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The role of causal beliefs in political identity and voting

Stephanie Y. Chen*, Oleg Urminsky

Booth School of Business, University of Chicago, USA

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ABSTRACT

An emerging literature in psychology and political science has identified political identity as an important driver of political decisions. However, less is known about how a person's political identity is incorporated into their broader self-concept and why it influences some people more than others. We examined the role of political identity in representations of the self-concept as one determinant of people's political behaviors. We tested the predictions of a recent theoretical account of self-concept representation that, inspired by work on conceptual representation, emphasizes the role of causal beliefs. This account predicts that people who believe that their political identity is *causally central* (linked to many other features of the self-concept) will be more likely to engage in behaviors consistent with their political identity than those who believe that the same aspect is *causally peripheral* (linked to fewer other features). Consistent with these predictions, in a study run when political identity was particularly salient—during the 2016 U.S. Presidential election—we found that U.S. voters who believed their political party identity was more causally central (vs. those who believe it was causally peripheral) were more likely to vote for their political party's candidate. Further, in two studies, we found that U.K. residents who believed that their English or British national identity was more causally central were more likely to support the U.K. leaving the European Union (Brexit) than those who believed the same identities were more causally peripheral.

1. Introduction

Recent research on political thought and behavior has challenged the foundational assumption of rational decision-making models, that political beliefs and behaviors are mainly driven by self-interest—i.e., that people vote for the candidate that provides them with the most economic benefit (Downs, 1957; Laver, 1981) or for the candidate that best matches their views on important issues (Page, 1977). In this recent research (reviewed in Mason, 2018), political identity, or partisanship, has emerged as a key driver of political thought and behavior. Party affiliation has been found to have a greater effect on policy preferences and voting behavior than self-interest measures (Sears, Lau, Tyler, & Allen, 1980; Sears & Funk, 1990) and personal political ideology (Cohen, 2003).

A large body of literature in political science and both political and social psychology cites political identity (political party) as a key driver of a wide range of political attitudes and activities (Bartels, 2000; Campbell, 1960; Carsey & Layman, 2006; Gaines et al., 2007; Gerber et al., 2010; Greene, 2004; Van Bavel & Pereira, 2018). This work has documented a causal relationship between partisanship and both voting behavior and evaluations of political figures (Gerber et al., 2010), as well as systematic differences in how Democrats and Republicans make political predictions (Granberg & Brent, 1983; Orhun & Urminsky, 2013) and interpret factual information regarding political issues (despite agreement on what the facts are, Gaines et al., 2007). Further, political identity has been found to influence the more basic cognitive processes that underlie political thought like memory, attention, and even visual perception (Caruso, Mead, & Balcetis, 2009; Castelli and Carraro, 2011; Van Bavel & Pereira, 2018).

Given how influential partisanship is on political thought and behavior, it is perhaps surprising that less attention has been paid to the cognitive underpinnings of political identity itself. Political scientists have noted variance in whether members of a given political party act in ways consistent with the party, and have found that political identity may conflict with other aspects of one's self-concept (e.g., gender, race, age, religion, etc., Mason, 2018). However, research has not focused on why such differences exist and how political identity fits into the broader self-concept. Our aim is to build on established cognitive principles, primarily research on conceptual and self-concept representation, to provide a psychological explanation for political identity as a potentially important part of the self-concept. This approach provides a generative framework that can predict who is more and less likely to act in ways consistent with their political identity.

* Corresponding author is now at: London Business School, Regent's Park, London NW1 4SA, UK.
E-mail address: stephaniechen@london.edu (S.Y. Chen).

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1.1. Categorization and causal centrality

In this paper, we build on a recent theoretical account of self-concept representation (Chen, Urminsky, & Bartels, 2016) to generate testable predictions of people's likelihood of engaging in behaviors consistent with their political party. This account suggests that people who believe that their political identity is *causally central*—causally related to more other features of their self-concept—will be more likely to act in ways consistent with the norms of that identity than those who believe their political identity is relatively casually peripheral (i.e., having relatively fewer causal connections).

This cognitive approach to understanding political identity is based on the importance of people's causal knowledge and beliefs in conceptual representation and learning. A seminal finding in this area is that a feature of a concept is seen as defining of that concept and important to categorization judgments to the extent that the feature is perceived as casually central (Ahn et al., 2000; Rehder & Hastie, 2001; Rehder, 2003; Sloman, Love, & Ahn, 1998). That is, items missing causally central features of a category are seen as less likely to belong to that category and less typical of that category than items missing causally peripheral features (Ahn et al., 2000; Rehder & Hastie, 2001).

Many explorations of the self-concept have taken a feature-based approach, assuming that there is a type of feature that is more defining of the self-concept. In particular, mirroring the debate about what underlies political reasoning, some researchers have argued that moral principles are most defining of personal identity (Strohminger & Nichols, 2014, 2015), while others have suggests that memories define an individual (Blok, Newman, & Rips, 2005; Nichols & Bruno, 2010). In contrast, Chen et al. (2016) proposed that causal beliefs about the relationships between these features play a critical role in determining what defines the self-concept, such that the importance of any type of feature is, at least in part, determined by the causal relationships that it is involved in.

Chen et al. (2016) had participants report the cause-effect relationships that they believed existed between different aspects of their self-concept and calculated the causal centrality of a feature in a manner consistent with Rehder and Hastie's (2001) relational centrality hypothesis, which proposes that a feature is causally central to a concept to the extent that it participates in many causal relationships. Thus, a feature's causal centrality was calculated by summing the number of other features a given feature was causally linked to, as either a cause or an effect. This measure is similar to "degree centrality" in social network analysis (Freeman, 1978), as it is the number of direct links that a node has. However, unlike in social network analysis, the "nodes" here represent different aspects of the self-concept (e.g., political party, gender, etc.). Furthermore, the links are not simply associative, but more specifically represent a belief that one feature influenced or shaped the other.

If causally central features are perceived as more defining of the self-concept, then changes to these features would make people perceive more disruption to the continuity of their identity. That is indeed what was found—people reported that changes to more causally central features would make them into more of a different person than changes to more peripheral features. Further, across a range of feature types (moral qualities, memories, preferences, and personality traits), participants perceived that changing a feature would be more disruptive of another person's self-concept when that feature was manipulated to be causally central than when the exact same feature was manipulated to be causally peripheral.

Chen et al. (2016) also examined another theoretical model of causal centrality, the causal status hypothesis (Ahn et al., 2000) and its computational implementation, the dependency model (Sloman et al., 1998). Unlike the relational centrality hypothesis, according to which a feature can be causally central by having many causes or effects, according to the dependency model, features are central to a concept to the extent that they have many effects (both direct and indirect) and the deeper a cause is in the causal chain, the more defining it will be of a concept. Chen et al. (2016) found that the dependency model did predict some identity judgments, but not as consistently as the relational centrality hypothesis. Thus, we will focus on relational centrality. However, as this paper explores causal centrality in a new context (behaviors rather than categorization or identity judgments), we will re-examine the dependency model in the final study (Study 2b).

1.2. The causal centrality of political identity

To illustrate how causal centrality influences beliefs about what is defining of the self-concept, imagine two Democrats who are academics, Anna and Alex. Anna believes that it is her moral qualities that caused her to become a Democrat and also caused her to choose her profession as an academic. Alex instead believes that it is being a Democrat that has caused him to develop his moral qualities and also caused him to choose his profession. As a result, even though Anna and Alex's profession, moral qualities, and political affiliation are identical, their self-concepts will be fundamentally different.

Moral qualities will be more causally central to Anna's self-concept than to Alex's, because she believes that her morals are causally connected to both her profession and political affiliation while Alex believes that his morals are only causally connected to his political affiliation. In contrast, Alex's political affiliation will be relatively more central, because he believes that it is causally connected to both his profession and moral qualities, while Anna believes that her political affiliation is only causally connected to her moral qualities. As a result, Alex would experience a change in political affiliation as more disruptive to his self-concept than Anna would.

The research on causal centrality in the representation of the self-concept thus far—much like research on conceptual representation, in general—has focused on categorization judgments (i.e., after a change, is the resulting individual still an instance of me?). However, our goal in this paper is to extend this literature by examining whether people's representations of the self-concept are informative about their political thought and behavior. As causally central aspects are perceived to be more defining of the self-concept, political identity may have a stronger relationship with behaviors among people for whom that political identity is more causally central, compared to people for whom the political identity is more causally peripheral.

Returning to the example, our account predicts that Alex, for whom political party is more causally central, would be more likely to vote for the Democratic candidate than Anna would be, even though both are self-ascribed Democrats. This prediction is consistent with recent research in political science and social psychology, which finds that people who more strongly identify with a political party are more likely to hold beliefs and act in ways consistent with their party (Greene, 2004; Huddy, Mason, & Aaroe, 2015) and that people are more motivated to act in ways consistent with social categories that they see as important to their self-concept (LeBoeuf, Shafir, & Bayuk, 2010; Markus & Wurf, 1987; Reed II, 2004). While these previous findings identify a link between identity, including political identity, and behavior, they provide little theoretical insight into what it means for an identity to be important to the self-concept. Our approach provides a testable psychological explanation, based on a large literature on conceptual representation, for why an aspect of the self-concept might be important to a given person for decision-making and behavior.

Further, our exploration of causal centrality in the domain of the self-concept provides a unique opportunity to test for a relationship between causal centrality and decision-making. Work on concepts and decision making has largely focused on how our concepts influence behaviors indirectly via inference (e.g., Chen, Ross, & Murphy, 2014a, 2014b; Murphy, 2002; Ross, 1997). For example, we behave differently towards a person who we categorize as having measles than one we categorize as having sun poisoning because, based on what we know about these two categories, we infer that a person with measles is contagious while one with sun poisoning is not.

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That is, causal centrality is only related to behavior indirectly, via the categorization and category-based induction process. Knowing about the causal centrality of a given feature (e.g., fever) in the two categories determines how likely we are to categorize a person with that feature as having the measles or sun poisoning. Then, once the categorization is made, it supports predictions that determine how we interact with the person (e.g., avoid if he has measles or be nice if he has sun poisoning). However, in our account of the self-concept, as causal centrality determines what is important to the self-concept, it is the causal centrality of the feature itself that predicts behavior.

In the following experiments, we directly tested whether differences in the causal centrality of a shared political identity predict differences in political attitudes and behaviors. In Study 1, we test whether U.S. voters who perceive their political party as more causally central are more likely to vote for their party's candidate, potentially over and above their ideological views. Political scientists have noted that other social identities, beyond party affiliation, often become part of how people organize their political views (e.g., age, race, religion, socio-economic classes; Mason, 2018). Accordingly, in Studies 2a and 2b, we examine whether the causal centrality of another social identity, national identity, predicts support for and voting for a related political policy among residents of the United Kingdom, Brexit. Further, in Study 2b, we test the predictive power of two different models of causal centrality from the conceptual representation literature, the relational centrality hypothesis (Rehder & Hastie, 2001) and the causal status hypothesis (Ahn et al., 2000) implemented with the dependency model (Sloman et al., 1998).

These studies provide an initial test of whether causal centrality, which has been studied in terms of conceptual representation, connects to behaviors outside of categorization judgments and category learning, and predicts identity-related real-world behavior. In doing so, we bridge research on cognitive representation and research on political behavior, and address calls to push research on basic cognition and cognitive representation into new areas to better understand when and to what degree known cognitive processes are at work (Bartels & Johnson, 2015; Murphy, 2003).

2. Study 1

To test our hypothesis that people who see their political identity as more causally central will be more likely to vote with their party, as part of a larger study of the psychological process underlying voting, we fielded a two-stage study at a time when political identity was very salient, during the 2016 U.S. Presidential election. The day before the election, participants completed the first wave, in which they reported the cause-effect relationships that they believed existed between various features of their self-concept, including their political identity (political party affiliation). From this survey, we calculated the causal centrality of their political party in a manner consistent with Rehder and Hastie's (2001) relational centrality hypothesis: the number of cause-effect relationships that political party participated in with the other features of the self-concept, either as the cause or as the effect.

The day after the election, participants completed the second wave of the study, in which they reported whether they had voted in the election, which candidate they voted for, and how satisfied they were with their party's nominee (Clinton or Trump).

2.1. Method

2.1.1. Participants

Four hundred eleven U.S. Amazon Mechanical Turk participants completed the first wave of a larger study the day before the 2016 U.S. presidential election (November 7, 2016). Of the participants who completed the first wave, 355 participants (86%) completed the second wave, which was launched the day after the election. Of those 355 participants, 166 reported being affiliated with the Democratic party and 77 reported being affiliated with the Republican party. Participants who reported being affiliated with one of these two parties had a relevant political identity and were therefore included in the analyses (n = 243). Full stimuli and data are provided via OSF.

2.1.2. Procedure

In the first wave, participants first answered questions about their demographics (gender, ethnicity, political ideology, political party, religion, income category, and education level). Then participants answered questions about the features of their political identity. For the sake of generality, participants were randomly assigned to one of two sources for the features: either self-generated or experimenter-defined. The self-generated group was asked—in an open-ended question—to list eight different aspects of their political identity. The experimenter-defined group reported their position on eight major political issues (abortion, gun control, immigration, taxes, gay marriage, military spending, social programs, and marijuana legalization).

To measure causal centrality, we had participants perform an adapted version of the "listing causal relationships" task from Chen et al. (2016), in which participants report the causal relationships that they believe exist between the features of the self-concept. This task involved a set of 20 items: their political party and the six other demographic features and the eight features of their political identity listed above, as well as five additional features that have been found to be important in prior research (Chen et al., 2016; Strohminger & Nichols, 2014): childhood memories, personal life goals, friendships, personal values and principles, and personality.

Participants completed one trial for each feature, in which that feature was the target (e.g., in Fig. 1, "being a Democrat" is the target feature). Participants saw the target feature at the top of the screen (along with the question text) and all of the other features, with check boxes, listed under it. In each trial, participants were asked to select all of the other features in the list that they thought were caused by the target feature. They also had the option, at the bottom of the list, to select "None of these are caused by my: [target feature]". Participants could check as many options as they wanted (unless they checked the None option). People were randomly assigned to one of three orders, such that they saw the demographic features, including political party, either at the beginning, middle, or end of the list (see Appendix A for details). Political party appeared as either as the 4th, 9th, or 12th feature in the list.

From this series of questions, we calculated the causal centrality of each feature—the total number of causal relationships that a feature is involved in, as either a cause or as an effect. More specifically, on the trial in which the feature was a target feature, the number of selected features on that trial measures the number of causal relationship in which the target feature is the cause. The number of causal links that the feature participated in as an effect is calculated based on the number of times it was selected from the list of features in all the other

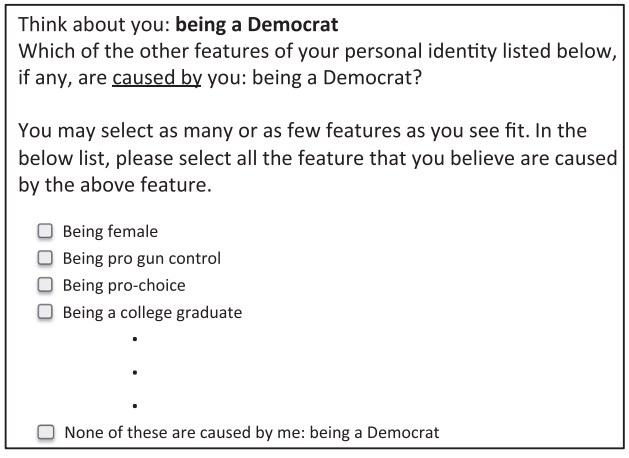

Fig. 1. Example trial of "listing causal relationships" task.

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trials, in which other features were the target. The sum of the number of links in which that feature was a cause and the number of links for which the feature was an effect provides us the total number of causal links a feature participated in.

After completing the "listing causal relationships" task, participants reported which candidate they supported and both their economic and social ideology (1 = very liberal, 7 = very conservative). We computed an ideology index by averaging the separate ratings of economic and social ideology.

The day after the general election, participants reported whether they had voted in the election, which candidate they voted for, how satisfied they were that their party had nominated Clinton or Trump, how they felt about the outcome of the election (happy vs. unhappy, and afraid vs. hopeful), and how involved they thought they would be in future politics. Our dependent measure was whether or not participants voted with their party. We predicted that participants for whom being a Republican or Democrat was relatively more causally central would be more likely to vote for their party's candidate than those for whom the political party identity was more causally peripheral.

2.2. Results

2.2.1. Preliminary analysis

There was no difference in the number of links reported for political party depending on its position on the list of features in the causal relationships task ($M_{4th} = 8.67$, $M_{9th} = 8.26$, $M_{12th} = 8.91$, $ts < 0.6$, $ps > .50$). The position of political party (whether political party was presented 4th, 9th, or 12th on the feature list) also was not a significant predictor of voting behavior, so we collapse across order in our analyses (see Appendix A for a regression that controls for position of political party).

Participants reported significantly more links to political party when they self-generated the features of their political identity ($M = 9.92$) than among the group who evaluated experimenter-defined features ($M = 7.53$), $t(2\,4\,1) = 2.71$, $p < .001$, 95% CI = [0.65, 4.12]. This does not seem to be specific to political identity, as we observe similar differences in the total number of links between those evaluating self-generated features ($M = 156.04$) vs. experimenter-defined features ($M = 111.97$), $t(2\,4\,1) = 3.67$, $p < .001$, 95% CI = [20.44, 67.70]. Because of these differences we controlled for the survey version (experimenter-defined vs. participant-generated features) in the regression analyses reported below that use causal centrality to predict voting behavior. No other effects of survey version were found.

2.2.2. Voting behavior

Our sample consisted of 77 Republicans and 166 Democrats. The majority of these participants (who all had reported one of the two party affiliations) reported that they had voted in the election (Democrats: 92%; Republicans: 95%) and that they had voted for the candidate that their party nominated (Democrats: 89%; Republicans: 71%).

We fit a logistic regression predicting whether participants voted with their party based on causal centrality of political party (the number of causal links political party had to other features), controlling for total number of links reported (among all features), survey version (experimenter-defined vs. self-generated features), and party (Democrat vs. Republican). As predicted, participants who perceived their political party as more causally central prior to the election were more likely to report having voted for their party's candidate after the election ($B = 0.15$, Wald $\chi^2(1) = 8.95$, $p = .003$) than those who had previously perceived their party to be more causally peripheral. We also found a main effect of party such that Democrats were significantly more likely to vote with their party. There was no significant relationship between voting and either survey version or total number of links reported (see Table 1 for detailed regression results). Because this regression controls for the total number of links, the effect is specific to political identity, as opposed to other factors such as having a more integrated identity in general, or a more conscientious survey response style.

Table 1
Study 1 logistic regression predicting voting for candidate of one's political party.

Factor	Beta	SE	Wald	p
Constant	2.56	0.64	16.02	< .001
Political party causal centrality	0.15	0.05	8.95	.003
Total number of links	−0.01	0.00	3.56	.059
Political party	−1.03	0.37	7.94	.005
Survey version	0.52	0.39	1.78	.182

*Coding of variables is as follows.
Voting: 1 = did not vote with party, 2 = voted with party.
Political party: 1 = Democrat, 2 = Republican.
Survey version: 0 = experimenter-defined, 1 = self-generated.

According to our account, people for whom being a Democrat or a Republican is more causally central are more likely vote with their party because they perceive acting in identity-consistent ways as more congruent with who they are, compared to people for whom political affiliation is more causally peripheral. However, it also possible that the causal centrality measure is merely capturing differences in the strength of people's preferences for the candidates or in people's ideological positions.

To examine this, we tested whether the effect of causal centrality was explained by differences in the participants' satisfaction with the candidate nominated by their party and their political ideology. We added the ideology index and candidate satisfaction as additional predictors in the regression reported above. Not surprisingly, participants who reported greater satisfaction with their party's candidate were more likely to vote with their party. More importantly, participants for whom being a Democrat or Republican was more causally central were more likely to vote with their party ($B = 0.15$, Wald $\chi^2(1) = 6.99$, $p = .008$), even controlling for satisfaction with the party's candidate and ideology (see Table 2 for detailed regression results). This result suggests that even among people who disapproved of their party's candidate, those for whom political party was more causally central were more likely to nevertheless vote with their party than were people for whom political party was more causally peripheral.

2.3. Discussion

In Study 1, we found that people who believed that their political identity was causally connected to more aspects of their self-concept were more likely to vote with their party than those who believed that their political identity was causally connected to fewer aspects. We find that causal centrality relates not only to how people structure their self-concepts, as shown in prior literature (Chen et al., 2016), but also to

Table 2
Study 1 logistic regression predicting voting with political party (controlling for ideology and candidate satisfaction).

Factor	Beta	SE	Wald	p
Constant	6.85	1.17	34.04	< .001
Political party causal centrality	0.15	0.06	6.99	.008
Total number of links	−0.01	0.00	3.96	.047
Political party	−1.15	0.67	2.94	.086
Survey version	0.54	0.45	1.43	.232
Satisfaction with candidate	−0.88	0.18	24.88	< .001
Ideology	−0.17	0.18	0.89	.346

*Coding of variables is as follows.
Voting: 1 = did not vote with party, 2 = voted with party.
Political party: 1 = Democrat, 2 = Republican.
Survey version: 0 = experimenter-defined, 1 = self-generated.
Satisfaction: 1 = very glad party nominated candidate, 5 = wish party had nominated a different candidate.
Ideology: 1 = extremely liberal, 7 = extremely conservative.

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their political behavior. These findings demonstrate that differences in causal centrality predict differences in voting behavior among members of a political party that are not explained by ideology or candidate satisfaction.

Further, as this study was executed at a time when political identity was extremely salient, differences in voting behavior are unlikely to be explained by differences in how salient the Democratic and Republican identities were. In contrast with past explorations of identity-based behaviors that have focused on factors that make an identity more salient via priming, identity threat, or social distinctiveness (e.g., LeBoeuf et al., 2010; Oyserman, 2007; Oyserman, Fryberg, & Yoder, 2007, Reed II, 2004), we focus on internal representations of the self and examine identity-based choice from a new perspective. Further, this approach allows us to predict which people will act in identity-consistent ways even when they are in the same situation—a prediction that approaches to identity-based behaviors that focus on environmental factors cannot make.

3. Study 2a

The primary goal of Studies 2a and 2b was to test whether of the relationship between causal centrality and political behavior extends to politically relevant aspects of the self-concept beyond political party. Our framework suggests that any causally central aspect of the self-concept can predict political behavior if that identity is associated with political positions or actions via widely-shared norms. While much of the study of identity in political psychology and political science is focused on partisanship, scholars in this area of research have also noted that membership in other social categories can guide political thought, particularly if these social categories tend to be aligned with political parties (Mason, 2018).

One example of a non-partisan aspect of identity that is often associated with political beliefs is that of national identity, with nationalistic appeals being used to motivate voters and promote policies around the world. In the United Kingdom, British and English national identities have long been associated with Eurosceptic attitudes (i.e., opposition to U.K. membership in the European Union; Hooghe & Marks, 2004). More recently, British/English identity has been associated with support for the United Kingdom leaving the European Union (Brexit) (Hobolt, 2016).

In the next study, we explore whether the causal centrality of national identity, among U.K. residents who consider themselves British or English, predicts support for and voting in favor of Brexit. As in Study 1, participants performed the "listing causal relationships" task and report political behavior (how they voted on the Brexit referendum and their current support for Brexit). As previous research has found that priming an identity influences attitudes and behaviors associated with those identities (LeBoeuf et al., 2010; Reed II, 2004), in Study 2, we counterbalance the order of these two tasks to examine whether reminding people of their past behavior influences the causal centrality of the identity consistent with that behavior. The study methods were pre-registered (AsPredicted #10244) and full stimuli and data are provided on OSF.

3.1. Method

3.1.1. Participants

Two hundred fifty-three residents of the United Kingdom who considered themselves English or British in prior demographic surveys were recruited via Prolific in April of 2018. Ten of these participants reported that they identified with a different national identity and were excluded from analysis, leaving a total sample of 243 participants (128 identifying as British and 115 identifying as English).

3.1.2. Procedure

Participants completed two tasks in counterbalanced order: 1) a survey about their attitudes towards Brexit and, 2) a variant of the "listing causal relationships" task used in Study 1. In the survey, participants rated their support for Brexit on a scale of 1 (*strongly support*) to 5 (*strongly oppose*). They also reported whether or not they had voted in the United Kingdom European Union membership referendum in 2016 (the "Brexit referendum") and which policy they had voted for. Finally, they reported how they currently felt about the outcome of the referendum on a scale of 1 (*totally unoptimistic*) to 5 (*totally optimistic*).

The listing causal relationships task was the same as that used in Study 1 except that the features were modified to match how demographics are collected in the United Kingdom (e.g., the educational degrees were modified to match those used in the UK) and national identity was added to the set of features. As in Study 1, participants first answered questions about their demographics (gender, ethnicity, political party, religion, income category, and education level). Then, as in the self-generated version of the task from Study 1, participants listed eight aspects of their political identity in an open-ended manner. Participants then reported the causal relationships that existed between the features of the self-concepts in the "listing causal relationships" task as they did in Study 1. The order of features was randomized across participants. The order of features for any given participant remained consistent across trials.

Finally, we measured the norms associated with national identity. Participants reported how likely they thought residents of the United Kingdom who primarily identified with each of the major geographic identities (English, British, European, Irish, Welsh, and Scottish) would be to support Brexit (1 = *very likely to support* to 5 = *very likely to oppose*). Participants then reported how much a change to their national identity would disrupt their identity on a scale of 0 (*exactly the same person*) to 100 (*completely different person*).

3.2. Results

3.2.1. Perceptions of support for Brexit (all UK geographic identities)

The results of the perceptions questions confirm that the English and British identities are seen as more strongly associated with support for Brexit than the European identity. Participants expected that people who primarily identified as British or English would be significantly more likely to support Brexit than people who primarily identified as European (support for Brexit is indicated by smaller numbers, $M_{British} = 2.8$, $M_{English} = 2.5$, $M_{European} = 4.2$, $t(252)s > 16.39$, $ps < .001$). We did not have an a priori hypothesis for the other national identities (Irish, Welsh, and Scottish) but in exploratory analyses, for each participant, we averaged predicted support for Brexit ratings for British and English people and averaged predicted support for Brexit ratings for Irish, Welsh, and Scottish people. This analysis revealed that, on average, participants believed that British and English people were more likely to support Brexit than people from the other three identities ($M_{AvgBritishEnglish} = 2.64$, $M_{AvgAllOther} = 3.45$, $t(252) = 16.39$, $p < .001$).

3.2.2. Causal centrality of national identity and task order

On average, participants reported that their national identity had 4.12 links to other features of their self-concept (the average remained 4.12 links among participants who voted in the Brexit referendum). If reminding people of a behavior associated with their national identity (how they voted) influenced reports of the causal centrality of national identity (perhaps via cognitive dissonance), we would expect those who voted for Brexit to report greater centrality and those who voted against Brexit to report lower centrality when the Brexit survey was *before* the causal relationships task, relative to those who did the Brexit survey *after* the causal relationships task. That is, we would expect an order × vote interaction. However, an ANOVA revealed no task order × vote interaction ($F(1, 204) = 0.19$, $p = .663$) suggesting that task order did not influence perceived causal centrality of national identity. We therefore collapse across task order in our subsequent analyses.

3.2.3. Support for Brexit

We conducted a multiple regression predicting support for Brexit based on causal centrality of national identity, controlling for national

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Table 3
Study 2a multiple regression predicting support for Brexit.

Factor	Beta	SE	*t*	*p*	VIF
Constant	3.02	0.17	17.49	< .001	
National identity causal centrality	−0.10	0.03	−3.83	< .001	1.50
Total number of links	0.01	0.00	4.35	< .001	1.52
National identity	0.28	0.18	1.59	.113	1.00

*Coding of variables is as follows.
Support for Brexit: 1 = strongly support, 5 = strongly oppose.
National identity: 0 = English, 1 = British.

Table 4
Study 2a logistic regression predicting voting for Brexit.

Factor	Beta	SE	Wald	*p*
Constant	−5.34	0.31	3.03	.082
National identity causal centrality	−0.11	0.05	6.55	.011
Total number of links	0.02	0.00	12.45	< .001
National identity	0.40	0.29	1.83	.176

*Coding of variables is as follows.
Vote: 1 = in favor of Brexit, 2 = in opposition of Brexit.
National identity: 0 = English, 1 = British.

identity category (English vs. British) and total number of links. The causal centrality of national identity was a significant predictor of support for Brexit ($B = -0.10, p < .001$) such that people who viewed British or English identity as more causally central were more likely to support Brexit. The total number of links reported was also significant predictor of support for Brexit such that people who reported more links were *less* likely to support Brexit. National identity category was not a significant predictor of support for Brexit (see Table 3 for detailed regression results).

Further, when task order (causal relationships task first vs. reporting attitudes and voting first) and the interaction between task order and causal centrality of national identity were added to the above model, no significant effects of order were found ($B_{order} = 0.08$, $p = .732$, $B_{interaction} = 0.002$, $p = .957$). This suggests that that the relationship between causal centrality and support for Brexit was robust to task-order.

3.2.4. Voting behavior

The majority of both British and English participants reported that they had voted in the Brexit referendum (British: 87%; English: 84%, 208 participants voted). A minority of participants in our sample reported voting in favor of Brexit (British: 49%; English: 37%).

We ran a logistic regression predicting whether participants had voted in favor of Brexit based on the causal centrality of national identity, controlling for national identity (British vs. English) and the total number of links reported. As predicted, people who believed that their national identity was more causally central were more likely to report having voted in favor of Brexit, compared with those who saw their national identity as more causally peripheral ($B = -0.11$, Wald $\chi^2(1) = 6.55$, $p = .011$). This regression also revealed no significant relationship between national identity and voting, and a significant relationship between total number of links reported and voting such that people who reported more links were *less* likely to vote in favor of Brexit (see Table 4 for detailed regression results). As in the regression for Brexit support, when task order and the interaction between task order and causal centrality of national identity were added to the above model, no significant differences in the findings by order were found ($B_{order} = -0.369$, $p = .369$, $B_{interaction} = -0.01$, $p = .920$).

3.3. Discussion

The results of Study 2a replicate the results of Study 1 with a non-partisan identity, national identity. People who believed that their British or English identity was more causally central were more likely to support and vote for Brexit than those who identified with the same groups but believed that the national identity was more causally peripheral. Consistent with ideas from political science (e.g., Mason, 2018), our results suggest that a potentially wide range of non-partisan social categories may be related to political decision making if political attitudes and behaviors become strongly associated with them.

4. Study 2b

In Study 2b, we again explore the relationship between the centrality of national identity and voting and support for Brexit. Study 2b provides both a direct replication of Study 2a and a more detailed exploration of the operationalization of causal centrality. Thus far, we have operationalized causal centrality based on the relational centrality hypothesis (Rehder & Hastie, 2001), which suggests that a feature's centrality is based on the number of direct causal relationships that it has regardless of whether the feature is a cause or an effect. In contrast, the causal status hypothesis (Ahn et al., 2000) and its computational implementation, the dependency model (Sloman et al., 1998), suggest that a feature is central to the extent that it is the cause of many other features (either directly, or indirectly by causing a feature that causes many other features) and being an effect feature does not influence a feature's causal centrality. Thus, the deeper a cause is in the causal chain, the more defining it will be of a concept (see Eq. (1)).

As noted in the introduction, we have focused on the relational centrality hypothesis because previous research found that this model of causal centrality more consistently predicted identity judgments (Chen et al., 2016). However, the relative validity of the two models is still being explored (e.g., Hayes & Rehder, 2012; Rehder & Kim, 2010) in the categorization literature. Further, most of the work on causal centrality has been in the domain of categorization (or identity) judgments, while the current exploration focuses on behaviors and attitudes. So, in Study 2b, we examine whether causal centrality as calculated by the dependency model also predicts political behavior.

The dependency model is an iterative model in which, c_i, the centrality of feature i, is determined (at each time step) by summing across the centrality of the concept's other features (at time, t), $c_{j,t}$, multiplied by how dependent each feature, j, is on feature i, d_{ij}:

$$c_{i,t+1} = \sum_j d_{ij} c_{j,t}. \quad (1)$$

The implementation of the model is a repeated matrix multiplication that converges on a stable ranking within a small number of iterations (Sloman et al., 1998; Kim & Park, 2009). Here we follow the conventions of the ConceptBuilder software (Kim & Park, 2009) which was developed to allow researchers to easily calculate causal centrality via the dependency model. The software performs 15 iterations and sets the initial centrality of all features (at time 0) to 0.5. In order to explore this model in the political identity context, in Study 2b, we added a measure (adapted from the ConceptBuilder software and used in Chen et al., 2016) that captures participant beliefs about the strength of the causal relationships that they report (d_{ij} from Eq. (1)).

Thus, the present study enables us to calculate causal centrality according to both the relational centrality hypothesis (as we have done in the prior studies, by summing the total number of causal relationships a feature participates in) and according to the dependency model. To avoid confusion between the two forms of causal centrality, we will continue to refer to the total number of links measure as *causal centrality* and the alternative dependency model measure as *causal depth*.

Further, in Study 2b, we examine how defining of the self-concept national identity is to participants relative to other important features of the self-concept. As noted in the introduction, research on personal identity has debated the extent to which the features that are perceived as defining the self-concept are consistent across individuals or are idiosyncratic. While most of this research has focused on individual-

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levels traits (like memories and moral qualities) as defining the self-concept, here we will examine how uniform perceptions of national identity are. In order to do so, for all features used in Study 2b, we adding a common measure of how defining a feature is for the self-concept—how much a change to the feature leads to the perception that an individual would be a different person after the change (Blok, Newman, & Rips, 2005; Chen et al., 2016; Strohminger & Nichols, 2014). The addition of this measure also allows us to re-test the finding that more causally central features are seen as more defining of the self-concept (Chen et al., 2016). The study methods were pre-registered (AsPredicted #17556) and full stimuli are provided on OSF.

4.1. Method

4.1.1. Participants

Two hundred fifty one residents of the United Kingdom who considered themselves English or British in prior demographic surveys were recruited via Prolific in December of 2018. Study 2a participants were not eligible to complete Study 2b. Six participants had to be dropped because JavaScript failed to launch and they were unable to see the features of their self-concept throughout the study. Fifteen participants reported that they identified with a different national identity than British or English and thirteen failed at least one attention check and were also excluded from analysis. After excluding these 34 participants, there were a total of 217 participants (131 British, 86 English). Results were similar when we included participants who failed the attention check (see Appendix A).

4.1.2. Procedure

As in Study 2a, participants completed two tasks (order counterbalanced): 1) a survey about their attitudes towards Brexit and, 2) the "listing causal relationships" task. The Brexit survey was identical to that used in Study 2a except that we did not include the question about how hopeful they were about Brexit. The "listing causal relationships" task was the same as that used in Study 2a, except that the features were slightly modified (and the number of features was reduced from 20 to 16). We reduced the number of features of political identity that participants had to generate from eight to four as some participants commented that it was challenging to think of eight distinct features. Additionally, to further ensure that our results were not a result of the features we chose, we replaced the pre-selected features (*childhood memories, personal life goals, friendships, personal values and principles, and personality*) with self-reported features from categories of features found to be important to the self-concept in previous research (Chen et al., 2016; Strohminger & Nichols, 2014). Following the procedure of Chen et al. (2016, Study 2), in an open-ended manner, participants were asked to report the feature that was most important to who they are as individuals in each of the following categories: memories, goals and desires, personality traits, preferences, and moral qualities.

In order to obtain the data needed to calculate causal depth with the dependency model, participants were asked a follow-up question after each trial of the "listing causal relationships" task, in which they had to specify how strong they believed each causal relationship they had reported was on a scale of 1–3 (1 = *weak*, 2 = *moderate*, 3 = *strong*).[1] As the addition of the strength ratings makes this task more complicated and tedious than the "listing causal relationships" task used in Studies 1 and 2a, following Chen et al. (2016), we added two attention check trials within the task and added a practice task in which, prior to performing the "listing causal relationships" task, participants practiced doing the task with an unrelated concept.

[1] Due to a coding error, for one causal relationship (the 2nd feature causing the 9th feature), the follow-up strength question failed to appear. For participants reporting that the 2nd feature caused the 9th, the strength of this relationship was assigned the most common strength rating (3).

After completing the Brexit survey and the "listing causal relationships" task, participants thought about being completely different on each feature used in the study, one at a time. They then reported how much they thought that each change would disrupt their self-concept on a scale of 0 (*exactly the same person after the change)* to 100 (*completely different person after the change*). Finally, we measured the norms associated with national identity using the same procedure used in Study 2a.

4.2. Results

4.2.1. Perceptions of support for Brexit (all UK geographic identities)

As in Study 2a, the results of the perceptions data confirm that participants viewed the English and British identities as more strongly associated with support for Brexit than the European identity (greater support for Brexit is indicated by smaller numbers, $M_{British} = 3.0$, $M_{English} = 2.6$, $M_{European} = 4.3$, $ts(216) > 14.69$, $ps < .001$). Likewise, support for Brexit among British and English people was expected to be higher than among Irish, Welsh, and Scottish people, as in Study 2a ($M_{AvgBritishEnglish} = 2.8$, $M_{AvgAllOther} = 3.6$, $t(216) = 11.53$, $p < .001$).

4.2.2. Causal centrality of national identity and task order

On average, participants reported that their national identity had 2.52 links to other features of their self-concept (2.57 links among participants who voted in the Brexit referendum). As in Study 2a, we found no significant task order × vote interaction ($F(1,174) = 1.68$, $p = .196$) suggesting that task order did not influence perceived causal centrality of national identity, and we collapse across task orders in our analyses.

4.2.3. Support for Brexit

We conducted a multiple regression predicting support for Brexit based on causal centrality of national identity, controlling for national identity category (English vs. British) and total number of links. The causal centrality of national identity was a significant predictor of support for Brexit ($B = -0.11$, $p = .010$) such that people who viewed their British or English identity as more central were more likely to support Brexit. National identity category was also a significant predictor of support for Brexit. Participants who primarily identified as English were significantly more likely to support Brexit than those who primarily identified as British. Total number of links was not a significant predictor of support for Brexit (see Table 5 for detailed regression results).

Further, when task order ("listing causal relationships" task first vs. Brexit survey first) and the interaction between task order and causal centrality of national identity were added to the above model, no significant effects of order were found ($B_{order} = 0.31$, $p = .234$, $B_{interaction} = -0.08$, $p = .238$). This suggests that that the relationship between causal centrality and support for Brexit was similar for participants across task-order conditions.

We performed the same regression replacing causal centrality with causal depth (calculated with the dependency model and z-scored due to the large range). We found that there was no significant relationship between causal depth and support for Brexit ($B = 0.11$, $p = .322$), again controlling for national identity (a significant predictor of support for Brexit; $B = 0.83$, $p < .001$) and the total number of links (not a significant predictor of support for Brexit; $B = -0.00$, $p = .567$).

4.2.4. Voting behavior

The majority of both British and English participants reported that they had voted in the Brexit referendum (British: 78%; English: 85%, 178 participants voted). A minority of participants in our sample reported voting in favor of Brexit (British: 29%; English: 48%). We ran a logistic regression predicting whether participants had voted in favor of Brexit based on the causal centrality of national identity, controlling for national identity (British vs. English) and the total number of links

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Table 5
Study 2b multiple regression predicting support for Brexit.

Factor	Beta	SE	*t*	*p*	VIF
Constant	2.98	0.20	15.01	< .001	
National identity causal centrality	−0.11	0.04	−2.59	.010	1.75
Total number of links	0.01	0.01	1.57	.118	1.76
National identity	0.83	0.20	4.14	< .001	1.01

*Coding of variables is as follows.
Support for Brexit: 1 = strongly support, 5 = strongly oppose.
National identity: 0 = English, 1 = British.

reported. As in Study 2a, people who believed that their national identity was more causally central were more likely to report having voted in favor of Brexit, compared with those who saw their British or English national identity as more causally peripheral ($B = -0.16$, Wald $\chi^2(1) = 4.61$, $p = .032$). As in the regression predicting support for Brexit, there was also a significant relationship between national identity and voting (such that participants who primarily identified as English were more likely to have voted in favor of Brexit than those who primarily identified as British) and no significant relationship between total number of links reported and voting (see Table 6 for detailed regression results). When task order and the interaction between task order and causal centrality of national identity were added to the above model, no significant differences in the findings by order were found ($B_{order} = 0.542$, $p = .229$, $B_{interaction} = -0.126$, $p = .265$).

The results of the dependency model analysis revealed that causal depth (z-scored) was not a significant predictor of voting behavior ($B = 0.50$, $p = .811$), controlling for national identity ($B = 1.28$, $p < .001$) and the total number of links ($B = -0.01$, $p = .191$).

4.2.5. Disruption to self-concept analysis

On average, a change to national identity was seen as moderately disruptive to the self-concept ($M = 46.97$ on a 100-point scale with larger numbers indicating more disruption). By way of comparison, change to participant-generated personality traits were the most disruptive ($M = 61.17$), while change to education level was least disruptive ($M = 42.85$). As can be seen in Fig. 2, people varied widely in their ranking of how disruptive a change to national identity was relative to the other features examined in Study 2b.

To examine the relationship between a feature's causal centrality and the amount of perceived disruption to the self-concept that a change to the feature would cause, for each participant we calculated the Spearman correlation between causal centrality and disruption to self-concept scores for the 16 features used in this experiment. A one-sample *t*-test revealed that the average Spearman correlation coefficient was significantly greater than 0, suggesting that changes to more causally central features were seen as more disruptive to the self-concept (mean $r_s = 0.14$, $t(212) = 4.86$, $p < .001$, 95% CI [0.082, 0.194].

We performed the same analysis with causal depth calculated with the dependency model. Changes to more causally deep features were seen as more disruptive to identity (mean $r_s = 0.12$, $t(212) = 4.41$, $p < .001$, 95% CI [0.067, 0.175]). A paired *t*-test revealed that the average Spearman correlation coefficient did not differ between the causal centrality and causal depth analyses, ($t(212) = 1.20$, $p = .231$, 95% CI of the difference [−0.046, 0.011]).

To examine the relative impact of causal centrality and causal depth on disruption to identity scores, we regressed identity disruption ratings on both z-scored measures, separately for each subject, The results revealed that the mean regression coefficient for causal centrality was significantly positive ($M = 3.27$, $t(212) = 3.71$, $p < .001$, 95% CI = [1.54, 5.01]); however the mean regression coefficient for causal depth was not significant ($M = 0.59$, $t(212) = 0.72$, $p = .471$, 95% CI = [−1.02, 2.19]). Thus, the causal depth measure did not appear to add predictive power to a simpler model of causal centrality that only includes the number of causal links.

Table 6
Study 2b logistic regression predicting voting for Brexit.

Factor	Beta	SE	Wald	*p*
Constant	−0.08	0.32	0.07	.798
National identity causal centrality	−0.16	0.08	4.61	.032
Total number of links	0.01	0.01	0.83	.362
National identity	1.28	0.34	14.53	< .001

*Coding of variables is as follows.
Vote: 1 = in favor of Brexit, 2 = in opposition of Brexit.
National Identity: 0 = English, 1 = British.

4.3. Discussion

The results of Study 2b replicate the results of Study 2a, the causal centrality of national identity predicted voting behavior and support for Brexit among UK residents. An alternative form of causal centrality, causal depth as calculated by the dependency model (Sloman et al., 1998), in which features are more central to the extent that they are deeper in the causal chain (i.e., they cause many features that also cause many other features), was not predictive of voting behavior and support for Brexit. We also revisited the results of Studies 1 and 2a and tested a modified version of the dependency model (Sloman et al., 1998). As we do not have the data on relationship strength that is required by the dependency model, to calculate causal centrality with the dependency model we assigned all causal relationships the same strength. Consistent with the results of Study 2b, we did not find that this version of causal centrality was a significant predictor of voting (Studies 1 and 2a) or attitudes towards Brexit (Study 2a) (see Appendix B for details).

It is worth noting that since our measure of causal centrality counts being a cause of other features and being an effect of other features as equal, one may wonder whether associative relationships would yield the same outcome. Causal centrality is based on the theory-based view of concepts (Murphy & Medin, 1985) which suggests that our concepts exist within our world knowledge; we not only know that features occur together in a concept (e.g., polar bears are white and live near snow) but also have lay theories about *why* feature go together (e.g., polar bears are white so they can blend in with the snow). Since (non-causal) associations do not provide any explanation for why features co-occur as causal relationships do, theoretically, associations would not hold the same privileged status in conceptual representation. Further, there is evidence that causal relationships are particularly important in our conceptual representations. People are more likely to recall that features are correlated when they can describe a causal relationship between them (e.g., summer shirts tend to have short sleeves because short sleeves allow one to stay cool in the summer) than when they cannot readily explain why they would be correlated (e.g., shirts with buttons tend to have long sleeves, Ahn et al., 2002; Malt & Smith, 1984).

In our own data, we find evidence for an asymmetry in how predictive the number of effects and causes an identity has is of political behavior. For each study, we simultaneously regressed our dependent measures on the number of causes and the number of effects that political or national identity had. We found that the number of causes political and national identity have (i.e., the number of things that the identity is an effect of) was more predictive of political thought and behavior than the number of effects an identity has (i.e., the number of other features that the identity is a cause of). (See Appendix D for details of these regressions.)

In contrast to our exploration of voting and support for Brexit, we found that both the causal centrality and causal depth of a feature predict ratings of disruption to the self-concept resulting from a change to that feature. However, when both measures were used in a multiple regression predicting disruption to identity scores, causal depth did not add any predictive power beyond that of causal centrality (replicating

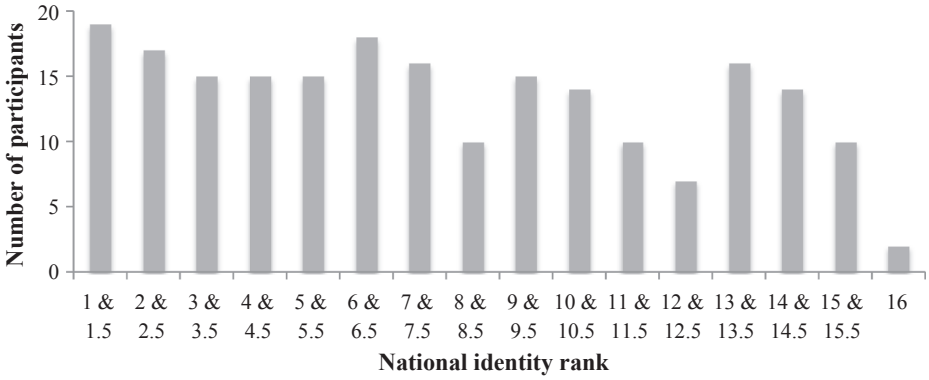

Fig. 2. Histogram of national identity rank on disruption to self-concept rating (1 = change to national identity is seen as the least disruptive of all features, 16 = change to national identity is seen as the most disruptive, average rank is assigned to tied features).

findings in Chen et al. (2016). As one of the main differences between causal centrality and causal depth is that causal depth takes into account indirect, downstream effects of a feature while causal centrality does not, it is instructive that taking into account these downstream effects does not seem to add predictive power. Another main difference between the two models is that causal depth does not take into account the number of relationships in which the feature is an effect (i.e., the number of other features that caused it). We tested whether the relationship between causal centrality and disruption to the self-concept is driven by the direct effects of a feature (and not the number of direct causes), but we do not find evidence for this interpretation. When disruption to the self-concept scores were simultaneously regressed on the number of effects and the number of causes a feature had, both were significant predictors of disruption scores (see Appendix D Table D.6 for details).

Further, the results of the disruption to the self-concept analysis also revealed that there is great variance among people's perceptions of how defining of the self-concept national identity is relative to other features of the self-concept (see Fig. 2). This suggests that the importance of national identity to the self-concept is highly idiosyncratic and underscores the importance of understanding not only which type of features tend to be important but also the underlying idiosyncratic causal beliefs that make different features important to different people.

In Studies 2a and 2b, we found that people who perceive their British or English national identity as more causally central are more like to have voted for and to support Brexit. As these results are correlational, it is, of course, possible that voting could influence the casual centrality of the identity studied in Studies 2a and 2b. However, the lack of task order effects in both studies suggests that this is not a key driver of our results. Specifically, if voting influences causal centrality (e.g., through some form of cognitive dissonance, Beasley & Joslyn, 2001), one would expect that the order would matter. Specifically, making the past vote salient by asking participants to report their vote prior to reporting the causal centrality of national identity would strengthen the relationship between causal centrality and voting (compared to having participants report their vote *after* reporting causal centrality of national identity). We found no such interaction between causal centrality and task order. Further, we also found no evidence of task order effects on the number of links reported for national identity. That is, there was no evidence that having participants report how they voted in the Brexit referendum influenced the causal relationships they reported for their national identity suggesting that these types of subtle primes may not have a strong influence on perceptions of causal centrality.

Of course, this is not to say that identity-based behaviors cannot influence causal centrality. Theoretically, doing more activities associated with an identity should eventually make that identity more causally central—for example, if a person starts participating in a lot of Democratic Party activities, doing these activities would likely shape his or her interests, beliefs, and values, as well as relationships with other people, making the Democratic identity more causally central over time. How quickly perceptions of causal centrality change in response to such changes in behavior is a key question for future research.

5. General discussion

We have proposed that some of the differences in people's political attitudes and behaviors may be predicted by differences in their beliefs about how identities with associated norms for political behavior are related to other aspects of the self-concept. In three studies, we found that people who perceived their political party (Study 1) or national identity (Studies 2a and 2b) as more causally central were indeed more likely to vote in ways associated with the norms of the group than other people who identified with the same group but who saw the identity as relatively more casually peripheral.

Further, we found that when causal centrality (causal depth) was calculated in accordance with another major theoretical model—the causal status hypothesis implemented with the dependency model (Sloman et al., 1998)—it did not predict differences in political attitudes and behavior. In our data, this measure yielded a small number of outliers. We conducted exploratory analysis and found that when controlling for outliers,[2] causal depth inconsistently predicted voting and support for Brexit in Studies 2a and 2b (but was not predictive of voting in Study 1; see Appendix B for details). Thus, although the dependency model is the main implementation of the causal status hypothesis, it is only one possible implementation and additional research may be needed to identify the best way to operationalize the causal status hypothesis in the context of the self-concept and identity-based behaviors. However, even causal depth measures controlling for outliers did not predict political behavior and attitudes as consistently as causal centrality (the total number of causal links a feature has). Further, as noted in the discussion of Studies 2a and 2b, we found evidence that political identity being an effect of other features is predictive of political attitudes and behavior. This is contrary to an assumption of the causal status hypothesis and the dependency model—that only being the cause of features, and not being the effect of features, influences causal depth.

5.1. Possible mechanisms

While this exploration of causal centrality and identity-consistent behaviors is meant to be strictly descriptive, considering rational perspectives on identity-consistent behaviors may provide a useful

[2] We controlled for outliers two ways. First, we assigned all participants above the 95th percentile the causal depth score at the 95th percentile. Second, we ranked participants by their causal depth scores for political and national identity and used the rankings to predict political attitudes and behaviors.

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framework in which to think about the mechanisms that may underlie our effects. Some economic models have incorporated identity into the utility function, suggesting that acting in identity-consistent ways leads to a gain in utility, while acting in identity-inconsistent ways leads to disutility (e.g., in the form of anxiety or discomfort, Akerlof & Kranton, 2000, 2010). It may be that when an identity is causally central, acting in identity-consistent ways provides greater utility or that acting in identity-inconsistent ways provides greater disutility than when that identity is causally peripheral, thus, making our results consistent with this rational account of identity-based behaviors.

The exact mechanisms underlying the relationship between identity-based behaviors and (dis)utility remain a topic for future research. However, previous research suggests some possibilities. As some approaches to identity-based behaviors suggest that acting in identity-consistent ways is a goal that can be activated by environments that make an identity salient, one such way that acting in identity-consistent ways may provide utility is via goal attainment (Oyserman, 2007, 2009). The causal centrality of these identities may provide a measure of how much utility is yielded by attaining the goals associated with them. As Chen et al. (2016) found that changes to causally central features led to more anticipated disruption to the self-concept than changes to more peripheral ones, acting in identity-*inconsistent* ways may provide disutility via a feeling of disruption to one's self-concept (i.e., feeling like one is not acting like him- or herself). However, mediation analyses using anticipated disruption to identity ratings for political and national identities yielded inconsistent results (see Appendix C for details). Further research into these possibilities could provide a better understanding of the mechanisms that underlie identity-consistent behaviors and of how our causal centrality approach to identity-consistent behavior may inform rational models of identity-consistent behavior.

5.2. Feature weighting in concepts of categories vs. concepts of individuals

The current exploration of causal centrality focuses on its relationship with behaviors. However, as discussed in the introduction, our approach to identity-consistent behaviors is rooted in the fact that causal centrality is critical to conceptual representation and to determining feature weights or importance in categorization decisions (Ahn et al., 2000; Rehder & Hastie, 2001). As with much work on concepts in cognitive psychology, the explorations of feature weights and causal centrality have focused on representations of categories (sets of items, e.g., the category of dogs, the category of people) rather than on representations of individuals (a single item or exemplar, e.g., my pet dog, Ralph, my self-concept; but see Blok et al., 2005). Our work (and previous work; Chen et al., 2016) has examined causal centrality in the context of a concept of an individual, the self-concept. Examining feature weights in the domain of the representation of an individual raises questions about whether approaches to feature weighting and causal centrality developed for concepts of categories generalize to concepts of individuals.

We have discussed two major theories of causal centrality from the conceptual representation literature: the relational centrality hypothesis (Rehder & Hastie, 2001), the causal status hypothesis (Ahn et al., 2000) and its computational implementation, the dependency model (Sloman et al., 1998). There is a third approach to consider, the causal model theory (Rehder, 2003; Rehder & Kim, 2010). This model suggests that people represent the causal relationships between the features of a concept as probabilistic causal mechanisms. The items that are seen as most likely to be members of a category are those that possess the combination of features that are most likely to have been generated by the category's underlying causal mechanism (i.e., Rehder's, 2003, coherence effect). Applying causal model theory to the self-concept raises questions about whether the assumptions of this approach apply to the self-concept and concepts of individuals, in general. This generative framework intuitively makes sense for categories where there are many exemplars for each category, each of which can have a different set of features (e.g., the bird category, in which your pet parakeet, the sparrow that comes to your birdfeeder, the ostrich you saw at the zoo, and the chicken in your refrigerator, are all exemplars). Applying the generative framework to a concept of an individual is less straightforward, since there is arguably only one exemplar. We have implicitly treated the relationships between features of the self-concept as deterministic—i.e., this set of relationships led to who I am. However, causal model theory assumes that these relationships are probabilistic. To what extent people see the relationships of their self-concept as deterministic or probabilistic is a question for future research.

Further, it may be that our concepts of individuals may be more similar to categories than is immediately obvious. This is particularly relevant in the case of the self-concept, as some psychological approaches in the personal identity literature conceptualize the self as being multi-faceted, consistent of different "selves"—e.g., the possible selves, the ideal self (Markus & Nurius, 1986; Markus & Wurf, 1987), the past selves, the future selves (Wilson & Ross, 2001), and selves that are defined by roles (e.g., son, neighbor, husband, McConnell, 2011). This conceptualization of the self as multiple selves (rather than as a single exemplar) could be more aligned with a view of causal centrality where a generative process creates category members that have different features but share a common underlying causal structure.

The conceptualization of the self as multiple selves may also be compatible with previous approaches to feature weighting in categorization that are based on statistical information. As these approaches use category validity (the likelihood that an item in a category has the focal feature) and cue validity (the likelihood that an item is in a category, given that it has the focal feature) to determine feature weights (e.g., Kruschke, 1992; Rosch & Mervis, 1975) in categorization judgments, they assume a distribution of features across exemplars from which category and cue validity are calculated. For example, ALCOVE (Kruschke, 1992), a computational model of category learning, uses cue validity to allocate attention to features—i.e., to determine which features are important and should be attended to. Thus, the view that the self is comprised of multiple selves might provide a set of exemplars from which distributions of features could be calculated from.

5.3. Future directions

In the present studies, we examined the relationship between the causal centrality of political party or national identity, and direct expressions of the norms of those groups (voting and support for policies). However, prior research has also suggested that political identity plays a role in how people reason and process information. Political scientists and psychologists have demonstrated that political identity can distort beliefs and interpretations of novel information via motivated reasoning (Gaines et al., 2007; Taber & Lodge, 2006; Tappin, van der Leer, & McKay, 2017; Van Bavel & Pereira, 2018). Thus, a key question for future research is whether the present effects extend from direct behavior to information processing and belief formation, and whether causal centrality may also predict biases in such processes.

Based on research which suggests that the norms of social groups drive identity-consistent behaviors (e.g., Akerlof & Kranton, 2000, 2010; LeBoeuf et al., 2010), whether causal centrality relates to belief formation may depend on whether the specific attitudes and beliefs are seen as norms of the group. Distortion of novel information seems more challenging to explain with a norms-based process, as it seems somewhat unlikely that there are strong identity-specific norms for biased information processing, as opposed to general norms for accuracy. Therefore, motivated reasoning and information processing may be less likely to be influenced by the causal centrality of a given identity. This remains an important question for future research.

Further, causal centrality may provide insights on a related question: which norms of a social group are most likely to be followed by group members? A recent framework proposes that biases towards

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social groups that are based on features seen as causally central (as determined by the dependency model) lead to more robust biases than those based on features that are merely associated with the group (Del Pinal & Spaulding, 2018). Therefore, it may be that beliefs about the causal structure of social categories also determine which group norms are seen as most central to the social category and most important to follow.

Another key question for future research is how malleable the causal relationships between features of the self-concept are. Much of the work on causal centrality in conceptual representation has been done using artificial categories, in which these relationships can be manipulated. However, it is unclear whether beliefs about relationships in familiar, knowledge-rich categories likewise represent a malleable constructed representation, or instead provide a stable basis for reasoning about the self-concept. Research on category-based reasoning has documented differences in causal beliefs and causal reasoning between novices and experts (e.g., López et al., 1997; Medin et al., 1997; Proffitt et al., 2000) such that experts rely more on their extensive and fully developed causal knowledge.

In the domain of their own self-concept, compared to other domains, people seem likely to resemble experts, with richer, more entrenched causal beliefs, particularly relative to artificial concepts. On the other hand, people who are relative novices to the political world may have less extensive causal beliefs about how their political identity is causally related to the other features of their self-concept. If that is the case, the casual centrality of political identity may be more malleable among these novices than among those more "expert" on their political identity. As a result, the way political novices are introduced to political identities may shape the centrality of their political identities, and ultimately, relate to how these identities predict behavior. Further, the motivation to see one's self as a member of a social group may influence both whether people act in identity-consistent ways and how likely they are to update their causal beliefs as a result of these actions.

In the present studies, our main goal was to leverage the nature of the representation of the self-concept to better understand the relationship between political identity and political behavior. However, the relationship between political identity and political behavior is only one example of how identity is linked to behavior. Social psychologists and economists have suggested that a wide range of social categories drive various behaviors (e.g., Akerlof & Kranton, 2000, 2010; Markus & Wurf, 1987). Accordingly, our framework has the potential to predict differences in propensity to follow norms among group members from a wide variety of social categories. A critical component of our framework is that political identity is interrelated with a wide range of other aspects of the self-concept that also participate in causal relationships with one another and, thus, have their own causal centralities that may predict relevant behaviors. Further, as people simultaneously belong to multiple social categories with potentially conflicting norms (e.g., the norms of one's national identity could conflict with the norms of one's political identity), our framework may have implications for understanding which social categories are more likely to prevail when such conflicts arise, and which identities may therefore moderate the role of political identities.

5.4. Conclusion

Our findings illustrate how theories about the nature of self-concept and conceptual representation can provide us with a deeper understanding of the relationship between political identity and political behavior. The causal centrality of political identity predicts which members of a political party are more or less likely to act in ways consistent with their political identity. Further, these results demonstrate an important expansion of the study of causal centrality, beyond behaviors directly involving categorization into downstream decision making and political behaviors motivated by category-associated norms.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cognition.2019.01.003, https://osf.io/3vjba/.

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