .05; ***p < .01

Table A9: Treatment and Funniness Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	0.117	-0.073	0.028	0.015	0.023
	(0.080)	(0.059)	(0.085)	(0.079)	(0.078)
Counter treatment	0.123**	-0.033	0.057	0.094	0.018
	(0.061)	(0.046)	(0.075)	(0.058)	(0.062)
Funny	0.132	0.003	0.124	0.114	-0.024
	(0.092)	(0.072)	(0.108)	(0.087)	(0.094)
Woman	0.00001	0.00001	-0.001	-0.0001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.094	0.007	0.009	-0.092	0.002
	(0.069)	(0.051)	(0.082)	(0.064)	(0.069)
Pro treatment*funny	-0.169	0.085	-0.062	-0.036	-0.031
	(0.138)	(0.103)	(0.152)	(0.132)	(0.136)
Counter treatment*funny	-0.177	0.091	-0.098	-0.179	-0.002
	(0.124)	(0.097)	(0.163)	(0.124)	(0.128)
Constant	0.581***	0.404***	0.455***	0.556***	0.586***
	(0.061)	(0.047)	(0.073)	(0.057)	(0.062)
N	160	162	161	159	160
R^2	0.043	0.029	0.019	0.037	0.010
Adjusted R^2	-0.001	-0.015	-0.026	-0.007	-0.036
Residual Std. Error	0.167 (df = 152)	0.126 (df = 154)	0.197 (df = 153)	0.158 (df = 151)	0.167 (df = 152)
F Statistic	0.973 (df = 7; 152)	0.657 (df = 7; 154)	0.427 (df = 7; 153)	0.834 (df = 7; 151)	0.217 (df = 7; 152)

*p < .1; **p < .05; ***p < .01

Table A10: Treatment and Need for Cognition Interaction

	Δ Economic conservatism	Δ Social conservatism	Δ Feelings toward left	Δ Feelings toward right	Δ Self-placement
	(1)	(2)	(3)	(4)	(5)
Pro treatment	-0.107	-0.055	-0.057	0.087	0.266
	(0.168)	(0.125)	(0.194)	(0.162)	(0.162)
Counter treatment	-0.039	-0.012	0.024	0.063	0.272
	(0.161)	(0.124)	(0.195)	(0.154)	(0.166)
Need for cognition	-0.030	-0.037	-0.003	0.056	0.213
	(0.167)	(0.129)	(0.198)	(0.160)	(0.165)
Woman	-0.00005	-0.0002	-0.001	0.0001	-0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.095	0.008	0.006	-0.099	-0.006
	(0.067)	(0.052)	(0.084)	(0.065)	(0.069)
Pro treatment*need for cognition	0.209	0.065	0.092	-0.103	-0.385*
	(0.235)	(0.174)	(0.271)	(0.226)	(0.228)
Counter treatment*need for cognition	0.121	0.041	-0.006	-0.050	-0.358
	(0.221)	(0.170)	(0.269)	(0.213)	(0.226)
Constant	0.664***	0.423***	0.516***	0.565***	0.429***
	(0.121)	(0.093)	(0.143)	(0.116)	(0.120)
N	169	176	167	165	167
R^2	0.034	0.009	0.008	0.021	0.027
Adjusted R^2	-0.008	-0.032	-0.035	-0.022	-0.016
Residual Std. Error	0.164 (df = 161)	0.128 (df = 168)	0.197 (df = 159)	0.159 (df = 157)	0.164 (df = 159)
F Statistic	0.813 (df = 7; 161)	0.228 (df = 7; 168)	0.190 (df = 7; 159)	0.486 (df = 7; 157)	0.620 (df = 7; 159)

*p < .1; **p < .05; ***p < .01

Balance tests

Considering the significant attrition rate, balance tests were conducted to ensure that no covariates were significantly related to the response rate. While the main text details that education and gender were unbalanced and thus controlled for, other variables were also tested: political interest, age, and political ideology (self-placement). The analysis shows that these are not related to the post-experimental response. Tables below detail the balance testing.

Table B1: Balance Test Gender

	Gender		
	Right compared to left	Control compared to left	Control compared to right
	(1)	(2)	(3)
Right-wing treatment	0.194**		0.143
	(0.089)		(0.091)
Left-wing treatment		-0.051	
		(0.088)	
Constant	0.409***	0.460***	0.460***
	(0.061)	(0.063)	(0.063)
N	124	129	121
R^2	0.038	0.003	0.021
Adjusted R^2	0.030	-0.005	0.012
Residual Std. Error	0.495 (df = 122)	0.499 (df = 127)	0.498 (df = 119)
F Statistic	4.769** (df = 1; 122)	0.340 (df = 1; 127)	2.493 (df = 1; 119)

*p < .1; **p < .05; ***p < .01

Table B2: Balance Test Education

	Education		
	Right compared to left	Control compared to left	Control compared to right
	(1)	(2)	(3)
Right-wing treatment	0.081**		0.039
	(0.037)		(0.033)
Left-wing treatment		-0.042	
		(0.034)	
Constant	0.559***	0.600***	0.600***
	(0.025)	(0.025)	(0.023)
N	128	131	125
R^2	0.037	0.011	0.011
Adjusted R^2	0.029	0.004	0.003
Residual Std. Error	0.208 (df = 126)	0.197 (df = 129)	0.186 (df = 123)
F Statistic	4.815** (df = 1; 126)	1.471 (df = 1; 129)	1.359 (df = 1; 123)

*p < .1; **p < .05; ***p < .01

Table B3: Balance Test Ideology

	Ideology		
	Right compared to left	Control compared to left	Control compared to right
	(1)	(2)	(3)
Right-wing treatment	-0.032		-0.044
	(0.038)		(0.039)
Left-wing treatment		-0.012	
		(0.037)	
Constant	0.337***	0.349***	0.349***
	(0.026)	(0.026)	(0.027)
N	122	127	121
R^2	0.006	0.001	0.010
Adjusted R^2	-0.002	-0.007	0.002
Residual Std. Error	0.209 (df = 120)	0.209 (df = 125)	0.216 (df = 119)
F Statistic	0.731 (df = 1; 120)	0.099 (df = 1; 125)	1.256 (df = 1; 119)

*p < .1; **p < .05; ***p < .01

Table B4: Balance Test Political Interest

	Political interest		
	Right compared to left	Control compared to left	Control compared to right
	(1)	(2)	(3)
Right-wing treatment	0.011		0.011
	(0.042)		(0.044)
Left-wing treatment		-0.001	
		(0.040)	
Constant	0.782***	0.783***	0.783***
	(0.029)	(0.029)	(0.031)
N	128	131	125
R^2	0.001	0.00000	0.0005
Adjusted R^2	-0.007	-0.008	-0.008
Residual Std. Error	0.240 (df = 126)	0.228 (df = 129)	0.244 (df = 123)
F Statistic	0.071 (df = 1; 126)	0.0003 (df = 1; 129)	0.059 (df = 1; 123)

*p < .1; **p < .05; ***p < .01

Table B5: Balance Test Age

	Age		
	Right compared to left	Control compared to left	Control compared to right
	(1)	(2)	(3)
Right-wing treatment	0.002		-0.033
	(0.029)		(0.030)
Left-wing treatment		-0.036	
		(0.035)	
Constant	0.162***	0.197***	0.197***
	(0.020)	(0.025)	(0.021)
N	128	131	125
R^2	0.00005	0.008	0.010
Adjusted R^2	-0.008	0.0004	0.002
Residual Std. Error	0.164 (df = 126)	0.199 (df = 129)	0.165 (df = 123)
F Statistic	0.006 (df = 1; 126)	1.051 (df = 1; 129)	1.282 (df = 1; 123)

*p < .1; **p < .05; ***p < .01

Table B6: Balance Test Political Knowledge

	Political knowledge		
	Right compared to left	Control compared to left	Control compared to right
	(1)	(2)	(3)
Right-wing treatment	-0.014		-0.034
	(0.047)		(0.048)
Left-wing treatment		-0.020	
		(0.049)	
Constant	0.382***	0.402***	0.402***
	(0.033)	(0.035)	(0.033)
N	108	113	107
R^2	0.001	0.002	0.005
Adjusted R^2	-0.009	-0.007	-0.005
Residual Std. Error	0.246 (df = 106)	0.262 (df = 111)	0.249 (df = 105)
F Statistic	0.086 (df = 1; 106)	0.169 (df = 1; 111)	0.502 (df = 1; 105)

*p < .1; **p < .05; ***p < .01

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