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The Role of Identity Commitment and Selective
Interaction Strategies on the Drinking Behavior of
Simulated Agent Interactions

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Abstract

In recent years, researchers have conducted numerous studies of alcohol consumption on college campuses. This research has been motivated in part by the need to address binge drinking as a major public health concern. As a result, universities have ramped up their intervention campaigns in attempts to reduce the drinking behavior on their campuses, with mixed results. In order to develop and implement successful interventions, sociological theory is needed to understand the complex interplay of the self and the role of alcohol consumption among interacting peers.

We present a model that incorporates Identity Control Theory to gain insight into the drinking behavior of college students. The model presented here is an agent-based simulation. Agents are assigned a "drinker identity," and they interact with other agents to form stable social network structures. During these interactions, agents provide and receive appraisals, on which they act in order to affirm their identities. Agents are also susceptible to peer influence and model their drinking behavior partially based on observation of group drinking. We also model selective interaction, in which individuals may seek different interaction partners whose appraisals are more in line with an individual's sense of self. Simulation results are presented to highlight the effects of peer influence and identity control. We also simulate selective interaction strategies and observe these consequences on drinking behavior on agents. Combined, Identity Theory and mathematical/computational models can help us understand the processes that lead to excessive alcohol consumption.

Introduction

According to the National Institutes of Alcohol Abuse and Alcoholism, approximately, 1,825 college students die each year due to alcohol related events. In addition, more than 690,000 students are assaulted by others that have been drinking, and more than 97,000 students will experience sexual assault or date rape by someone who is under the influence of alcohol (NIAAA, 2014). Binge drinking, defined as five or more drinks at an event for men and four or more for women, is particularly problematic (Wechsler et al 2002): students who binge at least once a week are much more likely to have academic problems, engage in risky sexual behavior, and suffer injury than their non-bingeing peers. The need to address binge drinking on college campuses has become a major concern across the United States.

In order to understand the processes that promote binge drinking on college campuses, we examine the role of alcohol in a two-step process. The first step involves two distinct but related concepts. One is to argue that individuals have self-views of their own identities as drinkers and through their interactions with others they seek to have their drinker identities verified in their interaction encounters. The other concept is that identity verification may be moderated by peer influence, under the condition that drinkers have a weak commitment to their drinker identities. In the second step, these concepts are translated into an agent-based simulation. Through the use of simulation methodology, we intend to model the implications of the model that we propose. In this paper, we examine the implications of

selective interaction as a means to reduce the discrepancies between reflected appraisals and the identity standard, and behaviors and identity meanings.

Identity Control Theory and Selective Interaction

The identity control model asserts that individuals modify behaviors in order to reduce the discrepancy between their reflected appraisals and their identity standards (Burke, 1991); that is, behavior becomes a vehicle through which identity maintenance is achieved. When a person engages in behavior, the person's goal is not to control their own behavior. The purpose of human action is to control their perceptions of the feedback (reflected appraisals) received in the interaction encounter (Burke and Harrod, 2005; Stets and Burke, 2014; Stets and Carter, 2012). Importantly, individuals have the capacity to manipulate their behaviors in order to achieve their desired results. However, opportunities may arise for when one is unable to achieve identity verification without considerable effort to manipulate the situation or the self. For example, one could engage in altercasting behavior in order to elicit identity verifying feedback (Burke and Stets, 2009), or on a more a more drastic note, one can ultimately change one's identity (Burke, 2006; Burke and Cast, 1997).

While Identity Theory research has suggested that individuals have a tendency to be in agreement over identity meanings (Riley and Burke, 1995), there may exist instances where meanings are not in agreement. Burke and Reitzes (1981), for example, have noted that the student identity can have various meanings. For some, the student identity implies having an academic identity (such as actively studying and performing well on exams), while for other students a student identity may mean partying and socializing with others (See Burke and Stets, 2009 pg. 49 and 83-84). Similarly, Simon (1997) examined role meanings for the worker, spouse, and parent identities among men and women and observed that gender differences in meanings reflected "perceived costs and rewards of role involvement." In order to resolve differences in identity meanings, McCall and Simmons (1978) suggest that individuals may engage in identity negotiation strategies so that interactions proceed smoothly (Burke and Stets, 2009). It may also be hypothesized that the negotiation of identity meanings may result in a change of identity meanings. For example, upon entering college a person may have their own definition of what it means to be a heavy drinker, but upon interacting with others come to learn that others have different expectations for maintaining a heavy drinker identity and may consequently adjust their definitions. In a slightly different vein, Cast (2003) examined the incorporation of the spousal identity and suggested that while over time individuals may make incremental changes to behavior in order to achieve identity verification, these incremental changes result in identity change. That is, through the self-appraisal process an individual comes to see themselves as a result of their own behaviors.

It can also be hypothesized that meanings are localized or embedded in groups (Burke, 2004). Thus, there is a structural component for the meaning of behavior. For example, among Americans placing the right hand over ones heart connotes a common set of meanings among members of society, but for non-Americans the practice may appear strange or unfamiliar. At a more micro level, specific signs or symbols may vary depending on the social structures in which individuals may be embedded. For example, what constitutes having an "academic responsibility" identity may differ between a state

university and an elite private university. Similarly, these definitions of meaning may vary within disciplines on campus as well. Lastly, to the extent that social networks imply frequent and meaningful interactions among individuals, it could be theorized that shared meanings are negotiated and evolve from within tight knit social structures.

Suggesting that meanings may be localized suggests two possible driving factors. First, it may be the case that frequent interactions among individuals cause them to agree on a common set of meanings for an identity. Second, it may lend evidence to suggest that individuals engage in selective interaction strategies (Swann, Stein, and Giesler, 1992; Swann, 2005; Robinson and Smith-Lovin, 1992). Selective interaction strategies offer an opportunity for individuals to discount the reflected appraisals that they receive from certain interaction partners and seek appraisals from those that are more likely to verify those identities for them. Swann, Stein, and Giesler (1992), for example, conducted a study where they had subjects perform a speech which was then evaluated by two reviewers. One reviewer provided an evaluation that verified the subjects self-view of their speaking abilities, while the other provided an evaluation that was non-verifying. During the study, subjects were then allowed to select a person with whom to interact. Students on average preferred to interact with the reviewer that verified their identities. In another selective interaction study, Robinson and Smith-Lovin (1992) observed that in most cases individuals opted to interact with partners that verified their self-views. Interestingly, however, among a subset of those that did not choose to interact with the verifying partner did so in order to change the evaluator's mind.

Selective interaction then provides an interesting approach to maintain identities. An important implication of this phenomenon is to suggest that selective interaction has the capacity to influence the formation of friendships among individuals, while also suggesting that identity meanings may be localized within drinking contexts. It is here we suggest that selective interaction processes can have implications for social structure, and that an existing social structure can have implications for the formation of identity meanings. In the college drinking literature a considerable amount of research has been conducted on the misperception of student drinking norms on college campuses (Lewis and Neighbors, 2004). The wide variability lends support to suggest that definitions of college drinking identities vary among college students (Perkins, 2002; Wechsler et al, 2002; Baer et al, 1991; Perkins et al, 2005; Scribner et al, 2011).

Perceptions of the Drinking Environment

How accurate are student perceptions of other student drinking behaviors? Research in the college drinking literature suggests that student perceptions are not very accurate. Early research suggested that students have a strong tendency to *perceive* that the typical student on campus drinks more than actually is the case (Perkins, 2002; Wechsler et al, 2002; Baer et al, 1991; Perkins et al, 2005; Scribner et al, 2011). Perkins (2002) conducted a survey and computed the *actual* drinking behavior on college campuses (defined as the median number of drinks that a student consumes) and compared that number to student perceptions (defined as "How many drinks do you think the typical student consumes when they party"). In the study, Perkins found that students had a tendency to overestimate the typical student drinking behavior. In fact, this association has been consistently demonstrated across

universities throughout the country (Baer et al, 1991; Perkins et al, 2005; Scribner et al, 2011; Neighbors et al, 2006), leading to the view that students will have a tendency to over-perceive *typical* student drinking behavior. As a result, numerous research efforts have been conducted to examine how perceptions of drinking norms could be changed on college campuses. Further research has examined the differences in perceived drinking behavior as determined by proximal and distal relationships (Neighbors et al, 2010). When students are asked to estimate the drinking norms of students that are socially distant from themselves they are more likely to overestimate their drinking behavior.

Researchers have also conducted studies that had acquired student definitions of “binge” drinking behavior. While binge drinking behavior (alternatively referred to as “heavy episodic drinking”) is typically defined as consuming 5 or more drinks for men and 4 or more drinks for women, researchers have found that student definitions vary and these definitions depend on whether the drinker is a heavy drinker. Wechsler and Kuo (2000) surveyed a nationally representative sample of college students and observed that “occasional binge drinkers” defined “binging” as 7 drinks for men as and 5 drinks for women, while frequent binge drinkers defined bingeing as consuming 8 drinks for men and 6 drinks for women (Wechsler and Kuo, 2000). In a qualitative study Murugiah (2013) observed that at times students don’t understand the term binge drinking and oftentimes associate the term with behavior, such as drinking to the point of making a fool of oneself, slurring words, or passing out.

Researchers have also found that definitions of “moderate drinking” also vary by non-college students, as well (Green et al, 2007). Green et al (2007) conducted a qualitative study on 150 respondents on their definitions of moderate drinking and that “Not Getting Drunk,” was illustrative of moderate drinking. Thus, if a person has a high tolerance for alcohol, and consumes an enormous amount during one sitting, that person may be perceived as drinking moderately since they are not exhibiting signs of drunkenness. A large proportion of respondents defined moderate drinking by social or normative circumstances. For example, drinking socially was indicative of moderate drinking, but drinking alone was not; or, drinking wine is an example of moderate drinking, while drinking hard liquor is not (Green et al, 2007).

While researchers have examined perceptions of typical drinking behavior among college students, and have examined the variability in what is considered to be acceptable drinking behavior, few researchers have examined how self and identity factor into the decisions that are made when students consume alcohol. In the present study, we examine how the source of an appraisal affects self-verification processes. We examine in particular the discrepancy between an agent’s self-meanings for their respective identities with how much they eventually consume. In essence, agents are instantiated with self-meanings for their drinking identity and compare that with how much the agents actually consumed. We examine how this discrepancy may vary as a result of the interaction strategies that are imposed upon the simulation model. We construct four specific experimental conditions for interaction strategies, and we study agent success in maintaining identity in the presence of appraisals and peer influence.

Agent-based Models

Agent-based modeling techniques translate a theory of social interaction into computational form (Macy and Willer, 2002). In principle, one can design a model that takes a theory (e.g., a theory of network exchange or a theory of conflict) and translate that theory about how individual agents act under a set of conditions. In this way, we can examine the implications and consequences of that theory, as well as test hypotheses by manipulating the rules of interaction in order to examine how the system evolves. Exemplars of agent-based methods include the work of Epstein and Axtell (1996) and the work of Schelling (1978). Epstein and Axtell (1996) constructed an agent model (called the “sugarscape” model) that modeled trade and exchange, thereby creating an economic system of interacting agents. Schelling (1978) constructed a model that examined racial segregation. In both research efforts, the researchers observed that very simple rules of interaction at the micro level have the ability to produce very complex macro level behaviors. Researchers have also examined other sociological phenomena including the evolution of trust (Macy and Skvoretz, 1998), diffusion and the spread of disease (Carley, Malloy, and Altman, 2011), and the adoption of strategies to attract clientele to alcohol outlets (Fitzpatrick and Martinez, 2012).

Among some of the advantages of agent-based modeling methods are (1) the ability to allow researchers to examine the implications of theoretical statements (Collins and Hanneman, 1998); (2) to explore new theoretical ideas and adapt competing ideas for testing and exploration; (3) to observe phenomena at a level of resolution that cannot easily be examined with real data (e.g., interviewing the same respondents everyday over the course of a year); and (4) to examine the range of outcomes through the result of Monte Carlo experimentation. In this sense, the causal structure of computer code offers the ability to study causation in social theories.

Methods: Model Description

As in our previous studies (Fitzpatrick et al, *in review*), we assume that parties can take on many different forms. They can take place at a dorm room or at a residence; they can be informal get togethers, or they can be organized by Greek organizations, and so on. To fix ideas, we simulate parties consisting of 20 individuals. Individuals enter the party with the possibility of having pre-existing friendship ties. At the party, individuals socialize with friends as well as with individuals that they do not know. Throughout the duration of the party (a period of four simulated hours), individuals will have the possibility of forming new friendships, which in principle may extend beyond the life of the party.

At model initialization, agents are assigned to random groups, in which they interact with each other by providing and receiving appraisals and by monitoring the drinking behaviors of others in the group. The agents are permitted to form new groups, to move to different groups, and to develop friendships with others at the party. An important feature of the model is that social structure emerges in the form of a friendship network which can persist beyond the life of the party. That is, friendships may continue beyond the first day, and agents may subsequently continue to interact with friends during the course of a simulated academic year. Also at initialization, each agent’s drinker identity is “activated,” and is therefore made salient in the interaction encounter. During this activation, the agent monitors both the drinking rates and the appraisals that he receives from the members in his current group. If the

appraisals that an agent receives are verifying, then the agent receives an input to maintain his current rate of alcohol consumption. To the extent that appraisals an agent receives are not verifying, the agent uses these appraisals either to slow down or to increase the rate of alcohol consumption. The decision to slow down or increase depends on the direction of the appraisals made by his peers during the interaction process. Likewise, if the agent is ahead or behind the group members in drinking, he receives a signal to increase or reduce his drinking rate.

In this study, we stress the view that individuals have self-views about the kind of drinker that they are. Conceptually, one might think of the drinker identity as varying on a continuum between one who does not drink and one who drinks quite heavily. However, we adopt the nomenclature used with the available survey data of “abstainer”, “infrequent drinker”, “social drinker”, “moderate drinker”, and “heavy drinker” in order to parameterize the model and associate these categories with survey data. Moreover, the survey data and the identity types offer the possibility of ascribing different meanings in terms of actual drinking rates for each identity type. We suggest that individuals monitor the amount of alcohol they consume, so as to keep their identities in alignment with how they want to be viewed by their interaction partners. For example, a person that views oneself as a light drinker may be cautious not to consume too much, otherwise she risks being thought of as someone they are not (McCall, 2003). Likewise, individuals with heavy drinking identities might monitor the drinking behavior of others, so as to stay a head of the curve or to be among the heavier drinkers in a crowd (Weiss, 2013).

To complicate matters, we note that there is considerable variation in how individuals define what it means to have a drinking identity. And so the variation in meaning potentially conflicts with the appraisals that students perceive in the situation. In our own analysis of the 1999 College Alcohol Survey (CAS), for example, we note that for self-identified drinker identity types (abstainer, infrequent, social drinker, etc...) students will report typical drinking behavior that we assume to be consistent with how they see themselves. However, we observe that what might be considered “moderate” drinking behavior by one person, might be considered “heavy” by another. Figure 1 contains a statistical summary from a nationally representative survey of college students and how much they had typically consumed in the past 30 days.

We explore the extent to which the drinking behaviors of the agents are affected by tunable parameter values. For example, in a previous study we examined how commitment to the drinker identity results in changes in drinking behavior (Fitzpatrick et al, *in review*). Agents that have a high commitment to their identity experience more pressure to modify behaviors so that appraisals match their identity standards, while those with a low commitment are more likely to conform to the behavior of the group. If the majority of agents have a low commitment to their drinker identity, then the variation in drinking behavior in the model is smaller than when the majority of agents have a high commitment to their drinker identity. The results indicate that pressures toward group conformity may result in *slightly* more drinking behavior than do the pressures toward identity verification.

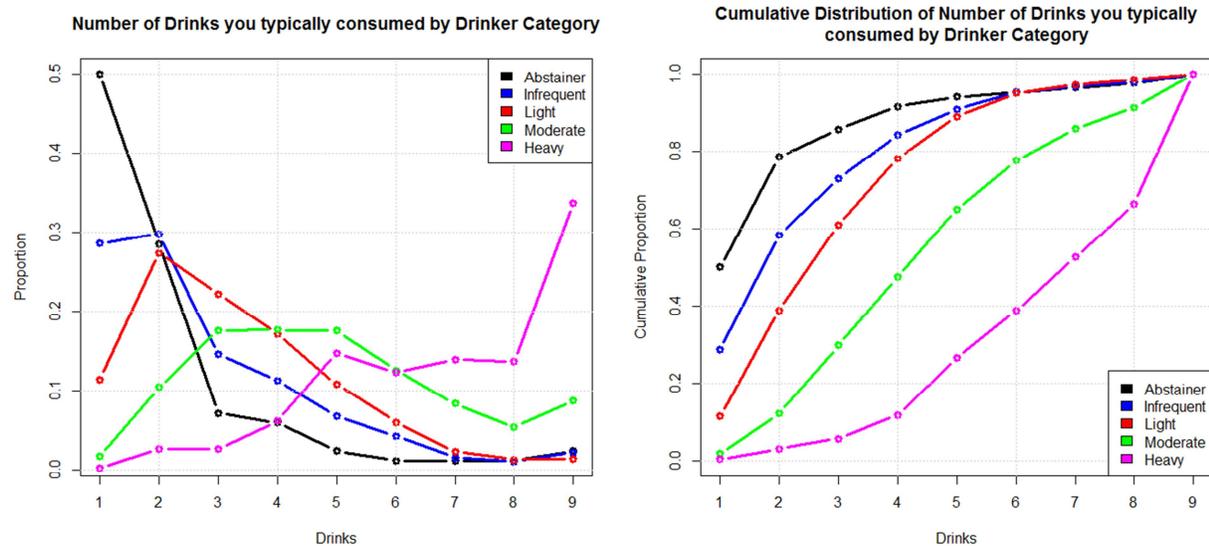


Figure 1. Distribution and Cumulative Distribution of “In the past 30 days, on those occasions when you drank alcohol, how many drinks did you usually have?”

Source: College Alcohol Study, Wechsler et al (2002). Number of observations for categories, Abstainer, Infrequent, Light, Moderate, and Heavy are 84, 2511, 2752, 3329, and 374, respectively.

Summary of Model Details

The model is written in the MATLAB programming environment, which is a high-level language designed for numerical computation, analysis, and computer programming. The mechanical details of the simulation model are presented elsewhere (Fitzpatrick et al, *in review*), and so only the minimal amount of computational detail will be presented in the following summary. Specifically we summarize the conditions that allow for the selective interaction component in the model.

At the start of the simulation model, the agents and their attributes are initialized according to random number generators. The distribution of drinker identities are apportioned into one of five possible categories of Abstainer, Infrequent Drinker, Light Drinker, Moderate Drinker, and Heavy Drinker, with the corresponding probabilities: 0.1697, 0.3138, 0.2255, 0.2477, 0.0433. We adopt the drinker type terminologies from categories used in survey data (Wechsler, 2002; DeJong et al, 2006) of drinking among college students. The numerical values for the fractions of individual students in each category come directly from the College Alcohol Survey (Wechsler et al, 2002).

Agents are assigned a “trait” attribute from a random uniform distribution on the interval between zero and one. The trait attribute serves a particular purpose in the agent model. In essence, we assert that people tend to interact with those that are most similar to themselves (principle of homophily). We can think of agent traits as representing a very abstract variable, meant to denote “tastes and preferences” for outside interests and activities (such as an interest in rock climbing, musical tastes, interests in popular culture, and so on); however, one could also think of it to denote demographic attributes, such as race, ethnicity, religious preferences, and so on. Thus, based on the principle of homophily, we suggest that agents that are more likely to interact with those that are similar to themselves. In all

models presented herein, any two agents that have trait distances that are less than “0.16” will be assigned as friends at the beginning of the simulation. Therefore, agents that are similar to each other on traits are more likely to be (a) friends and (b) they are more likely to interact with each other in groups at the party.

Each agent is assigned one of five identities. In addition, each agent will be assigned their own *unique* identity meanings for each of the five identities. Thus, an agent who is assigned the heavy drinker identity will have their own perception as to how much is required to consume as a result of that identity. Likewise, they will have a perception of the appropriate drinking behaviors for the other four drinker identity types. Because of the variability that we observe in the drinking behavior of college students, and because it is widely known in the literature that students have a tendency to have various perceptions about what it means to hold a particular drinker identity type, we have constructed the model to incorporate this variability that we see in the literature. In essence, an agent is assigned to one of the five possible drinker identities, for which they are also assigned a numerical value that defines *their own views* of what it means to hold that identity. Similarly, they are also assigned numerical values that define what they believe other students of other identity categories should drink. For example, John (an abstainer) may ascribe to the notion that other “abstainers” drink less than 1 drink per sitting, while also holding the view that infrequent, light, moderate, and heavy drinkers consume 3, 5, 9, and 12 drinks per sitting. Similarly, Sarah, also an abstainer may have her own self-views of these identity types. These variations in meaning, then, define how appraisals are received and sent back and forth during the interaction process.

The distribution of identity meanings for each of the five drinker identity types are presented in Figure 2 below. These distributions are generated from lognormal distributions with parameters specified in Table 1. Agents are randomly assigned numerical values that define their meanings for each of the five identity types for each of these distributions. The numerical values for the parameters of these log normal distributions are also derived from the College Alcohol Survey data (Wechsler et al, 2002).

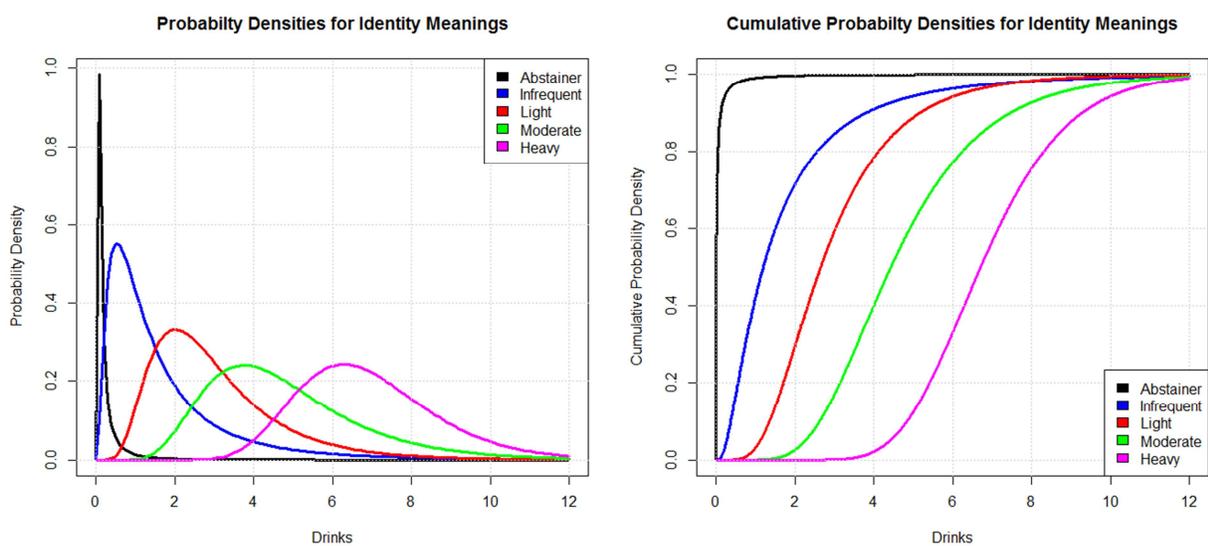


Figure 2. Distribution of Identity Meanings in Population of Agents

Table 1. Parameters for drinking rates for each of the five identities.

<i>Drinking Type</i>	<i>Log Normal Mean</i>	<i>Log Normal Standard Deviation</i>	<i>Mean Drinks/Event</i>	<i>Standard Deviation Drinks/Event</i>
Abstainer	-4.6874	2.0224	0.0712	0.5457
Infrequent	0.1830	0.9031	1.8054	2.0270
Light	0.9770	0.5213	3.0431	1.7005
Moderate	1.4895	0.4067	4.8172	2.0431
Heavy	1.9035	0.2536	6.9286	1.7857

The parties are designed to last a total of four simulated hours. As the party starts, agents are assigned to initial groups. At time zero, all agents have consumed a total of zero drinks (hence, we do not model “pre-gamming” activities). Time proceeds in discrete time units, however, the units are modeled as fraction of hours. A subset of agents is randomly selected within each time step (modeled as a discrete exponential waiting time law), in which they monitor their decision to leave a group or decide whether to consume another drink. Agents decide to jump to groups if the groups become too large or if there are other groups that are similar in terms of (a) trait attributes and on (b) whether the agent knows other individuals in those groups. Further details of these group formation processes are defined in (Fitzpatrick et al, *in review*).

Agents have varying commitments to their drinker identities. This is characterized as a weighting term that is used to compute the relative importance of an appraisal; that is, if a person is highly committed to their identity, they will weigh the appraisals more heavily than the observed drinking rate of the group. In essence, we suggest that agents that are highly committed to their drinking identities are more likely to drink in order to reduce the discrepancy between the reflected appraisals and their identity standards, while those that are low on commitment are more easily influenced by peer influence.

The distribution of commitment to the drinker identity is presented on Figure 3 below. Numbers close to one indicate a strong commitment to the drinker identity. The distribution is symmetric at 0.50, though it is not normally distributed. The cumulative distribution of the drinker identity is presented on the right panel of Figure 1 and more clearly delineates what fraction of the population will have values below the x-axis. The computation for assigning commitment to the drinker identity is determined by the following equation: $commitment_i = \alpha_i / (\alpha_i + \beta_i)$, where α_i and β_i are random uniform variables on the interval between zero and one for each agent “*i*”.

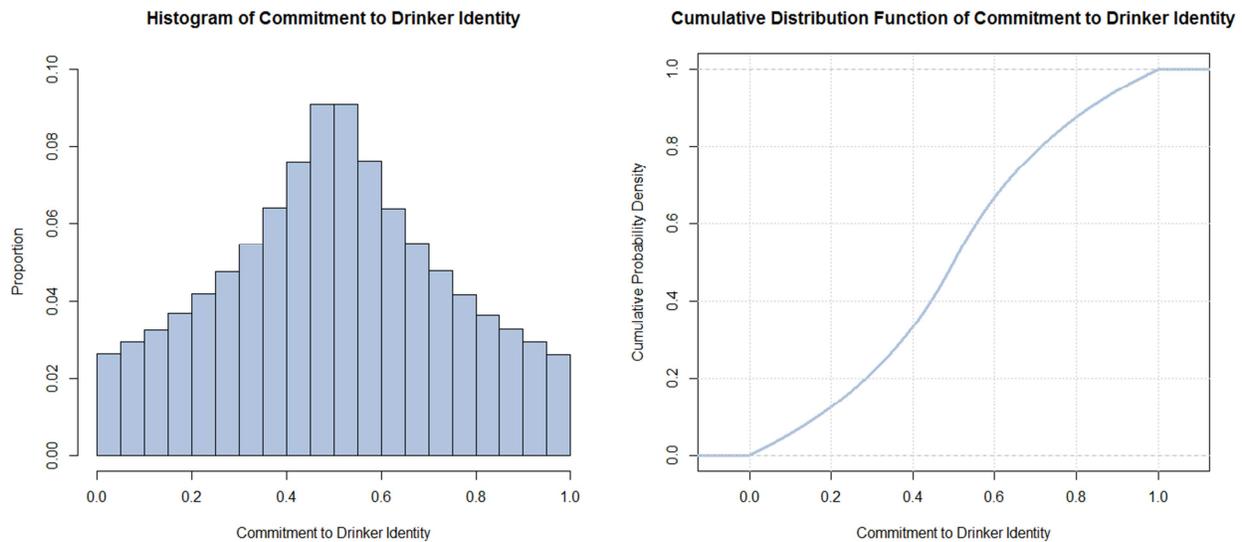


Figure 3. Histogram and Cumulative Distribution of Commitment to the Drinker Identity

Experimental Conditions

We generate four experimental conditions that control how agents choose groups to interact with at the party. In the first condition, agents will have a tendency to interact with those that are similar to them on the basis of the “traits” attribute mentioned above. This condition is considered our baseline model, where the decision to interact with a particular group has nothing to do with the perceived drinking rate among the members nor whether those group members are likely to return identity verifying feedback. In this scenario, traits are assigned *independently* of the drinker identities and of their identity meanings. In Condition 2, agents have a high propensity to interact with other agents that have the same drinker identity types (e.g., light drinkers will seek to interact with other light drinkers; moderate drinkers will interact with other moderates, and so on). In Condition 3, agents choose to interact in groups that have *similar* identity meanings as themselves; for example, an agent that believes that in order to maintain the “light drinker” identity, she cannot drink beyond one drink, then she will seek to interact with others that have similar identity meanings. In this particular experimental condition, agents look to interact with individuals that verify their identities—this is our “selective interaction” condition. And lastly, in Condition 4, agents adopt the strategies presented in conditions 2 and 3; namely, agents seek to interact in groups who are (a) similar in terms of their drinking identity and (b) are also likely to have the same identity meanings as themselves. Table one summarizes the basic experimental conditions proposed in the present paper.

For Condition 1, the traits attribute is generated *independently* of the agents (a) drinker identity type and (b) independently of their identity meanings. For Conditions 2 - 4 however, the traits attribute is correlated with either the drinker identity type (Conditions 2 and 4) or correlated with the identity meanings (Conditions 3 and 4). In these experimental conditions the traits attribute serves the additional purpose: when agents choose to interact with others at the party, they are implicitly basing their decisions to interact with other agents, as specified in Table 1.

Table 2: Experimental conditions

Experimental Condition #	Model Settings	
	Traits Correlated with Identity categories	Traits correlated with identity meanings
Condition 1 (baseline)	No	No
Condition 2	Yes	No
Condition 3	No	Yes
Condition 4	Yes	Yes

An image of the initial friendship network for two simulation realizations is presented in Figure 4 below. In the figure, the circles denote individual agents, while the line segments connecting them denote the presence of a friendship. The colors refer to one of five possible agent identities as represented in the figure. The figure provides an illustration of the implications of each experimental condition. As noted in the left hand side of the Figure 4, the agent identity types are independent of their friendships, while on the right hand side the identity type is highly correlated with who are friends at the party.

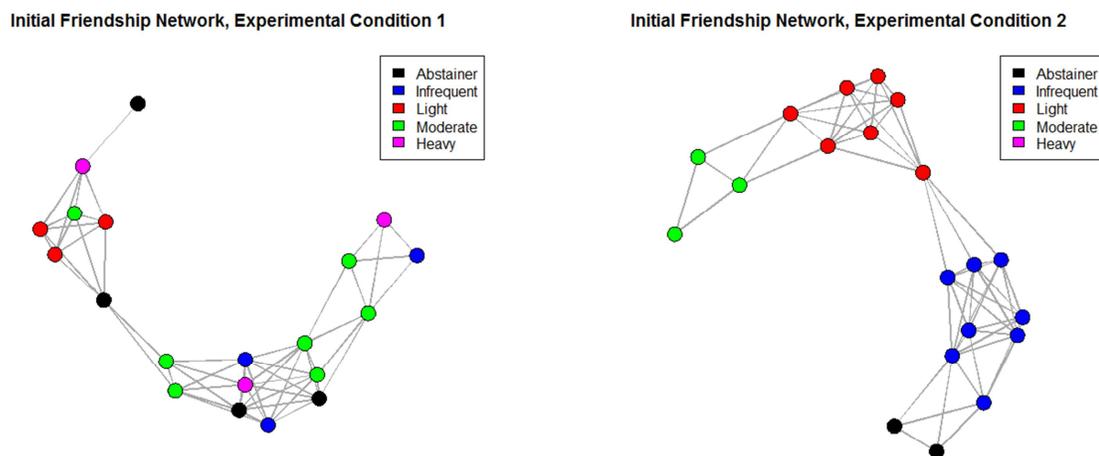


Figure 4. Initial Friendship Networks: Comparing baseline (Condition 1) with correlation of Traits with Identity Categories (Condition 2)

Results

For each experimental condition a total of 10,000 Monte Carlo realizations were conducted. For each simulation condition, we computed the average discrepancy at the end of the simulation. Table 3 summarizes the discrepancies for each experimental condition. As observed by the table, the mean discrepancy varies by experimental condition. Surprisingly, Condition 3 has a slightly larger mean discrepancy than the others. However, in condition three the mean discrepancy is slightly higher than in conditions 1 and 2. As might be expected, condition 4 has the lowest mean discrepancy.

Table 3. Mean and Standard deviation of Number of Drinks minus Identity Meanings

	Condition 1	Condition 2	Condition 3	Condition 4
Median	0.2595	0.1158	0.0827	0.0088
Mean	0.0820	0.0817	0.1050	0.0770
Standard Deviation	2.1023	1.8948	1.6442	1.4604

Table 4 contains Spearman rank order correlations between Appraisals of Peers (their actual appraisals), the agents' self-meanings for their own identities, the total number of drinks consumed, and the group drinking behavior. We note that in condition 1, the number of drinks consumed is highly correlated with the actual appraisals of the peers ($\rho = 0.7870$), however, we find that the number of drinks consumed is only moderately ($\rho = 0.6410$) correlated with one's self-meanings for their identities. In condition 2, there is a stronger correlation between the actual appraisals and one's drinking behavior ($\rho = 0.8900$). Similarly, correlation between number of drinks consumed and the agents self-meanings also increase ($\rho = 0.7602$). Condition 3 offers more interesting support (and in the direction of our selective interaction hypothesis) that one's drinking behavior and self-meanings become highly correlated ($\rho = 0.7807$). And lastly, one's self-meanings and drinking behavior become highly correlated in condition 4 with $\rho = 0.8906$. Also of interest is the fact that all of the variables are highly correlated with each other in Condition 4, suggesting that selective interaction strategies and interacting with those in the same identity categories increases identity verifying opportunities.

In order to examine the relationship between commitment to the drinker identity and the effect of various selective interaction strategies, we examine the data graphically in order to observe the impact of the effect of commitment. We present this information in Figure 5. In here, for each experimental condition we bin commitment into three-hundred discrete categories. For each category, we compute the mean discrepancy in the model, and a loess line was fit to the data in order to discern any nonlinearities that may be present in the data. In all experimental conditions, agents on average had a tendency to drink *more* than what their self-meanings might allow (this is the result of the running max of the jumping conditions and it may be a result of the feed-back loop in the peer pressure effect). In Condition 1, it appears that the mean discrepancy as a function of alpha does not have an effect (this was hypothesized in the model). In Conditions 2 and 3, it appears that there is only slight downward trend in this discrepancy. And in Condition 4, it appears that the mean discrepancy, on average approaches zero as commitment increases. Another interesting feature of this model output is that the variation about the loess line appears to vary as a function of commitment. In Figure 6, we compare this variability by binning the data again and computing the standard deviation of the values about the Commitment.

Table 4. Correlation Matrices of Actual Appraisals, Self-Meanings, Group Drinking Behavior, and Number of Drinks Consumed

Condition Number	Appraisals of Peers	Self-Meanings	Number of Drinks Consumed	Group Drinking Behavior
Condition 1				
Appraisals of Peers	1.0000			
Self-Meanings	0.7052	1.0000		
Number of Drinks Consumed	0.7870	0.6410	1.0000	
Group Drinking Behavior	0.3943	0.4200	0.7728	1.0000
Condition 2				
Appraisals of Peers	1.0000			
Self-Meanings	0.7038	1.0000		
Number of Drinks Consumed	0.8900	0.7602	1.0000	
Group Drinking Behavior	0.7211	0.7524	0.9063	1.0000
Condition 3				
Appraisals of Peers	1.0000			
Self-Meanings	0.9108	1.0000		
Number of Drinks Consumed	0.8232	0.7807	1.0000	
Group Drinking Behavior	0.5077	0.5030	0.8199	1.0000
Condition 4				
Appraisals of Peers	1.0000			
Self-Meanings	0.9392	1.0000		
Number of Drinks Consumed	0.9543	0.8906	1.0000	
Group Drinking Behavior	0.9173	0.8327	0.9592	1.0000

A regression model was conducted to examine the implications of commitment to the reduced discrepancy. A multilevel model was conducted with the R statistical environment. For each experimental condition, we constructed a two-level model with the group number that the agent belonged to at the end of the simulation as the random effect. We examined the drinks minus self-meanings as our dependent variable. The variable "Departures" refers to the total number of times an agent jumped groups during the course of the simulation. Group size denotes the size of the group that the agent was in at the end of the simulation, while commitment refers to the agent's commitment to the drinker identity. These results are presented in Table 5.

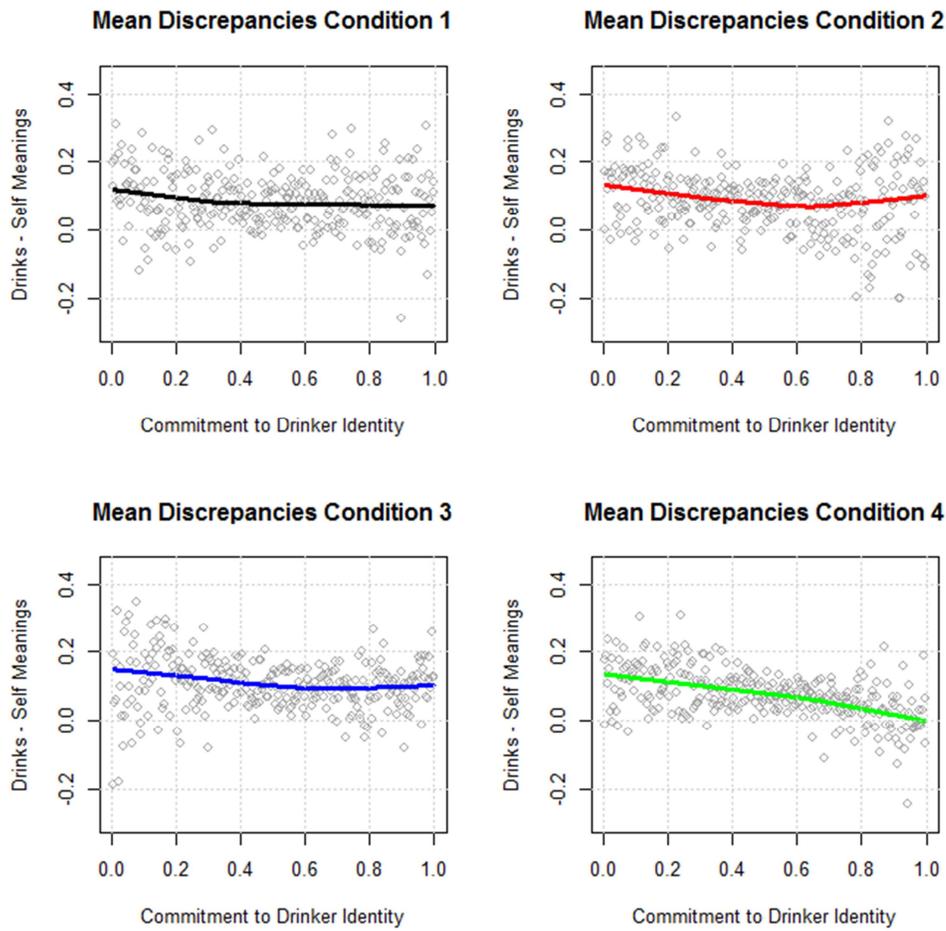


Figure 5. Comparison of Mean Discrepancies

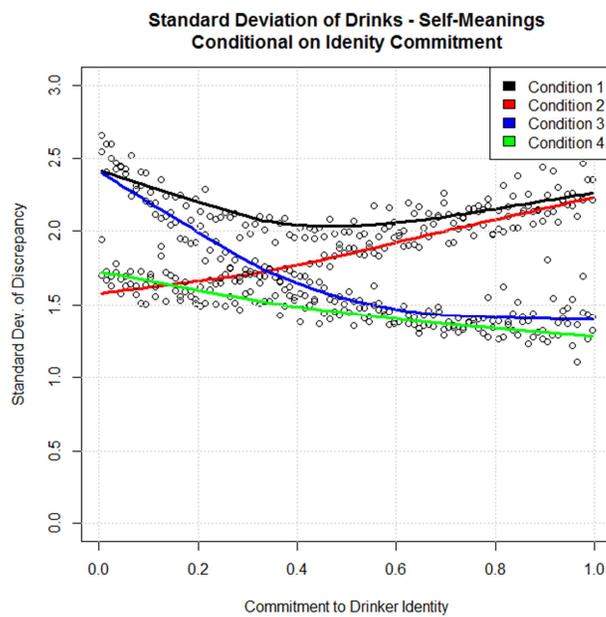


Figure 6. Standard Deviation of Drinks minus Self-meanings for Identities

In these results, we observe that in all instances, as commitment to the drinker identity increases the discrepancy between drinks and self-meanings decreases. When comparing the commitment coefficients across experimental conditions, we observe that the magnitude of this affect becomes stronger from condition 1 through to condition 4. Also, we note that Departures also has a tendency to increase as this discrepancy, which appears to be the result of a running max problem observed in Fitzpatrick et al (*in review*). And lastly, group size has the effect of reducing the discrepancy in simulation conditions 1 and 2, but has the opposite effect on conditions 3 and 4. It appears that when agents are interacting with other agents that have similar identity meanings, the effect of more agents in the group has the tendency on average to increase the discrepancy. However, if agents are interacting with other agents that do not share the same identity meanings, then modifying behaviors might have a tendency to decrease the behavioral discrepancy. And lastly, as noted above in table 4, the correlation between the number of drinks consumed and the agents self-meanings has a tendency to increase as various selective interaction strategies are implemented.

Table 5. Regression Model on Number of Drinks minus Identity Meanings

	Variable	B	SE	
Condition 1	Intercept	0.0291	0.0202	
	Commitment	-0.0742	0.0194	**
	Departures	0.0727	0.0045	**
	Group Size	-0.0117	0.0059	*
Condition 2	Intercept	0.0726	0.0181	**
	Commitment	-0.1075	0.0175	**
	Departures	0.0680	0.0040	**
	Group Size	-0.0201	0.0052	**
Condition 3	Intercept	0.0188	0.0157	
	Commitment	-0.0866	0.0152	**
	Departures	0.0446	0.0035	**
	Group Size	0.0199	0.0046	**
Condition 4	Intercept	-0.0327	0.0138	*
	Commitment	-0.1591	0.0134	**
	Departures	0.0610	0.0031	**
	Group Size	0.0316	0.0040	**

* $p < 0.05$; ** $p < 0.01$

Figure 7 contains select output from each experimental condition. In here, we note how the respective identity categories tend to cluster in experiments 2 and 4. Similarly, we note that in experimental condition 3, identity categories are uncorrelated with friendship formation, though not presented in the

figure is the extent to which an agent might receive identity verifying feedback from those that they are interacting with.

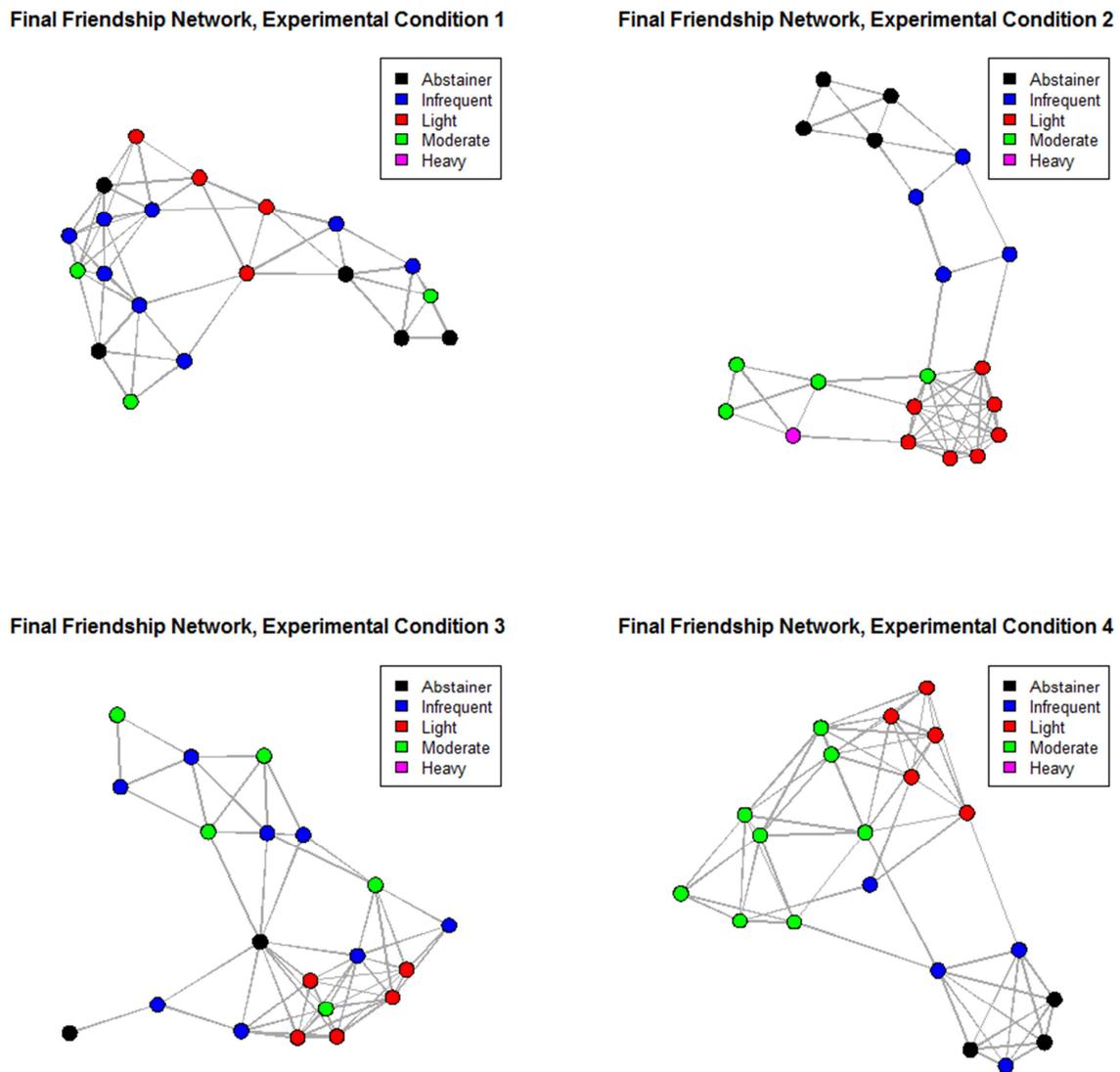


Figure 7. Example of Final Network Structure for Select Parties

Discussion

In this study, we examine the implications of identity verification and peer influence on college student drinking behavior. We are particularly interested in selective interaction as a means of reducing distress in identity maintenance. In our previous efforts (Fitzpatrick et al, *in review*), the research models presented a curious (but perhaps predictable) result: agents modified their behaviors until their interaction partners were satisfied that the behavior exhibited by ego (the focal agent) were consistent

with how they viewed the agents identity. That is, if ego saw herself as a heavy drinker and if her alters provided appraisals that indicated that she wasn't drinking enough to be heavy drinker, then she would continue to drink until the appraisals were verifying¹. Thus both ego and her alters held the view that she was a heavy drinker. Interestingly, her own behaviors did not necessarily conform to her own meanings of that identity. This result derives from our simple implementation of the identity verification process, with agents focused on the appraisals they receive from interaction partners.

Burke and Stets (2009) identify this phenomenon as an alternative class of discrepancy in the identity control model, called *behavioral discrepancy* (Burke and Stets, 2009; pg. 199). In our own view, the extent to which a person feels negative emotions as a result of this discrepancy may depend on the extent to which they are *certain* of their identity meanings. As mentioned previously, upon entering college a student may have a view of what constitutes having a heavy drinker identity, only to learn that others may have quite different definitions for that identity. Under these circumstances, it may be the case that students conform to the definitions of others. Presumably, under this circumstance students may update their views of their identities to correspond to the meanings as defined by the social structure in which they are embedded². In the present research effort, we incorporate this view in the computational model.

Our previous models were designed as "one-day/one party" models in which agents were attending parties that were thought of as "freshmen mixers;" that is, the network densities were low (few individuals had friends), and individuals had interacted with each other on the basis of their similarity to other agents. It is important to note that the trait variable governing similarity was *independent* of drinker identity type. This structure had the effect of creating an environment in which agents are very likely to interact with others that had very different meanings for the respective identities. As a result, the behavioral discrepancy was high among virtually all agents.

In the present work, we resolve the behavioral discrepancy problem in three possible ways. The first way to resolve the issue is to correlate the trait variable with the drinker identity. This has the effect of light drinkers seeking to interact with other light drinkers, moderate drinkers with other moderate drinkers, and so on. Another way is to correlate the traits variable so that agents that are similar on their traits would also have similar identity meanings. And lastly, we suggest correlating traits with both the drinker identity type and with those that have the same identity meanings. These models lead to a selective interaction environment in which individuals are choosing to interact with those who have similarities in trait have similar identities and identity meanings.

In all models considered, agents are free to move around at the party and interact with others. Because groups form in a manner where agents are more likely to interact with those that have the same traits

¹ More specifically, agents reduced their discrepancies immediately to match the appraisals in the modeling processes. In part, this was a convenient adaptation of the computer code. Various adaptations of the model also include reflected appraisals that were upwardly biased, so that egos would drink more and so on. For computational simplicity, the appraisals offered in here are in *actual appraisals*, which allow us to examine the model and its implications minus the noise introduced by random error in the model.

² Similarly, if alter is a person with high status, ego may defer to the meanings of alter out of social obligation.

they are quite practically engaging in selective interaction strategies. Consequently, when agents interact in groups where the individuals in those groups have traits that are different than their own, they will consequently find other groups to interact in that have similar trait variables.

We note that the impact of selective interaction depends quite strongly on the accuracy of shared meanings. In the absence of strong commitment to identity, there is little difference in distress (as defined by the discrepancy between an individual's identity meaning and actual behavior), but as that commitment strengthens, the distress is much lower for Conditions 3 and 4, in which shared identity meanings draw individuals together (as in Figure 5). This result suggests that accurate shared identity meanings may have an important impact on binge drinking and that social norms interventions designed to educate students should consider these shared meanings carefully in order to be effective.

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