

Is the Self-Concept like other Concepts? The Causal Structure of Identity

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Abstract

We investigate the age-old questions of what makes us who we are and what features of identity, if changed, would make us a different person. Previous approaches to identity have suggested that there is a type of feature that is most defining of identity (e.g., autobiographical memories or moral qualities). We propose a new approach to identity that suggests that, like concepts in general, more causally central features are perceived as more defining of the self-concept. In three experiments, using both measured and manipulated causal centrality, we find that changes to features of identity that are perceived as more causally central are more disruptive to both the identity of the self and others.

Keywords: self-concept; concepts and categories; causal reasoning; personal identity

Introduction

Recent research has found that personal identity influences a wide-range of in-lab and real-world decisions (e.g., Akerlof & Kranton, 2010; Bryan et al., 2011). While this research has explored the relationship between identity and decision making, it largely ignores what underlies these decisions, the representation of the self. How is the self-concept structured and what is most defining of the self-concept?

Understanding these questions is particularly important because beliefs about continuity of identity—whether or not we will be the same person in the future—have been linked to how we value future outcomes. People who believe that their identity will change tend to discount future rewards more steeply and show less willingness to give up immediate rewards to save money than those who believe it will remain stable (Bartels & Urminsky, 2011, 2015). This paper explores how people represent the self and what features of identity people believe they need to retain to remain the same person.

Previous explorations of self-continuity have provided various answers to the question of what is most defining to identity. Philosophers have long suggested that continuity of memories allows for continuity in identity (Locke 1694/1979). In particular, autobiographical memories provide a unique narrative for each individual. Nichols and Bruno (2010) found that disruption to memories disrupted identity judgments not only for one's self but also in judgments of other people. Other explorations of lay intuitions about personal identity have suggested that the things that make us distinctive are those that make us who we are. This includes autobiographical memories, since they are unique for each individual. Other features that also make

us distinct and may be essential to our self-concept are personality traits and preferences (Gelman et al., 2007).

More recent research has suggested that lay theories of identity put moral qualities at the center of the self-concept. Strohminger and Nichols (2014) examined this *essential moral self hypothesis* by comparing how changes to moral features and various other types of features (e.g., memories, personality, preferences) impacted identity continuity judgments. They found that changes to the moral features of identity were most disruptive to identity judgments.

To bridge these approaches to identity and provide a new framework for encompassing these discrepant findings, we appeal to the idea, from concept and categories literature, that more causally central features are more defining of a concept (Ahn, et al., 2000; Rehder & Hastie 2001; Sloman, Love, & Ahn, 1998). We propose that representations of the self-concept are like representations of concepts in general and hypothesize that 1) the self-concept incorporates causal relationships between the features of identity and, 2) more causally central features are perceived as more defining of identity. For example, the importance of memories, traits, or preferences for the self-concept depends on how these features are causally related to each other and to other features of identity. Although ideas about causal centrality have been highly influential in the study of concepts, this is the first time that this approach has been incorporated into a theory of personal identity.

Causal Centrality and Continuity of Identity

In the following experiments, we measured beliefs about how defining features of identity are to the self-concept and beliefs about the causal centrality of these features. Beliefs about the how defining features are to identity were measured by asking participants how much a change to a feature would disrupt their identity (i.e., the extent to which a change in a feature would lead them to feel that they were a different person). Changes to features that are more defining to the self-concept should lead to greater perceived disruption to identity. To measure causal centrality, we elicited beliefs about how various features of identity are causally linked either by having participants draw these causal links in a concept map (Experiment 1) or by having them verbally report these links (Experiment 2). Based on participants' reports, we calculated causal centrality of features two ways described below.

Number of Causal Connections Features may be defining to a concept to the extent that they participate in cause-

effect relationships with other features of the concept (Rehder & Hastie, 2001). This measure calculates causal centrality as the number of direct causal relationships a feature participates in as either a cause or an effect.

Causal Depth We also calculate causal centrality according to Sloman et al.'s (1998) dependency model¹. This model suggests that the causal centrality is determined by causal depth. That is, causes are more central than their effects; the deeper a feature is in the causal chain the more central it is. This model takes into account both the feature's direct and indirect effects, and the strength of these causal links.

Data Analysis In Experiments 1 and 2, for both measures of causal centrality described above, we calculated the Spearman correlation between causal centrality and disruption to identity two ways: averaged across participants and individually for each participant. If more causally central features are more defining to identity, causal centrality and disruption to identity will be positively correlated such that changes to more causally central features would be more disruptive to identity continuity.

Experiment 1

The first experiment examined whether people perceive causally central features of identity as more defining of their own identity. Participants performed two tasks: 1) the concept map task, which measured the causal centrality of 16 features of personal identity and, 2) the identity questionnaire, which measured how defining each feature was to the participant's personal identity.

Method

Design Participants were randomly assigned to one of two between-participants conditions. The conditions served to counterbalance the order the two tasks were performed in.

Participants Participants were 92 University of Chicago students. Twelve participants were excluded due to computer program failures, either to record data or to display randomized features, yielding 80 cases.

Procedure

Concept Map Task Each participant drew a computerized map of the causal links between 16 features of their identity (Table 1). Twelve of the sixteen features were chosen from categories of personal identity identified as important in the prior literature (memories, personality, morality, and preferences/desires; e.g., Strohminger & Nichols, 2014). The remaining four features were intended to be low importance. Two were found, in previous research, to be less important for identity (instances of semantic memories,

Strohminger & Nichols, 2014) and two (fillers) were found to be unimportant for identity in a pretest.

Participants used ConceptBuilder software to report beliefs about causal relations (Kim & Park, 2009), first in an unrelated practice task and then to draw the causal map of personal identity using the 16 features. The features were initially presented on the screen in random order. Participants could move the features and draw unidirectional or bidirectional arrows between them to represent cause-effect relationships, as they saw fit (see Figure 1). For each link specified, participants also rated the strength of the causal relationship (1 = weak, 2 = moderate, 3 = strong).

Identity Questionnaire Participants rated each feature on how much a change in the feature would disrupt their identity on a scale of 0 (exactly the same person) to 100 (completely different person).

Table 1: Features used in Experiments 1 and 2.

Features	Category
Cherished memories of time with family	Autobiographical memory
Important childhood memories	Autobiographical memory
Memories of important life milestones	Autobiographical memory
Height	Filler
Level of Hunger	Filler
Level of Wholesomeness	Morality
Level of Honesty	Morality
Level of Loyalty	Morality
Intelligence Level	Personality
Degree of Shyness	Personality
Reliability	Personality
Goals for personal life	Preferences/desires
Favorite Hobbies/Activities	Preferences/desires
Aesthetic Preferences	Preferences/desires
Knowledge of math	Semantic memory
Knowledge of music	Semantic memory

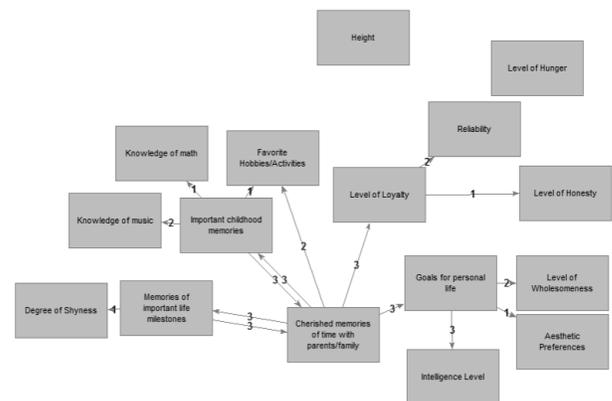


Figure 1: Example of a self-concept map. Each box contains a feature of personal identity. The arrows represent causal relationships between features. The numbers on each arrow indicate the strength of the causal relationship.

Results & Discussion

On average, participants drew 20.0 causal links between the features. This did not significantly differ across conditions ($M_{mapfirst} = 21.2, M_{surveyfirst} = 18.7, t(78) = 1.3, p > .05$).

¹ According to this iterative model, 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} :

$$c_{i,t+1} = \sum_j d_{ij}c_{j,t}$$

The implementation of the model is a repeated matrix multiplication that comes to a stable ranking within a small number of iterations (Kim & Park, 2009; Sloman et al., 1998).

Number of Causal Connections Consistent with our hypothesis, we found a significant overall Spearman correlation between the average causal connections and rated disruption to identity, $r = .79, p < .001$. This positive relationship between causal connections and disruption to identity was observed for 80% of participants. The mean individual-level correlation (within-participant across all features) between feature centrality and importance² was significantly positive ($M = .33$), $t(79) = 7.4, p < .001$.

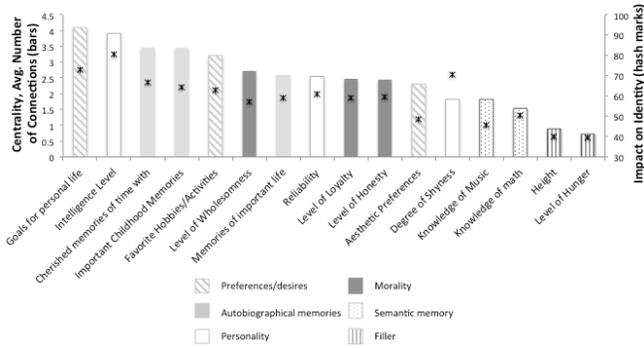


Figure 2: Results of Experiment 1 (number of causal connections). Causal centrality is shown on the left y-axis (bars). The impact a change in each feature had on identity is shown on the right y-axis (x marks).

Causal Depth We also found evidence that this measure of causal centrality was associated with identity judgments. The Spearman rank correlation between causal depth and disruption to identity ratings was significant, $r = .65, p = .01$ (see Figure 3). The mean individual-level correlation between feature centrality and disruption to identity was significantly positive ($M = .23$), $t(79) = 5.3, p < .001$. This positive relationship between causal depth and disruption to identity was observed for 78% of participants.

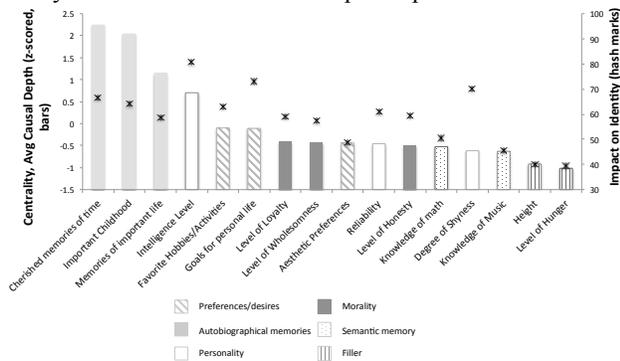


Figure 3: Results of Experiment 1 (causal depth). Causal centrality is shown on the left y-axis (bars). The impact a change in each feature had on identity is shown on the right y-axis (x marks).

Experiment 2

Experiment 1 found that changes in more causally central features of identity were seen as more disruptive to the continuity of one’s own identity. Although our perceptions and evaluations of ourselves can be strikingly different from

²All correlations reported in Experiments 1 and 2 are Spearman rho, and Fisher transformations were performed prior to t-tests.

how we perceive others (Pronin, 2008), people use analogies to the self in forming judgments of even dissimilar others (Orhun & Urmitsky, 2013). Experiment 2 tested whether our findings generalize to judgments of other people’s identities.

Design Participants were assigned to one of three conditions (self, close-other, generic-other).

Participants Two-hundred-fifty participants were recruited via Amazon Mechanical Turk. Eleven participants were excluded before analysis, either because of a scripting error (5), failed attention check (4), or giving all the same answers (2), yielding 239 cases.

Procedure Participants in the self condition completed a causal centrality task and the identity questionnaire from Experiment 1 for features of their own identity. Participants in the close-other condition did the same tasks for a non-romantic close other they specified, while participants in the generic-other condition completed the tasks for a generic other person.

To measure centrality, participants completed a “listing causal relationships” task, using the 16 features of identity from Experiment 1. After a practice task with feedback, participants completed 16 individually randomized trials. In each trial, participants saw a different target feature and indicated which of the other 15 features, if any, were caused by the target feature (see Figure 4). Then, for all the features selected as direct effects of the target feature, participants rated the strength of the relationship.³

Think about your **Aesthetic Preferences**
Which of the other features of your personal identity listed below, if any, are caused by your Aesthetic Preferences?

You may select as many or as few features as you see fit. In the below list, please select all the features that you believe are caused by the above feature.

- Level of Loyalty
- Reliability
- Cherished memories of time with parents/family
- Level of Wholesomeness
- Degree of Shyness
- Intelligence Level
- Goals for personal life
- Important childhood memories
- Level of Hunger
- Knowledge of math
- Knowledge of music
- Favorite Hobbies/Activities
- Memories of important life milestones
- Height
- Level of Honesty
- None of these features are caused by my Aesthetic Preferences

Figure 4: Illustration of listing causal relationships task.

Results & Discussion

On average, participants reported 75.7 causal links between the 16 features of identity. The number of links chosen did not differ by condition ($M_{\text{self}} = 71.1, M_{\text{close-other}} = 78.1, M_{\text{generic-other}} = 77.9, F(2, 238) = .69, p > .05$), suggesting participants perceived similar causal complexity in others’ personal identity as in their own.

³ In a separate pre-test, we confirmed that this task yielded similar causal centrality scores to Experiment 1’s concept map task.

Table 2: Experiment 2, Summary of Individual-Level Correlation Analysis Results.

Condition	Causal Connections		Causal Depth	
	Mean Spearman Correlation	% Participants with Positive correlations	Mean Spearman Correlation	% Participants with Positive Correlations
Self	.34, $t(78)=7.3, p < .001$	77%	.26, $t(78) = 5.2, p < .001$	72%
Close-other	.38, $t(78)=9.1, p < .001$	84%	.32, $t(78) = 6.6, p < .001$	80%
Generic-other	.30, $t(80)=6.3, p < .001$	74%	.22, $t(80) = 4.8, p < .001$	72%

Number of Causal Connections Changes in features with more causal connections were rated as more disruptive to identity in all conditions (self: $r = .60, p = .02$; close-other: $r = .62, p = .01$; generic-other: $r = .44, p = .09$). The differences between conditions in disruptiveness of the more causally connected features were not significant (self vs. close-other, $p = .84$, self vs. generic-other, $p = .17$, close-other vs. generic-other, $p = .12$). Likewise, the average individual-level correlations were significantly positive and the majority of participants had a positive correlation between features' causal connections and rated disruptiveness of change in all conditions (see Table 2).

Causal Depth Changes in more causally central features were rated as more disruptive to identity in the self and close-other conditions (self: $r = .49, p = .05$; close-other: $r = .65, p = .01$) but not in the generic-other condition ($r = .42, p = .11$). The correlations in the close-other and generic-other conditions were significantly different ($p = .04$).⁴

In all conditions, the average individual-level correlations were significantly positive and the majority of participants had a positive individual-level correlation between features' causal centrality and rated disruptiveness of change (see Table 2).

Experiment 3

There were two main aims of Experiment 3. The first aim was to manipulate the causal centrality of features in a set vignettes to test whether making a feature more causally central impacts how defining that feature is for identity. In order to do this, we constructed vignettes that described the causal relationships between four salient features of a person. For example, one vignette described four of Jack's features as relating to each other in a common cause structure—Jack's memories of being a lonely child caused his shyness, his preference for solitary activities, and his awkward demeanor (Figure 5, Version A). In order to manipulate whether a feature was causally central or peripheral, we created two versions of each vignette. In another version of the above vignette the position of two target features (shyness and memories) were flipped so that Jack's shyness caused his memories, preferences, and demeanor (Figure 5, Version B). So, the exact same features were counterbalanced to be causally central (cause feature)

and causally peripheral (effect feature), to control for any idiosyncratic influences of specific features.

The focal task was to select which of two individuals, one missing the effect feature (e.g., shyness in Version A) and one missing a cause feature (e.g., memories in Version B), was more likely to be the character in the story. As according to both approaches to causal centrality, the cause features is more causally central than the effect feature (it is both involved in more causal connections and deeper in the causal chain), retaining the cause feature should be more important for continuity of identity. So, we predicted that participants would choose the individual who is missing the effect feature (and retains the cause feature) as being more likely to be the character in the vignette.

The second aim of Experiment 3 was to understand more precisely how causal beliefs influence identity judgments. To do this, we created common effect (one effect with three causes) versions of all the vignettes which allows us to distinguish between the two approaches to causal centrality. For example, the common effect version of Jack's vignette presented his childhood memories as an effect of the other three features, including shyness (Figure 5, Version C). As with the common cause vignettes, we created two versions of the common effect vignettes to counterbalance the position of two target features in the causal structure. The other common effect version of Jack's vignette presented his shyness as an effect of the other three features, including his memories (Figure 5, Version D).

Unlike the common cause vignettes, the two accounts of causal centrality make different predictions about which individual should be selected in the common effect vignettes. The causal depth approach predicts that the individual missing the effect is more likely to be judged as the character in the story. This is because features deeper in the causal chain (the cause features) are more important to categorization, and in this case, to identity continuity. In contrast, the number of causal connections approach predicts that participants will tend to pick the person missing the cause feature. This is because the effect feature is linked to all three cause features while each cause is only linked to one other feature, the effect feature. So, based on the number of causal connections measure, childhood memories would be more causally central than shyness in Versions C, whereas shyness would be more causally central than childhood memories in Versions D.

⁴ The difference between the self and close-other conditions, and the difference between the self and generic-other conditions were not significant ($p = .14, p = .58$, respectively).

Method

Design Participants were randomly assigned to read one of two sets (Set 1 vs. Set 2) of six vignettes which counterbalanced which vignettes described a common effect vs common cause structure.

Participants Sixty participants were recruited via Amazon Mechanical Turk. Four participants were removed before analysis, either for answering the comprehension check question wrong or for failing an attention check.

Materials We constructed six vignettes that described the causal relationships between four features of a person's identity. There were four versions of each vignette that contained the same four features. Two described a common cause structure and two described a common effect structure.

The vignettes were split into two sets (Sets 1 and 2). Each set contained both common cause versions for three vignettes and both common effect versions for the other three vignettes (e.g., for the Jack vignette Set 1 contained Versions A and B, Set 2 contained Versions C and D, see Figure 5). Participants were randomly assigned to read one of the two versions of each vignette in the set (which counterbalanced the position of features in the causal structure, e.g., Version A or B in the common cause version). So, participants read only one version of each of the six vignettes.

Procedure Each participant read the six vignettes in the set that they were assigned to. Diagrams like those in Figure 5 accompanied the vignettes and could be used to answer the questions. The order of presentation of the vignettes was randomized within-participants.

To measure which feature was seen as more defining to identity, after reading each vignette, we asked participants which of the two people was most likely to be the character in the vignette. One person was missing a cause feature; the other was missing an effect feature. Participants read that these people retained the other three features of the character in the vignette. Participants then reported how plausible they felt the vignette was on a scale of 0 (not at all plausible) to 100 (extremely plausible).

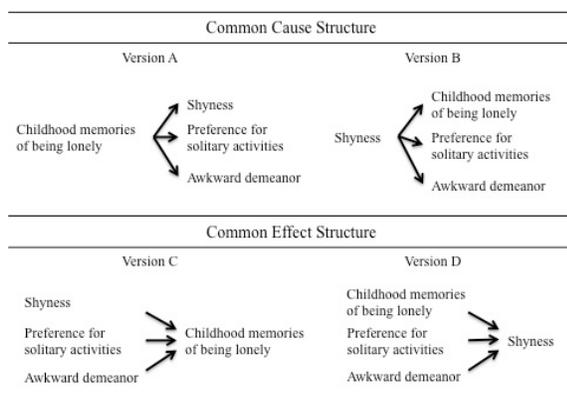


Figure 5: Structure of vignettes used in Experiment 3. There were four versions of each vignette: two versions for each causal structure. Versions A/B and C/D counterbalanced the placement of the target features as cause or effect.

Results & Discussion

The dependent measure was the average of the individual-level percentage of trials in which the participant selected the person missing the effect feature. For the common cause trials, we predicted that participants would pick the person missing the causally peripheral effect feature as the same person rather than the person missing the causally central cause feature. This is what we found. Participants were significantly more likely to select the person missing the effect feature ($M = 72\%$, $t(55) = 5.3$, $p < .01$), replicating the prior findings with a causal manipulation.

For the common effect trials, however, the two approaches to causal centrality yield different predictions. The number of causal connections approach suggests a missing effect should disrupt identity more than a missing cause. So, based on this definition of causal centrality, the results should be the reverse of the common cause trials, with participants picking the person missing the effect *less* than the person missing the cause. In contrast, the causal depth approach implies that a missing cause should disrupt identity more than a missing effect would. This approach predicts that participants will pick the person missing the effect *more* than the person missing the cause, just as they did for common cause trials.

Our results are more consistent with the number of causal connections approach. In the common effect condition, participants were *less* likely to select the person missing the effect feature—the feature that had more connections but was less deep—than the person missing the cause feature ($M = 41\%$), $t(55) = 2.6$, $p = .01$. The average percentage of missing effect selections was significantly different between the common cause and common effect conditions, ($M_s = 72\%$ vs. 41%), $t(55) = 5.2$, $p < .01$.

Because different causal structures may also differ in how natural they appear to be (Ahn, 1999), we also examined the plausibility of the two different types of causal structures. The common cause and common effect vignettes were rated as equally plausible ($M_{commoncause} = 73.9$, $M_{commoneffect} = 72.5$, $t(55) < 1$, $p > .05$). So, the observed difference in selections between the two conditions cannot be explained by a difference in the believability of the two causal structures. These results experimentally corroborate our correlational findings. Change in more causally central features, as defined by the number of causal connections, is more disruptive to perceived continuity of identity.

Lastly, we looked at the effects of vignette plausibility. Concepts, in general, are influenced by our prior knowledge (Murphy & Medin, 1985). This suggests that prior intuitions about what causal relationships are likely to occur among features of identity may moderate identity judgments. The higher the perceived plausibility, the more likely that participants believed that the feature described as having fewer connections was actually causally peripheral and the more likely that they selected the person missing the causally peripheral feature.

We found the predicted moderation by plausibility. We found a correlation between the plausibility of the story and

the proportion of selections of the person missing the causally peripheral feature with fewer connections ($r = .64$, $p < .001$). The average proportion of selections of the person missing the causally peripheral feature was significantly higher among the twelve most plausible vignettes ($M = 74.2\%$) than the twelve least plausible vignettes ($M = 55.7\%$), $t(22) = 2.5$, $p = .02$.

General Discussion

We found that, as with concepts in general, causal beliefs play a critical role in the representation of the self-concept. People perceived more causally central features as being more necessary for continuity of identity, for both the self (Experiment 1) and others (Experiment 2). Manipulating the causal centrality of a feature changed perceptions of how defining that feature was to identity (Experiment 3).

While both the number of causal connections and causal depth related to how defining a feature was to identity, the results of Experiment 3 suggest that the number of causal connections better describes how causal beliefs influence identity judgments. This suggests that features that either cause many other features or are caused by the combination of many other features (or both) will be most defining of identity. As causes generally occur before their effects, this means that the features that develop early in our lives (e.g., childhood memories) will not necessarily remain the most defining to identity, contrary to what a causal depth approach would suggest. Rather how defining an early-developing feature is to identity will depend on how many other features it causes. Late-developing features will be important if they are caused by the combination of other features and, in turn, cause new features.

Our approach to identity may also have implications for understanding affective responses. In fact, it has been suggested that differences in representations of the self-concept can explain differences in affective responses to stress and failure. People with whose self-aspects are highly overlapping or highly associated tend to have more trouble coping with negative experiences because failure in one aspect is likely to spillover into other aspects of the self (Linville, 1987; McConnell, 2011). Our results suggest that understanding the causal relationships between these aspects may be useful to predicting what types of negative experiences will be most impactful on mood and affect.

Prior research has focused on comparing the individual importance of different types of features. These approaches seem to have missed a critical aspect of representations of identity, beliefs about the causal relationships between features. These relationships influence the extent to which a feature defines identity. These findings are consistent with the general drive to explain the world, including ourselves, using causal relations (Gopnik, 1998; Keil, 2006).

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