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**Too Heavy to be Popular?:  
Lay Theories about Weight and Social Status in Adolescence**

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**Too Heavy to be Popular?:**

**Lay Theories about Weight and Social Status in Adolescence**

**by**

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## **Abstract**

### **Too Heavy to be Popular?:**

### **Lay Theories about Weight and Social Status in Adolescence**

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Abstract: The present research examines causal lay theories about the relation between weight and social status in adolescence. We hypothesize that these causal schemata are expected to manifest in social information processing in the presence of weight and social status cues. Participants include 80 ninth grade adolescents and 203 college adults. First, in probabilistic judgment scenarios (Part 1), we show that participants expect statistical covariation between weight and social status when inferring others' social status. Next, in a weight social categorization task (Part 2), participants were more likely to use weight cues to categorize people when they were presented with cues that were inconsistent with their lay theories (e.g., weight causes certain social status). Lastly, in a weight attribution task (Part 3), young adults tended to make more negative, dispositional attribution to overweight targets relative to thin targets when interpreting ambiguously-caused negative social events. As an initial test of the developmental process model, the findings support our theoretical predictions that adolescents' and young adults' causal lay theories about weight and social status serve as mental models that guide social information processing in judgment of others' social status.

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## INTRO

In contemporary societies, children and adolescents are flooded with societal messages portraying weight as a measure for one's social status. Past research (Crosnoe & Muller, 2004; Gordon, Crosnoe, & Wang, 2013; Puhl & Heuer, 2009) has documented that slender individuals tend to gain more social acceptance, perform better in academic and occupational settings, entertain more opportunities for romantic relationships, and enjoy greater access to medical services than overweight individuals, all of which grant higher social status. Meanwhile, popular media often characterize overweight individuals as being lazy, less attractive, intellectually less capable, weak-minded, or often rejected by peers and romantic partners, all of which signal a connection between overweight status and lower social designation in our society.

Although the psychological salience and importance of weight are substantial in everyday life (Crocker, Cornwell, & Major, 1993; Major, Eliezer, & Rieck, 2012), little is known in terms of how children and adolescents conceptualize weight as social information about a person's status, and how it may change with development. Broadly speaking, existing literatures on weight predominantly focus on clinical samples who are at risk of childhood and adolescent obesity (Daniels, 2006; Nader et al., 2006), eating disorders (Bearman, Presnell, Martinez, & Stice, 2006; McCarthy, 1990; Stice & Bearman, 2001), or excessive weight concerns and body image dissatisfaction (Liechty, 2010; Paxton, Schutz, Wertheim, & Muir, 1999; Vogt Yuan, 2010). This pathological perspective tends to focus on identifying risk factors that are thought to intensify one's problematic cognitions regarding weight and their psychological and health consequences. In addition, social psychological research (Burnette, 2010; Crocker et al., 1993; Goffman, 2009; Logel & Cohen, 2012; Major et al., 2012; Weiner, Perry, & Magnusson, 1988) has investigated

attitudes, beliefs, and emotions toward overweight individuals with emphasis on stigma and stereotypes of obesity. Along the line of this intellectual tradition, the field has not yet illuminated the normative social cognitive development processes that may take place among children and adolescents with all spectrums of weight ranges.

In light of this, the present research takes the first step to investigate causal lay theories of the relation between weight and social status among adolescents and young adults. Our thesis is that individuals do not simply observe statistical covariation between weight and social status from their focal environments. Rather, they are able to detect statistical patterns between one's weight and social status, and then begin to form lay explanations about this seemingly nonobvious link in an effort to make sense of the world: whether and why people with a different weight range have different a social status. Like in many other causal mental representations (Bigler & Liben, 2006; Cimpian & Salomon, 2014; Dodge et al., 2015; Olson & Dweck, 2008; Yeager & Dweck, 2012), these once-formed lay theories might further develop into more coherent forms of mental representations that guide individuals' social information processing and behavior in relevant domains.

Therefore, our prediction is that post-pubertal adolescents and young adults might have already formed coherent causal lay theories about weight and social status (e.g., "being heavy/thin causes lower/higher social status"), and these lay theories can be assessed by measuring their social information processing tendencies in the presence of weight and social status cues. The contribution of the present research is then to demonstrate that normative, healthy populations of post-pubertal adolescents and adults hold lay theories about weight and social status, and these might affect the ways in which they make judgments of others and themselves.

In the following section, we begin by reviewing relevant cognitive and social cognitive development theories explaining how lay theories are typically formed beginning in early childhood, and what developmental function they typically serve.

First, in cognitive development literatures, our review focuses on essentialism beliefs (Gelman, 2003; 2004; Gelman & Heyman, 1999; Heyman & Gelman, 2000) and inherence heuristic (Cimpian & Erickson, 2012; Cimpian, Mu, & Erickson, 2012; Cimpian & Salomon, 2014), which highlight systematic tendencies in causal explanation. Next, in social cognitive development literatures, we review developmental intergroup theory (Bigler & Liben, 2006; 2007) and implicit theories (Chiu, Hong, & Dweck, 1997b; Ross, 1989; Yeager & Dweck, 2012). Finally, our review discusses important characteristics of adolescence development—such as pubertal transition and peer socialization—that may spur the development of lay theories about weight and social status.

The present paper first proposes an initial, developmental, mechanistic process model concerning the development of lay theories about weight and social status. Note that although we review a full model here, our data do not test it in its entirety. Specifically, we do not examine developmental antecedents of lay theories. Instead, we simply document the existence of weight-social status lay theories by adolescence, as a first step toward a broader investigation of the developmental antecedents of these lay theories in future research.

### **REASONING ABOUT CAUSAL CHARACTERISTICS OF GROUPS**

Cognitive development literatures (Gelman, 2004; Gopnik, 1998; Gopnik, Sobel, Schulz, & Glymour, 2001; Heyman & Gelman, 2000) argue that human minds have strong tendencies to explain novel objects, entities, or events by forming naïve theories—which are called “lay theories” here. Gopnik et al (1999) uses the term “naïve scientists” to illustrate how deeply human minds are concerned with explaining underlying causal

structures of novel entities or events as part of fundamental learning mechanisms. In parallel with early childhood research, Ross and Nisbett (1991) note that adults tend to form lay theories in an attempt to search for causal explanations of events and make sense of the world. These naïve or lay theories help individuals to grasp on what supplies a core identity to an entity and what causes an entity to operate in a particular manner.

Research finds that children and even adults have a proclivity in their conceptual and causal reasoning about entities, by predominantly attending to inherent features that are thought to constitute the “essence” of the entity (Gelman, 2003; 2004; Medin & Ortony, 1989). Over numerous studies (Gelman, 2004; Gelman, Heyman, & Legare, 2007; Heyman & Gelman, 1999; 2000), research on essentialism beliefs has shown that individuals with essentialism beliefs tend to view the traits as stable over time and contexts, driven by biological origin (e.g., blood types, brain, DNA), innate or present at birth/infancy, and immutable. These biased beliefs are found to exist in a wide range of knowledge including biological, social, and psychological entities (see Gelman, 2004 for review).

In an attempt to understand where these essentialist beliefs come from and why people often use them, Cimpian and Salomon (2014) propose the inherence heuristic as a cognitive precursor of psychological essentialism. The inherence heuristic (Cimpian & Erickson, 2012; Cimpian, Mu, & Erickson, 2012; Cimpian & Salomon, 2014) posits that individuals initially observe statistical associations between an entity and an event from their environments (e.g., boys wear blue whereas girls wear pink), and then begin to search for inherent traits of the entity as causal mechanisms of the event (e.g., there might be a DNA or an area in the brain that causes girls to prefer pink). In the eyes of the observer, these inherent traits are believed to be deep seated and difficult to observe but ultimately cause the entity to operate that way. Like any heuristic (Tversky & Kahneman, 1983), this inherence heuristic is often a sensible way to reason, and it can lead people to quickly

discern true answers given limited existing knowledge. Yet it can also lead perceivers astray, as when there are no essential characteristics explaining a statistical association among social variables (for instance, 100 years ago, blue was more favorable color for girls, whereas pink was more for boys; Hooper, 1890).

Returning to the present interest, the inherence heuristic offers a useful framework for understanding individuals' causal reasoning about the relation between weight and social status. Suppose that a child observes an overweight friend being victimized or rejected by other peers in the playground. The victimized child may differ in many ways from other non-victimized peers, but weight may be particularly salient visually, and may even be an explicit reason for the victimization (e.g, calling the child "fat"). Over many observations like this, this child might create lay causal explanations, believing that "weight" has some inherent characteristics that cause people to dislike them. Indeed, this is highly plausible, given mounting empirical evidence pointing to an elevated risk of peer victimization and bullying among overweight children and adolescents (Janssen, Craig, Boyce, & Pickett, 2004; Puhl, Moss-Racusin, & Schwartz, 2007; Sjöberg, Nilsson, & Leppert, 2005). In parallel, a child may see skinny and popular celebrities from TV shows and develop causal lay theories, inferring that thin people share some inherent qualities that lead people to like them more and confer a higher social designation to them (see Grabe, Ward, & Hyde, 2008 for a meta analytic review about the impact of media exposure). Although children may not be taught explicitly that "overweight people cannot have status," they may nevertheless infer it on the basis of the nearly ubiquitous social realities outlined here.

These cognitive development theories explain some fundamental cognitive tendencies that emerges early in life, as younger children attempt to mold their own causal lay theories about psychological entities. Nevertheless, they do not offer clear theoretical

predictions on one important question: why might certain psychological traits or entities—in our case, weight and social status—be far more likely to elicit these biased causal theories than others? To answer this question, we review prominent theories in social cognitive development research, with a focus on developmental intergroup theory (DIT; Bigler & Liben, 2006; 2007) and implicit theories (Chiu et al., 1997b; Ross, 1989; Ross & Nisbett, 1991; Yeager & Dweck, 2012).

### **DEVELOPMENTAL INTERGROUP THEORY**

Developmental Intergroup Theory (DIT; Bigler & Liben, 2006; 2007) is an integrative theoretical model of the precursors of social stereotyping and prejudice. DIT supplies some theoretical predictions in terms of why “weight” might be a social dimension that engenders causal lay theories and stereotypical thoughts. DIT posits that perceptual discriminability heightens the psychological salience of a social dimension (e.g., race, gender). The explicit or implicit use of labeling a social characteristic intensifies this. According to the DIT, weight might be a psychologically salient social dimension that is perceptually distinctive, has proportional group size differences (e.g., individuals differ in whether they are obese or very skinny), and some functional languages referring to weight-relevant characteristics frequently used in daily lives (e.g., fat talk, weight teasing).

All of these ingredients build up to the expectation that if one can notice differences and widely talk about the social attribute, it is far more likely that people begin to treat others differently on the basis of the group membership. Bigler et al (1997) has demonstrated that functional use of group membership (e.g., “yellow” vs. “blue” groups), regardless of whether the group was assigned on the basis of biological attributes or random selection, is the first step that generates stereotypical thoughts. More recent inference heuristic models (Cimpian & Salomon, 2014) expand on this by explaining how functional

use of group membership triggers individuals' cognitive tendencies to search for inherent traits as possible explanations for group membership and function.

Individuals may then use the mentally constructed categories to link to other non-obvious characteristics that are causally irrelevant. For instance, Bigler et al (1997) demonstrated that once “yellow” vs. “blue” groups are subjectively constructed, children begin to use different causal explanations about group members' performance, which are indeed causally irrelevant to group categories. These causally unwarranted links between social categories (e.g., race, gender) and attributes (e.g., intellectual, attractive, lazy, shy, athletic, aggressive) are problematic, mainly because they can create stereotypes and prejudice against individuals who belong to these implied groups and further preclude the possibility to learn and individualize unobserved characteristics of others. Indeed, past research in the DIT (Bigler, 1995; Bigler et al., 1997; Patterson & Bigler, 2006), essentialism (Diesendruck & haLevi, 2006; Macrae & Bodenhausen, 2003), and person perception and impression formation (Fiske & Neuberg, 1990; Stangor, Lynch, Duan, & Glas, 1992; Weisman, Johnson, & Shutts, 2014) has converged on the notion that children and adults engage in social categorization in terms of race, gender, personality, religion, language, and other group-based traits.

In the context of weight and social status, the following conjecture might be possible: children and adolescents observe statistical covariation between weight and social status, and use it to categorize people in terms of weight dimension, and then assign different status labels. Much research documenting anti-fat stigma, negative stereotypes, and discriminatory acts against overweight individuals shows the existence of the end-product of this process (Brewis, Wutich, Falletta-Cowden, & Rodriguez-Soto, 2011; Crocker et al., 1993; Goffman, 2009; Major et al., 2012; Puhl & Heuer, 2009).

Our application of DIT and inference heuristic models to causal lay theories about weight and social status may extend present research in several ways. First, weight might be somewhat distinctive from other attributes that are often essentialized—such as sex and race—in the sense that perceivers might consider weight as more readily changeable (unlike skin color or biological sex characteristics) and relatively less stable over time. Furthermore, a group’s status is by its very definition a social construction and therefore a shared mental representation. That an entirely socially-constructed group—those who are overweight—could have shared stereotypes about a purely mentally represented characteristic—social status—is a fascinating test case for DIT and inference heuristic models. The present research also extends DIT models because it highlights how stereotypes are not mere mental statistical associations, but rather they are causal theories about members of certain groups, as explained next.

#### **LAY THEORIES CREATE PREDICTABLE PATTERNS OF SOCIAL INFORMATION PROCESSING**

Lay theories have been a topic of a tremendous amount of research in social and developmental psychology (Gopnik, 1999; Heyman & Gelman, 2000; Molden & Dweck, 2006; Ross, 1989; Ross & Nisbett, 1991). Children and adolescents construct lay theories about a wide range of psychological attributes—such as intelligence (Aronson, Fried, & Good, 2002; Dweck & Leggett, 1988), willpower (Job, Dweck, & Walton, 2010), personality traits (Beer, 2002; Chiu et al., 1997b; Gervy, Chiu, Hong, & Dweck, 1999; Ross, 1989; Yeager, Trzesniewski, Tirri, Nokelainen, & Dweck, 2011; Yeager et al., 2013), morality (Chiu, Dweck, Tong, & Fu, 1997a; Gervy et al., 1999), emotion regulation (Tamir, John, Srivastava, & Gross, 2007), and others. Therefore much research in domains that are analogous to the present domain points to the patterns of social information processing that could be expected by those with a stronger lay theory that weight causes



social status. We outline these commonly-observed implications of a lay theory because they directly inform the potential task measures that could assess the presence of a lay theory in adolescence.

Lay theories are analogous to scientific theories. Lay and scientific theories include knowledge (or perceived knowledge) about social reality; they guide the allocation of attention to certain types of information/data; and they provide a basis for making causal attributions about information/data that they have attended to (Chiu et al., 1997b; Ross, 1989; Ross & Nisbett, 1991).

For instance, Levy and Dweck (1999) demonstrated that children's lay theories about malleability of personality traits facilitated the formation of stereotypes based on limited observation about the groups (in their case, schools) and led to over-generalize their judgment about the groups to other unobserved individuals belonging to the groups. Plaks and colleagues (2001) showed that individuals' lay theories about the malleability of human traits affected the degree to which individuals allocated attention to stereotypes consistent vs. inconsistent information. Plaks et al (2005) also found that individuals tended to experience more anxiety when presented with lay theories-violating information and then attempted to reestablish a coherent sense of prediction. In the present study, if individuals have formed lay theories that weight causes status, they should first show that they are aware of a statistical covariation between weight and social status. But they should also evaluate novel social information differently if it is consistent or inconsistent with their causal expectations. Individuals with a lay theory that weight causes social status should more readily process novel information in which weight and status are aligned, and less readily process information where weight and social status are not aligned.

Finally, lay and scientific theories provide an explanatory framework for novel events, resulting in predictable patterns of attributions for events. In some past research,

when children held a lay theory that a person's goodness or badness could not be changed, they were more likely to attribute an ambiguously-caused negative event to one's deficient traits, rather than to circumstances (Chiu et al., 1997b; Heyman & Gelman, 2000; Yeager, Miu, Powers, & Dweck, 2013). In the case of weight and social status, a person may observe an ambiguously-caused negative social event occurring to a person who is heavier or skinnier, and then explain it as having occurred because the person was skinny or heavy, rather than looking to situational factors. These well-established implications of lay theories—not yet investigated in the context of weight and social status—led to our creation of novel cognitive tasks in the present research.

#### **ADOLESCENCE AS A SENSITIVE DEVELOPMENTAL PERIOD**

According to the account above, when would individuals develop lay theories about weight and social status? That is, when should the formation of causal lay theories about weight and social status occur developmentally? We view adolescence as a particularly important developmental period, mainly due to its increasing emphasis on both weight and social status.

Our prediction is that an overemphasis on weight and social status in adolescence (both biologically and sociocontextually) might heighten the likelihood of detecting statistical covariation between these two valued dimensions, and further lead adolescents to establish stronger causal connection between weight and social status, more so than at younger ages. Supporting this conjecture, there is mounting evidence showing that adolescence is a vulnerable time, characterized by the increasing prevalence of weight concerns, body image dissatisfaction, disordered eating, and risky weight loss behaviors (Bearman et al., 2006; Liechty, 2010; Paxton et al., 1999; Stice & Bearman, 2001; Vogt Yuan, 2010).

A number of global and U.S. representative sample studies (Liechty, 2010; Sabbah et al., 2009; Vogt Yuan, 2010) have shown that adolescents increasingly become aware of their weight as compared to younger age groups. According to the 2001-2002 Health Behavior of School-Aged Children study (HBSC; Sabbah et al., 2009) that analyzed the cross-sectional survey data in twenty-four Western countries, the prevalence of body dissatisfaction tends to increase with age for both genders starting from 38.9% at age 11, 41.8% at age 13, and rising up to 54.9% at age 15. These emerging weight-related problems in adolescence might stem from changes in the perceptual salience of weight and in the importance of social status in adolescence.

In this regard, a number of factors might serve as important developmental contexts that contribute to mold adolescents' causal lay theories about weight and social status. First, we discuss the pubertal transition (Ge, Elder, Regnerus, & Cox, 2001; Markey, 2010; Tremblay & Lariviere, 2009). Next, we address sociocontextual factors (Crosnoe, 2002; Helms et al., 2014; Rancourt, Choukas-Bradley, Cohen, & Prinstein, 2014; Webb & Zimmer-Gembeck, 2013).

### **Pubertal Transition and Biological Factors**

The pubertal transition accompanies rapid bodily changes and growth that often result in significant weight gain (Markey, 2010; Stice, Maxfield, & Wells, 2003). According to the DIT (Bigler & Liben, 2006; 2007), these visible changes in weight and individual variations in physical growth rates during the pubertal transition are expected to escalate the psychological salience of “weight” dimension among adolescents. These in turn might trigger adolescents to engage in social categorization processes whereby they group others in terms of this “meaningful” social cue, and then attach different meanings toward them.

Combining rapid physical growth and weight gain, the pubertal transition also brings dramatic neurobiological and hormonal changes that are known to activate adolescents' vigilance to social status. Recent review papers (Eisenegger, Haushofer, & Fehr, 2011; Johnson & Carver, 2012) have summarized that testosterone, a HPG-axis hormone that strongly increases during puberty, can create a rapt attention to cues about the causes of social success or failure. This testosterone-cued vigilance to social status and pursuit of positive social evaluation is increasingly supported by neuroimaging studies (Crone & Dahl, 2012; Forbes & Dahl, 2010; Somerville, 2013).

Given these biological contexts during the pubertal transition, one can posit that adolescents might be under the great influence in using inherence heuristic (Cimpian & Salomon, 2014) specifically for searching for causal explanations of what causes one to be socially successful or not. Because a person's weight is perceptually salient and highly relevant for gaining admiration or avoiding humiliation, it makes a prime candidate for being involved in a strong causal lay theory. However, to date there is no empirical evidence showing whether pubertal transition fundamentally alters adolescents' mental representations about the link between weight and social status (and we do not provide it here).

### **Peer Socialization and Socio-Contextual Factors**

Along with biological contexts that adolescents experience through the pubertal development, there are socio-contextual changes that might contribute to escalate adolescents' sensitivity to peer social status. Past studies (Barber, Eccles, & Stone, 2001; Coleman, 1961; Crosnoe, 2011; Eckert, 1989) that examine adolescent cultures often describe teenagers' common social struggles with fitting into peer groups while seeking out desirable social designations that distinguish themselves from the crowds with a unique social identity (e.g., "jocks", "cool", "populars"). In this regard, Brown and colleagues

(1994) note that adolescents tend to create socially construed mental representations of peer identities as “symbolic categories” that help them discern who is friend or foe in their local environments. If true, such mental representations about better or worse social categories that adolescents put themselves or others into might lead them to develop lay explanations about what gets them a better social designation.

Connecting this with weight, a large volume of past studies has investigated the role of peer socialization processes in shaping adolescents’ weight-related cognitions and behaviors (Hutchinson & Rapee, 2007; Paxton et al., 1999; Rancourt et al., 2014; Webb & Zimmer-Gembeck, 2013). Most of these studies highlight peers’ weight-related social evaluation and sanction as important aspects of peer socialization processes that intensify the psychological salience of weight in adolescence. For instance, according to a meta-analytic review (Webb & Zimmer-Gembeck, 2013), fat talk, weight teasing, peer pressure to be thin, peer encouragement to lose weight, weight bullying, and appearance conversations are the kinds of inputs that adolescents commonly receive from peer social environments. Given this, it is not surprising that typically developing adolescents become increasingly aware of weight as an important social proxy for desirable social places and peer acceptance.

Taken together, it is our notion that adolescence is a sensitive developmental timing that accompanies pubertal transition and related neurobiological and socio-contextual changes. These biological and social contingencies might lead post-pubertal adolescents to actively construct or revise causal lay theories about weight and social status and apply them in various contexts of social information processing. Therefore, in the present study, we test our initial theoretical model with post-pubertal adolescents and young adults who might have formed coherent lay theories about weight causing social status.

## THE PRESENT STUDY

Building on the research summarized above, we conceptualize a developmental, mechanistic process model of the lay theories about weight and social status (see Figure 1). For the purpose of the current study, we initially test whether adolescents' and young adults' mental representations about weight and social status might manifest in each step of the model: (1) probabilistic judgment (see step *a* in Figure 1), (2) social categorization (see step *b* in Figure 1), and (3) causal attribution (see step *c* in Figure 1). In doing so, we use novel social cognitive tasks that are thought to capture individuals' cognitive tendencies to causally link weight and social status, which might be difficult to observe from self-report attitude measures.

First, in probabilistic judgment scenarios (Part 1), we examine whether young individuals expect statistical covariation between a person's weight and social status (step *a* in Figure 1). We use brief person statement scenarios about high school teenagers and test whether participants tend to make different probabilistic judgment about person's social status on the basis of weight cues.

Second, we developed a novel social categorization task (Part 2) to examine individuals' tendencies to categorize people in terms of weight (step *b* in Figure 1). Using the logic of violation of expectation paradigms among adults (Plaks et al., 2005), it is hypothesized that when weight is considered to be a psychologically salient social cue, participants might rely more heavily on weight cues to categorize people and then link social status to these mentally represented weight categories. Such tendencies might be more pronounced when the available social information is incompatible with their held lay theories about weight and social status.

Lastly, our study examines how adolescents might use their lay theories of weight and social status in causal attribution (Part 3). We expect that young individuals might have

tendencies to attend to weight as a potential cause of the negative outcome of social events as meaningful information (step c in Figure 1). When the causes of the events are ambiguous, such attributional tendencies might favor thin individuals over heavier individuals based on a lay explanation that being thin causes higher social status whereas being overweight causes lower social status. To test this, we manipulate actors' perceived weight within individuals, and then measure overall tendencies of causal attribution as a function of target's weight status.

## METHODS

### PARTICIPANTS

The present study includes two sample age groups: 9th grade adolescents (N=80) and college students (N=203). 9th grade adolescents were enrolled from a public high school in California and participated in a school field study during English or Health Education classes. Of 80 ninth grade students, 56.3% were girls ( $M_{age} = 14.6$ ,  $SD_{age} = 0.54$ ). 43.8% were European-American, 36.3% were Asian, 7.5% were Latino/Hispanic, 2.5% were African-American, 8.8% were multiracial or other ethnicity. According to self-reported body mass index (BMI), 21.3% were underweight (BMI below 18.5), 63.8% were normal weight (BMI between 18.5 and 25), 11.3% were overweight (BMI between 25 and 30), and 2.5% were obese (BMI greater than 30).

In parallel with the school field research, a total of 206 college students were recruited from an undergraduate psychology research course in the University of Texas at Austin during Fall 2014-Spring 2015 academic year. College students participated in a 1-hour laboratory study in an exchange of course credit. There were no exclusion criteria in terms of participants' sex, ethnicity, school year, or body mass index. However, three participants who are age of 30s and 40s were screened out from the final analyses due to age range differences from typical college students sample. Of 203 students, sixty-one percent were college freshmen ( $M_{age} = 19.3$ ,  $SD_{age} = 0.95$ ). Sixty-seven percent were women, 47.6% were European- American, 21.8% were Asian, 19.9% were Hispanic/Latino, 4.4% were African-American, and 4.9% were multi-racial or other ethnicity. According to participants' measured BMI of college students sample, 6.4% were underweight, 72.9% were normal weight, 13.3% were overweight, and 6.9% were medically obese. The research protocols were approved by the institutional research review board and a written



form of consents and assents were collected prior to the study. Only those who agreed to consent to the study were instructed to complete the study activities.

## **PROCEDURE**

The study was conducted in laboratory and school classrooms for different age groups of participants. First, for 9th grade adolescents sample, we administered a school field study in English or Health Education classes during the Spring semester of 9th grade. Participants were invited to school computer labs for a single study session (approximately 45 minutes). Cardboard dividers were set up between seats in order to protect students' privacy as well as minimize disruption between adjacent peers. Following brief verbal instructions about the study purpose and procedures, students were asked to log in the online survey using their student ID and then complete the study materials privately at their own pace. Once participants completed the survey, they were redirected to computerized tasks that assess their social information processing tendencies in presence of weight and status cues. These computerized tasks were programmed and administered on the Inquisit Millisecond software (Millisecons, 2003) which allows a highly precise recording of reaction time. In the beginning of each task, participants were presented with detailed task instructions and then asked to complete several practice trials. Those who did not consent to the study or chose to withdraw were instructed to work on their own homework or reading quietly.

College student participants were invited to the laboratory for their individual study session. Following brief verbal instructions about study purpose and procedures, participants were brought to a small computer lab and then were asked to complete a self-report online survey questionnaire privately at their own pace. Same as the school field study, a number of computerized social cognitive tasks followed with detailed instructions. Upon the completion of the computerized tasks, college student participants were led to

another room across the hallway for weight and height assessment. Weight and height measurements were privately done with a trained experimenter to prevent any psychological discomfort. After the completion of weight/height assessment, participants were thanked and offered a snack.

Of importance, throughout the study, experimenters did not mention that the study was related to weight or social status as we expect that such explicit instructions can affect participants' general response tendencies.

## **MEASURES**

### **Weight-Social Status Probabilistic Judgment Scenarios**

To examine young individuals' tendencies to use lay theories about weight and social status in probabilistic judgment, we used two vignettes for heavy vs. thin teenage girls. Using these vignettes, we measured participants' overall tendencies to infer target person's social status based on limited social information that includes weight cues (see Appendix A). First, a heavy target vignette reads:

“Hanna is 15 years old, outgoing and very bright. She is somewhat taller than other girls, and she is somewhat heavy. She enjoys writing and is interested in news articles. As she works on the school announcements team, she often meets with other students in her school and interviews their stories.”

After reading this vignette, participants were asked to estimate how likely or unlikely each of the statements could reflect Hannah's personal characteristics using numeric values ranging between 0 (= extremely unlikely) and 100 (= extremely likely). Among six statements presented, we are primarily interested in probabilistic judgment made on three social status-relevant statements: “Hannah is very popular”; “Hannah doesn't have a boyfriend”; and “Hannah is very popular and doesn't have a boyfriend”. Similarly, in a thin target vignette, participants read a brief story as follows:

“Jennie is 16 years old, adventurous and very caring. She has average height in her age, and she is quite slim and skinny. She enjoys comedy movies and is interested in filming. As a member of the school movie club, she often goes out to watch movies with other club members, and posts reviews in her personal blog.”

The order of heavy vs. thin target vignettes was randomized. Responses on the statement “*Hanna/Jennie doesn’t have a boyfriend*” were reversed, so that higher probability corresponds to higher social status inferred based on the given person descriptions. Greater differences in the estimated probability between thin and heavy targets indicate participants readily use their lay theories about weight and social status to make statistical inference about unfamiliar teenagers’ social status.

### **Weight Social Categorization Task**

It is hypothesized that one’s lay theories about the relation of weight and social status might operate as mental representations and are used in categorizing people in terms of weight and social status dimensions. In particular, we expect that when individuals are presented with social cues deemed to be neutral and consistent with their mental representations (e.g., “an overweight person likes to go to concerts”), they might be less likely to use weight cues to categorize people. However, when individuals are confronted with social information that are inconsistent with their mental representations (e.g., “an overweight person is popular among peers”), it might induce a shift in the kind of strategies they use to categorize people. That is, they might resolve this cognitive conflict by relying more heavily on weight cues as meaningful social categories that convey some inherent traits about a person.

To test this, we developed a novel social categorization task. The task design was informed by Diesendruck and haLevi (2006). In the task, participants were presented with three different person cards that describe a novel peer’s personal characteristics that are either social status-relevant (e.g., “*Julie has many friends.*”; “*Ashley always got invited to*

*parties*") or neutral (e.g., "*Daniel enjoys running.*", "*Brittany loves animals*"). In terms of weight cues, we systematically adapted body illustration images from a medical BMI chart to display a person figure for thin vs. heavy categories. Stimuli stature, body posture, appearance, and skin tone were held constant in order to minimize other confounding visual factors. See Appendix B.

Using these person sorting card stimuli, participants were asked to make a spontaneous sorting judgment in terms of whether the target person in the center goes with either left or right card person. Importantly, the target person always shares a similar weight status with only one option card, whereas the personal character descriptor was matched to the remaining option card to create a choice conflict. The trial sequence and the position of left/right option cards were randomized. There are a total of 16 actual trials that are broken by target's weight status (heavy/thin), statement (popularity/neutral), and gender (female/male). 4 neutral control trials were added to match in terms of t-shirt colors (green/purple) as alternative visual cues that are non-weight yet perceptually salient. A number of practice trials with neutral visual and written cues were given prior to the actual trials.

Responses were recorded and analyzed in terms of the % of weight cue sorting in different trial conditions and corresponding average latency of sorting in milliseconds. We hypothesized that young individuals on average might refrain from using weight cues to categorize people in neutral statement condition, in which other person statements rather than weight cues share a common attribute to form a group (e.g., "*Robert loves animals*" and "*Aaron has cats and dogs*"). However, in popularity statement condition, individuals' held lay theories about weight and social status are challenged with incompatible information (e.g., a heavy looking person has many friends), and thus induce a shift in social categorization strategies, indicated by increased use of weight cues in social

categorization. In terms of reaction time, it is expected that people's mental processing time (*ms*) would take longer in heavy target-popularity statement trials, as they resolve cognitive conflict between weight and social status cues.

As in many other cognitive tasks, we found that raw latency was significantly skewed, a Shapiro-Wilk normality test  $W=.599, p=.000$ . Therefore, we trimmed extreme values (greater than 2SD, or below 100ms), and then transformed the trimmed values with square root. This improved the normality issues of the latency variable, a Shapiro-Wilk normality test  $W=.975, p=.000$ . See Appendix X for visual examination of latency variable distribution. See appendix for visual examination of the latency distribution.

### **Weight Attribution Task**

In contexts of weight and social status, it is our notion that post-pubertal adolescents might have already formed coherent lay theories and use them when interpreting the causes of social events. For instance, when a teenager witness ambiguous social rejection from their peers, he or she might attribute that to person's inherent characteristics (e.g., "S/He must be not likable") or some other situational factors that are not fully known. One way to test this hypothesis is to manipulate targets' perceived weight status and then measure how young individuals attribute causally ambiguous yet negative events to either person traits (dispositional attribution) or situation (external attribution) depending on the target's perceived weight. We adapted an ambiguous social cue task (Flagan & Beer, in prep) that assesses individuals' attributional judgment in various causally ambiguous social contexts.

The present task consists of four phases: attention fixation (2 seconds), target weight manipulation (3 seconds), ambiguous scenario (3 seconds), and attribution probe question (6 seconds). To manipulate actor's perceived weight and attractiveness, we first selected twenty stock photo images of teenage girls and young female adults with varying degrees of attractiveness, weight, and ethnicity. To create two distinctive weight status

categories (heavy vs. thin) within same target stimuli, we retouched these images using Photoshop software. Mechanical Turk online survey respondents ( $N=55$ , 64.3% female,  $M_{\text{age}}= 26.3$ ) rated these retouched images in terms of perceived weight status, attractiveness, popularity, and age. Based on the average rating scores, we selected 6 highly attractive female images ( $M_{\text{attractiveness}}=5.81$ ) that are manipulated to be heavy ( $M_{\text{weight}}=5.50$ ) or thin ( $M_{\text{weight}}=3.81$ ) in terms of weight, and other 6 female images with average attractiveness ( $M_{\text{attractiveness}}=4.33$ ) that are manipulated to be heavy ( $M_{\text{weight}}=5.43$ ) or thin ( $M_{\text{weight}}=3.82$ ). See Appendix D for weight manipulation stimuli.

There were a total of 12 attribution judgment scenarios in contexts of peers, romantic relationships, and public social interactions. For instance, a romantic relationship scenario reads:

“Haley texts her crush to ask if he wants to go out for a movie this evening. She sees that he read the message but did not reply yet.”

These scenarios were randomly paired with female target stimuli—heavy/highly attractive, heavy/average attractive, thin/highly attractive, thin/average attractive targets. Participants were instructed to make a spontaneous attribution judgment with regard to whether the cause of the ambiguously negative social event is due to the person (e.g., “*doesn’t want to go*”) or the situation (e.g., “*no time to reply*”) by pressing “F” (left) or “J” (right) keys using the keyboards. Across all trials, four levels of randomization were implemented: (1) individual trial sequence; (2) heavy vs. thin target image selection within same targets; (3) scenario assignment to individual targets; and (4) the left/right position of response options. See Appendix E.

Responses were recorded in terms of the direction of attribution (person vs. situation blame) and corresponding reaction time ( $ms$ ). The average score of attribution in each trial block was computed so that 1= all situation/non-dispositional attribution and -1=

all person traits/dispositional attribution. We expected that if young individuals hold lay theories about weight and social status, their attributional tendencies might be affected as a function of targets' perceived weight status. Therefore, we contrasted attribution scores between thin and heavy target trials. Greater differences in composite scores indicate more negative, dispositional (person traits) attribution toward heavy young women relative to slender young women.

### **Body Mass Index**

We assessed participants' weight and height in the laboratory study in order to understand sample characteristics with respect to body mass index. Prior to measurement, participants were asked to take off shoes and heavy outers for measurement precision. First, in weight assessment, participants were given a box to hold and then stand on a digital weight scale to obscure their measured weight (Logel & Cohen, 2012). To compute participant's actual weight in *kg*, box weight (*5kg*) was subtracted from the measured weight in *kg*. Next, for height assessment, participants were instructed to stand against a stature scale. Measurement was recorded in *cm*. For school field study with high school adolescents, we used self-reported weight and height to compute BMI and corresponding BMI categories.

According to the Center for Disease Control and Prevention guidelines (Kuczmarski et al., 2002), a simple formula for BMI is weight (*kg*) divided by squared height (*m*). Using this formula, we computed individual participants' BMI using a measured weight (*kg*) and height (*m*). The measured BMI was further classified into four BMI status categories: underweight (BMI under 18.5), normal (BMI between 18.5 and 25), overweight (BMI between 25 and 30), and obese (BMI greater than 30).

We do not hold predictions that only young individuals with certain weight range would develop causal lay theories about weight and social status. Rather, we view that the

formation of causal lay theories about weight and social status might be somewhat universal. Consistent with this, participants' BMI did not significantly predict their responses on the social cognitive task,  $P_s > .10$ . Therefore, in the analysis we do not include BMI as a statistical covariate.



## RESULTS

In the present study, we conducted data analysis with SPSS ver. 23 for Mac software. As our primary focus of analysis was to test the mean differences of participants' responses between overweight and thin stimuli conditions, we mainly used a series of pairwise *t*-tests to contrast the mean levels between heavy vs. thin stimuli trials according to our hypotheses. In pairwise *t*-tests, we did not control for the mean differences attributable to participants' own gender and BMI as pairwise *t*-tests do not permit statistical covariates. When age differences appeared to emerge between the adolescents and college samples, we conducted a repeated measures of ANOVA by entering AGE (adolescents vs. college sample) as a between subject grouping factor and treating responses on the tasks as repeated measures within subjects.

### **PART 1: WEIGHT-SOCIAL STATUS PROBABILISTIC JUDGMENT**

We examined whether high school adolescents and young adults on average tend to pick up on statistical associations between one's weight and social status and use them to infer teenage girls' social status differentially based on weight cues. Specifically, we contrasted the differences in the average % of the target being estimated to be popular in heavy vs. thin target scenarios. The ratings for the item "*she doesn't have a boyfriend*" were reversed so that higher values indicate a higher social status. Consistent with our hypothesis, pairwise *t*-tests indicated that both 9th grade adolescents and college adults on average tend to say that thin female targets are more likely to be very popular ( $M_{\text{thin}}=57.38\%$ ,  $SD_{\text{thin}}=23.01$ ,  $M_{\text{heavy}}=44.84\%$ ,  $SD_{\text{heavy}}=23.75$ ,  $t(79)=5.10$ ,  $p=.000$  for adolescents;  $M_{\text{thin}}=56.18\%$ ,  $SD_{\text{thin}}=19.03$ ,  $M_{\text{heavy}}=48.19\%$ ,  $SD_{\text{heavy}}=21.75$ ,  $t(201)=4.60$ ,  $p=.000$  for college adults), and more likely to have a romantic partner ( $M_{\text{thin}}=70.62\%$ ,  $SD_{\text{thin}}=20.47$ ,

$M_{\text{heavy}}=54.19\%$ ,  $SD_{\text{heavy}}=25.68$ ,  $t(76)=4.86$ ,  $p=.000$  for adolescents;  $M_{\text{thin}}=64.56\%$ ,  $SD_{\text{thin}}=20.95$ ,  $M_{\text{heavy}}=49.63\%$ ,  $SD_{\text{heavy}}=18.61$ ,  $t(201)=7.51$ ,  $p=.000$  for college).

Interestingly, the mean level differences between heavy and thin target scenarios were greater when the statement was somewhat mixed in terms of social status—“*she is very popular and doesn’t have a boyfriend*”,  $M_{\text{thin}}=76.13\%$ ,  $SD_{\text{thin}}=22.12$ ,  $M_{\text{heavy}}=36.09\%$ ,  $SD_{\text{heavy}}=22.20$ ,  $t(79)=12.96$ ,  $p=.000$  for adolescents;  $M_{\text{thin}}=73.62\%$ ,  $SD_{\text{thin}}=20.93$ ,  $M_{\text{heavy}}=45.00\%$ ,  $SD_{\text{heavy}}=20.90$ ,  $t(201)=12.96$ ,  $p=.000$  for college adults. Further, there appeared no significant gender differences across all responses,  $P_s > .10$ , suggesting that the tendencies to recall the statistical associations between weight and social status might not differ across gender groups. See Figure 2.

## **PART 2: WEIGHT SOCIAL CATEGORIZATION**

Though probabilistic judgment tendencies shown in Part 1 provide some initial evidence that both adolescents and young adults readily reference weight cues and form impression about others with regard to social status, the measures did not fully control for other social information that might be equally important in social evaluation process. Moreover, it remains unclear how participants reconcile multiple social cues that may or may not be consistent with their lay theories about weight and social status. To address this question, we used a novel social categorization task that pairs visual weight cues with social status statements and then systematically dissect how participants engage in social categorization with cues that are inconsistent with lay theories. In doing so, we hypothesized that participants would suppress their overall tendencies to use weight cues in categorizing people. However, such cognitive styles might be challenged in popularity statement trials in which an overweight person is classified into a “popular” category with a skinny person. To test this hypothesis, we first looked at the average % of weight cue

social categorization in heavy/popular, heavy/neutral, thin/popular, thin/neutral, t-shirt color/neutral statement trials.

### **Weight social categorization tendencies**

As expected, we found a significant difference in the average % of weight cue sorting between popularity statement trials (e.g., “*always gets invited to parties*”, “*has many friends*”, “*is the captain of football team*”) and neutral statement trials. That is, when the visual weight cue-based matching was conflicting with popularity cue-based matching, participants were more likely to use weight cues to categorize people into a same group compared to neutral statement trials,  $M_{pop}=0.22$ ,  $SD_{pop}=0.23$ ,  $M_{neu}=0.10$ ,  $SD_{neu}=0.19$ ,  $t(73)=6.945$ ,  $p=.000$  for adolescents;  $M_{pop}=0.27$ ,  $SD_{pop}=0.19$ ,  $M_{neu}=0.07$ ,  $SD_{neu}=0.15$ ,  $t(201)=16.69$ ,  $p=.000$  for college adults. Further, we tested the effect of target weight status (heavy vs. thin) on the % of weight-based social categorization. In both adolescents and college adults sample, participants were slightly more likely to categorize people in terms of weight cues rather than popularity cues when the target was thin than the target was heavy,  $M_{heavy-pop}=0.19$ ,  $SD_{heavy-pop}=0.23$ ,  $M_{thin-pop}=0.26$ ,  $SD_{thin-pop}=0.30$ ,  $t(73)=-2.16$ ,  $p=.034$  for adolescents;  $M_{heavy-pop}=0.24$ ,  $SD_{heavy-pop}=0.18$ ,  $M_{thin-pop}=0.31$ ,  $SD_{thin-pop}=0.27$ ,  $t(201)=-3.43$ ,  $p=.001$  for college adults. However, it is important to note that the average % sorting in terms of weight cues in popularity statement trials was significant lower than the chance level,  $t(73)=10.50$ ,  $p=.000$  for adolescents;  $t(201)=16.66$ ,  $p=.000$  for college sample, suggesting that a tendency to suppress weight-based social categorization. See Figure 3.

### **Target gender effects in weight social categorization**

Are individuals’ lay theories about weight and social status more potent toward women than men? To test this, we compared female vs. male target cards trials. Results indicated significant target gender differences in heavy target-popularity statement trials,

$M=0.26$ ,  $SD=0.31$  for female/heavy target-popularity statement trials,  $M=0.11$ ,  $SD=0.24$  for male/heavy target-popularity statement trials,  $t(73)=4.49$ ,  $p=.000$  for adolescents sample;  $M=0.38$ ,  $SD=0.27$  for female/heavy target-popularity statement trials,  $M=0.11$ ,  $SD=0.22$  for male/heavy target-popularity statement trials,  $t(201)=11.83$ ,  $p=.000$  for college sample. In thin target-popularity statement trials, target gender differences were found only in college sample,  $t(73)=0.00$ ,  $p=1.00$  for adolescents sample;  $t(201)=2.401$ ,  $p=.017$  for college sample. The target gender effects in social categorization tendencies implicate that young individuals are more prone to use their lay theories about weight and social status toward overweight females than overweight males. See Figure 4.

### **Latencies in weight social categorization**

We hypothesized that weight cues-popularity statement trials would violate individuals' held lay theories about weight and social status, therefore average sorting judgment time would take longer in popularity statement trials than neutral statement trials, indicated by greater values in latency (*ms*, square root transformed). Supporting this hypothesis, results showed that both adolescents and college samples exhibit slower latencies in popularity statement trials than neutral trials,  $M_{pop}=64.93$ ,  $SD_{pop}=10.68$ ,  $M_{neu}=59.91$ ,  $SD_{neu}=10.16$ ,  $t(73)=5.98$ ,  $p=.000$  for adolescents;  $M_{pop}=63.01$ ,  $SD_{pop}=9.08$ ,  $M_{neu}=55.71$ ,  $SD_{neu}=8.53$ ,  $t(201)=17.76$ ,  $p=.000$  for college adults. In terms of target weight status (heavy vs. thin) effects in sorting latency, we found significantly slower latencies in popularity statement trials compared to neutral trials for both heavy and thin target trials,  $Ps=.000$ . Also, participants were significantly slower in weight status (heavy vs. thin) trials compared to neutral control trials with t-shirt color cues (green vs. purple),  $Ps=.000$ . This rules out the possibility that any visual cues that are conflicting with statements might induce longer processing time. See Figure 5.

### **PART 3: WEIGHT ATTRIBUTION**

In spite of findings in Part 1 and 2 that are consistent with our prediction, one might contend that probabilistic judgment and social categorization could possibly operate under a pure mental association between one's weight status and social status that are not necessarily a causal relationship per se. In other words, it is possible to argue that young individuals do not hold a particular causal lay theories about how different weight status causes different social status, rather they are simply aware of statistical associations between two meaningful social dimensions. Therefore, it is important to manipulate target person's perceived weight status and then assess how participants use their mental representations to come up with different causal explanations for ambiguous social events depending on targets' perceived weight. In this regard, past studies have shown that overweight women are vulnerable to make self-blame attribution in the face of negative social feedback and this self-blaming attribution elicits negative affects and lower self esteem (Crocker et al., 1993; Major et al., 2012). However, to our knowledge no prior studies have investigated whether and to what extent a third person's perceived weight status produces different causal explanations for ambiguously negative social events. In light of this, in Part 3, we tested whether adolescents' and young adults' lay theories about weight and social status engender more negative dispositional (person traits) vs. situational causal explanations for heavy vs. thin female targets.

The aggregated attribution composite scores in the weight attribution task ranged between -1 (= all person traits/dispositional attribution) and 1 (= all situation/non-dispositional attribution). Repeated measures ANOVA was conducted to determine age differences between adolescents and college sample in causal attribution as a function of targets' perceived weight status (heavy vs. thin). In terms of model specification of the repeated measures of ANOVA, we entered participants' attribution scores on heavy vs.

thin target trials as within subjects repeated measures, and then included AGE (adolescents vs. college) as a between subjects group factor. No statistical covariates—such as gender or BMI—were entered as they appeared non-significant.

Results indicated a significant interaction of AGE x Target Weight,  $F(1, 278)=6.749, p=.01$ . To further determine the direction of interaction, pairwise  $t$ -tests were conducted within age group. In adolescent sample, causal attribution tendencies did not significantly differ between heavy and thin target trials,  $M_{\text{heavy}}=.19, SD_{\text{heavy}}=.49, M_{\text{thin}}=.17, SD_{\text{thin}}=.39, t(74)=0.293, p=.77$ . In contrast, college adults were more likely to attribute ambiguously negative events to negative, dispositional (person traits) reasons for heavy target relative to thin target trials,  $M_{\text{heavy}}=.11, SD_{\text{heavy}}=.42, M_{\text{thin}}=.09, SD_{\text{thin}}=.39, t(201)=5.098, p=.000$ . We did not find significant 3 way interaction of AGE x GENDER x Target Weight,  $F(1, 276)=0.56, p=.455$ . See Figure 6.

Next, we examined whether adolescents' and young adults' lay theories about weight and social status are selectively applied to different social contexts: peers, romantic, and public social interactions. In the adolescent sample, we did not find any significant differences in attributional tendencies between thin vs. heavy target across peer, romantic, and public contexts,  $P_s > .20$ . However, college adults exhibit significant mean level differences in all three types of social context scenarios, and the mean differences between heavy and thin target conditions were the greatest in romantic contexts (mean difference between heavy vs. thin targets in peer contexts=.163,  $t(201)=2.252, p=.025$ ; mean difference in romantic relationship contexts=.282,  $t(201)=4.299, p=.000$ ; mean difference in public interaction scenarios=.139,  $t(201)=2.081, p=.039$ ). Taken together, our hypothesis in weight causal attribution task was only supported in college adults sample. See Figure 7.

## DISCUSSION

Despite heightened societal and public awareness of population level obesity rates and its psychological implications in contemporary life, surprisingly little developmental research has been conducted in an effort to understand the development of one's lay theories about weight or the potential link between weight and social status. This gap in the literature might be in part because of our common view that weight is not a psychological trait, but rather a biological entity that does not load with psychological meanings. As a consequence, existing literatures primarily focus on investigating "weight" through the lens of stigma and stereotypes against overweight individuals (Crocker et al., 1993; Major et al., 2012; Puhl & Heuer, 2009), or body/weight dissatisfaction and clinical eating disorders (Stice & Bearman, 2001; Stice & Shaw, 2002; Stice, Mazotti, Weibel, & Agras, 2000). Unfortunately, this relatively independent theoretical and empirical pursuit in existing literatures on weight did not provide a substantial explanation on how individuals' understanding of the psychological concept of weight develop and change over time as a fundamental developmental inquiry. Further, little is known in terms of why adolescents and young adults who are in a healthy weight range are chronically concerned with their weight and pursue extreme weight loss behavior.

In light of this, the present research attempts to conceptualize the development of causal lay theories about weight and social status. As an initial test, we examine post-pubertal adolescents and young adults who might have already formed coherent causal lay theories that concern the relation between weight and social status. Drawing on Developmental Intergroup Theory (DIT; Bigler & Liben, 2006; 2007), we posit that perceptual discriminability of weight cues are likely to induce the psychological salience of this person attribute among other social dimensions, which might lead to engender individuals' cognitive tendencies to use this salient person attribute to categorize people

and attach meanings toward individuals who share similar characteristics in weight. Further, our central thesis is that adolescents and adults might come to establish causal lay theories in an attempt to explain the relation between weight and social status, and use that to make sense of the world and guide their actions. To demonstrate whether and how young individuals use their lay theories about weight and social status in judgment of others, our study examines probabilistic judgment (Part 1), social categorization (Part 2), and causal attribution tendencies (Part 3) in the presence of weight and social status cues.

In probabilistic judgment scenarios (Part 1), findings support our predictions that both adolescents and young adults are able to detect statistical covariation between weight and social status and use this statistical covariation to make probabilistic inference about others' social status. This tendency was expressed in overestimating one's social status when the person is described as skinny, while underestimating one's social status when the person is illustrated as heavy. It is important to note that this measure was completed in the beginning of the self report survey, before participants are exposed to any written or visual weight cues in other measures. This implicates that post-pubertal adolescents are able to quickly form impressions about others' social status based on their mental representations about weight and social status and its statistical covariation in the real world. This is consistent with the inherence heuristic (Cimpian & Salomon, 2014) and essentialism literatures (Gelman, 2003; Gelman, 2004; Gelman et al., 2007; Heyman & Gelman, 2000) which showed individuals' cognitive tendencies to quickly search for inherent features of an entity and use that to infer novel information about the entity.

Next, in social categorization task (Part 2), our findings reveal interesting tendencies that both adolescents and college adults are more likely to rely on weight cues in judgment of others' social status and use that to categorize people. However, when other competing cues were irrelevant to social status, participants shifted their sorting strategies,



so that they now group people based on shared characteristics (e.g., interest), rather than visibly similar weight cues. This supports our prediction that individuals' lay theories about weight and social status ("*weight causes certain social status*") would elicit cognitive conflict when presented with sorting cards that are incompatible with their held theories (e.g., "*overweight person is popular/has many friends*"). Under this popularity statement condition, to categorize people in terms of written statements would violate their understanding of the world (e.g., the skinny and the overweight go into the same popular social group), therefore they are likely to turn to weight cues to assign a mental categorization. In line with this, our findings in sorting latency differences also support this notion that participants might have felt more of a processing load in weight-popularity trials relative to weight-neutral statement trials.

This social categorization tendency in weight-social status (Part 2) has a number of important implications. First, according to the DIT (Bigler & Liben, 2006; 2007) and intergroup attitude literatures (Apfelbaum, Pauker, Ambady, Sommers, & Norton, 2008) with regard to race, individuals' tendencies to explicitly reference racial groups are suppressed by the age of 8-9. Specifically, Apfelbaum and colleagues (2008) have shown that school children compared to preschoolers begin to understand societal norms and existing prejudices against racial minority groups and therefore refrain from explicitly using group-relevant social cues (e.g., "*Is s/he black?*") even in a novel social game context. Similar to this, our study found that adolescents and college adults on average exhibited an overall tendency to suppress their use of weight cues. This was indicated by below chance level weight-based social categorization across different trials. To further understand the extent to which young individuals view weight-based social categorization as a benign or prejudiced form of social cognition, it would be interesting to ask participants to provide their answers to experimenters and then look at how this explicit reporting context might

affect the frequencies of using weight cues in social categorization, compared to the experimental contexts where participants privately complete the task.

Second, our findings in overall sorting tendencies suggest that adolescents and adults do not merely attend to perceptually discriminating cues (e.g., heavy vs. thin body figures, or t-shirt color) that are visually more salient than written statements. Rather, they view this through the lens of their mental representations about the social world and selectively choose between salient and less salient cues to make social categorization. Indeed, this is consistent with the core thesis of social cognitive development framework (Olson & Dweck, 2008) that highlights the role of individuals' mental representations in shaping one's attention and interpretation of social information and as a result creating coherent meaning systems.

Third, it is important to note that these social cognitive tendencies in weight-based social categorization were more pronounced toward overweight female targets compared to their male counterparts. Unlike other tasks and measures, in this minimal set of social categorization task, we show that individuals' lay theories about weight and social status might differ between men and women. This further seems to reflect stronger psychological links between weight and social status toward women than men in our society. In future studies, it would be interesting to test how the measured weight social categorization tendencies predict moral licensing of weight discrimination and stereotypes against overweight females more so than their male counterparts, and how these in turn might be detected by women as a potential source of weight concerns and dissatisfaction.

Finally, in Part 3, we conducted more controlled, causal test of the effects of weight in forming different causal explanations on ambiguous social events. Our prediction was that if young individuals hold lay theories that being skinny causes high social status or being overweight causes lower status, they might come to believe that the reasons for why

a person receives negative social feedback differ depending on their weight—that is, more negative dispositional, person trait attribution for overweight individuals, whereas more situational/non-dispositional blames for slender individuals. We found mixed evidence in the causal attribution task between different age groups. That is, college adults exhibit significantly more negative, dispositional (person traits) causal attribution toward overweight target females in comparison to thin target females across all types of social contexts. However, among the adolescent sample, we did not find supporting evidence in weight-based causal attribution tendencies.

There might be at least two reasons for this. First, it is possible that adolescents on average might not have fully formed coherent lay theories about weight and social status to make differential causal claims based on target's perceived weight. That is, they might be able to detect statistical covariation between different weight status and social status from their environments, but do not necessarily hold strong causal views to believe that weight causes social status. As an alternative explanation, we speculate that adolescent participants might have paid more attention to other cues of the target person stimuli and steered their causal attribution based on their observations. As such example, we found a significant difference of causal attribution as a function of target' attractiveness (high vs. average attractiveness). To disentangle this, future studies are needed with more diverse, large sample of adolescents and with more visible contrast between heavy and thin weight status manipulation.

## **LIMITATIONS**

There are a number of limitations in the present research that are important to consider for future investigation. First, the present research does not include a direct test of specific contents of lay theories of weight and social status. That is, our theoretical predictions do not differentiate between the lay beliefs that “being overweight causes lower

status” and that “being thin causes higher status”. Here, we simply showed that young individuals tend to hold lay theories that “weight causes certain social status”. Therefore, it is possible that one’s lay theories about weight and social status could be multiple forms rather than being one particular content. However, operating under these global lay theories about weight and social status, the present study demonstrated that adolescents and young adults do hold mental representations about the relationship between one’s weight and social status, and tend to apply these lay beliefs in various types of social information processing contexts.

Second, although we are deeply interested in the question of when these lay theories about weight and social status first emerge, and how these lay theories might unfold with development, our study does not directly speak to these important developmental questions. Nevertheless, we posit that pubertal transition might serve as a sensitive time period that brings several important neurobiological and psychological changes. Further, these pubertal transition-associated psychobiological changes might affect objective weight status and physical growth as well as psychological concept around one’s weight and social status (Forbes & Dahl, 2010; Ge et al., 2001; Markey, 2010; Tremblay & Lariviere, 2009). Supporting this conjecture, using representative sample data, Ge and co-authors (2001) have shown that girls’ significant weight gain during the pubertal transition is linked to subjective overweight perception. Therefore, in the future study, it would be important to assess adolescents’ lay theories about weight and social status by comparing pre- and post-pubertal age groups to determine developmental processes.

Last, the tasks and measures used in the present research mostly focus on female targets (Part 1 and Part 3). Thus, the current study does not completely eliminate the possibility that the gendered stimuli (e.g., only showing female scenarios or images) in the task might affect the ways in which individuals interpret the meaning of social cues.

Although most of the existing literatures on weight and weight-related social cognitions disproportionately focus on girls and young women as a high risk group for weight bias/stigma, subjective weight concerns, and clinical eating disorders, it would be more fair tests of the current hypotheses if the tasks included both genders in equal manner. Given this, future studies would greatly benefit from utilizing stimuli for both gender and assessing whether individuals' lay theories about weight and social status are relevant to both female and male targets.

## CONCLUSIONS

Adolescents often receive explicit and implicit messages from peers, romantic partners, popular media, and societies that admire skinny girls and lean body as a meaningful social accomplishment that attracts positive feedback and social reward (Webb & Zimmer-Gembeck, 2013 for meta analytic review). Meanwhile, children and adolescents often witness overweight peers in schools and playgrounds who become constant targets of bullying and social rejection from peer groups. All these social inputs and daily observations from focal environments might continuously influence the ways in which individuals form causal mental representations about who gets popular and who gets not in terms of weight dimension. Building on to this hypothesis, the present research takes an initial step to show that one's mental representations about weight and social status are readily applied in individuals' social information processing and these tendencies can be measured in several domains of social cognitions: probabilistic judgment, social categorization, and causal attribution.

Though the present study mainly focused on demonstrating the existence of lay theories about weight and social status, it is crucial to extend our theoretical inquiries to developmental antecedents and outcomes of these lay theories (see Olson & Dweck, 2008). First, developmental antecedents concern the question of where these lay theories come from. There might be multiple sources of person- and societal-level factors that contribute to crystalize or alter one's lay beliefs about weight and social status. Parenting, media, cultures, peer norms, and individual differences of sensitivity to social status might be a few that are thought to intervene these processes. Identifying critical developmental antecedents and individual difference factors would be an important step toward understanding the architecture of these lay theories with regard to weight and social status.

Finally, like in many other prominent social cognitive developmental theories (Bigler & Liben, 2006; 2007; Dodge et al., 2015; Yeager & Dweck, 2012; Yeager et al., 2011; 2013), one's mental representations about social world are thought to shape behaviors that are relevant to the domain of the lay theories. In this regard, one might posit that one's lay theories about weight and social status might predict one's behavioral tendencies to control weight in an attempt to enhance one's social designation in a valued group. Therefore, it is our hope that future studies might continue to investigate developmental antecedents and outcomes of lay theories of weight and social status in an effort to better understand the implication of these lay beliefs.

## FIGURES

Figure 1. Developmental mechanistic process model of lay theories about weight and social status.

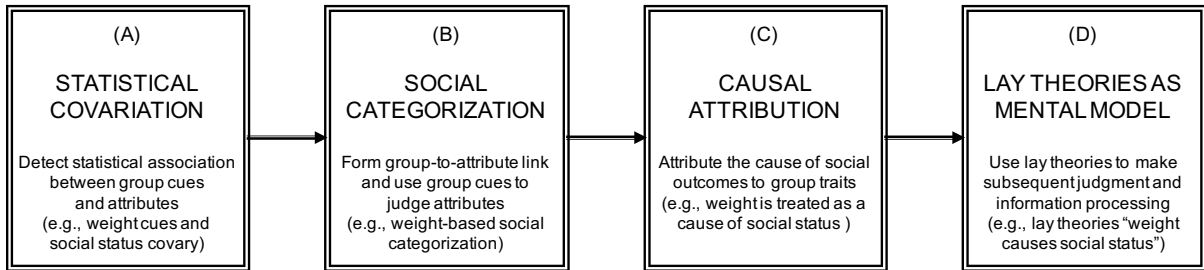




Figure 2. Weight-social status probabilistic judgment in heavy vs. thin target vignettes, broken by age group (Adolescents, N=80; College adults, N=203).

Notes: The statement “has a boyfriend” is a reversed probability score on the original statement “Hannah/Jennie has no boyfriend”. Greater values on y-axis indicate higher social status estimated for the target person. Error bars indicate  $\pm 1$  standard errors. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$ .

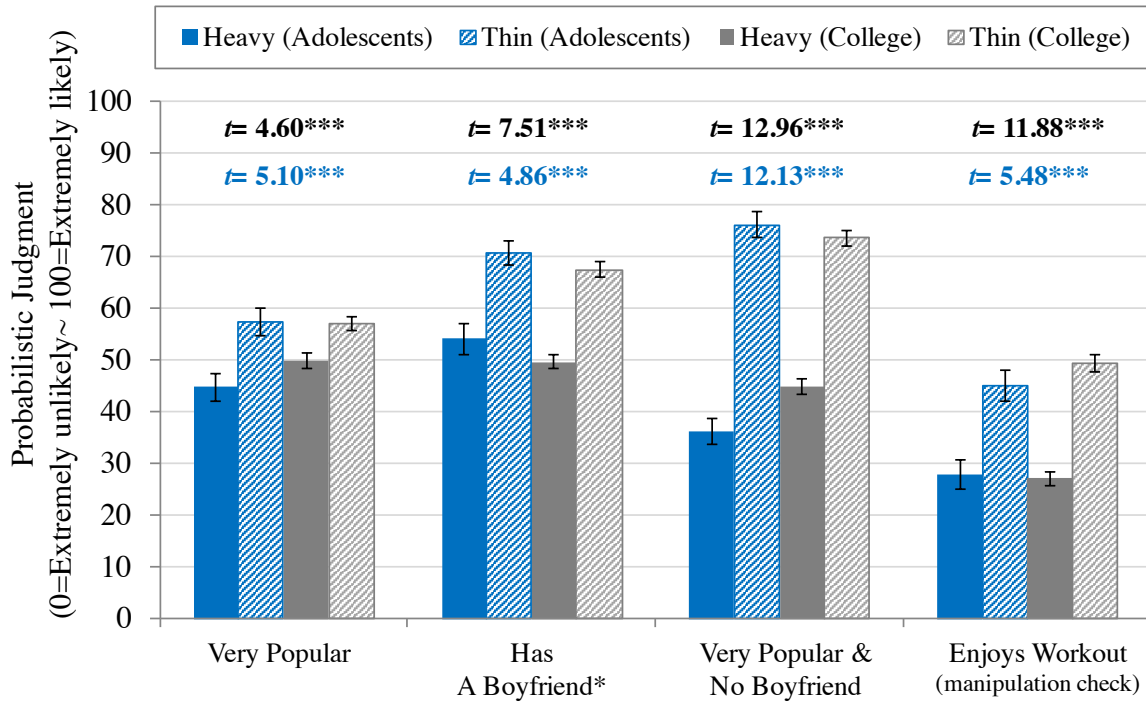


Figure 3. Overall tendencies in sorting novel peers in terms of weight cues in a social categorization task, broken by age group (Adolescents, N=74; College adults, N=203).

Notes: Error bars indicate  $\pm 1$  standard errors. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$ .

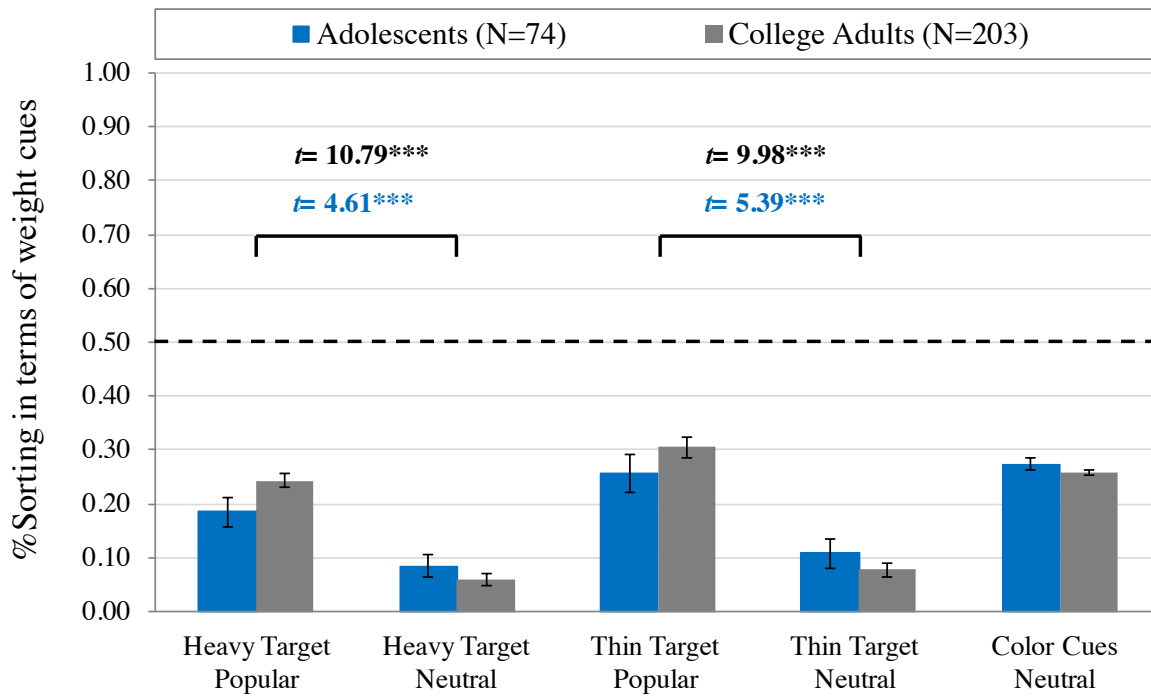


Figure 4. Target gender effects in overall sorting tendencies in terms of weight cues, broken by age group (Adolescents, N=74; College adults, N=203).

Notes: Error bars indicate  $\pm 1$  standard errors. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$ .

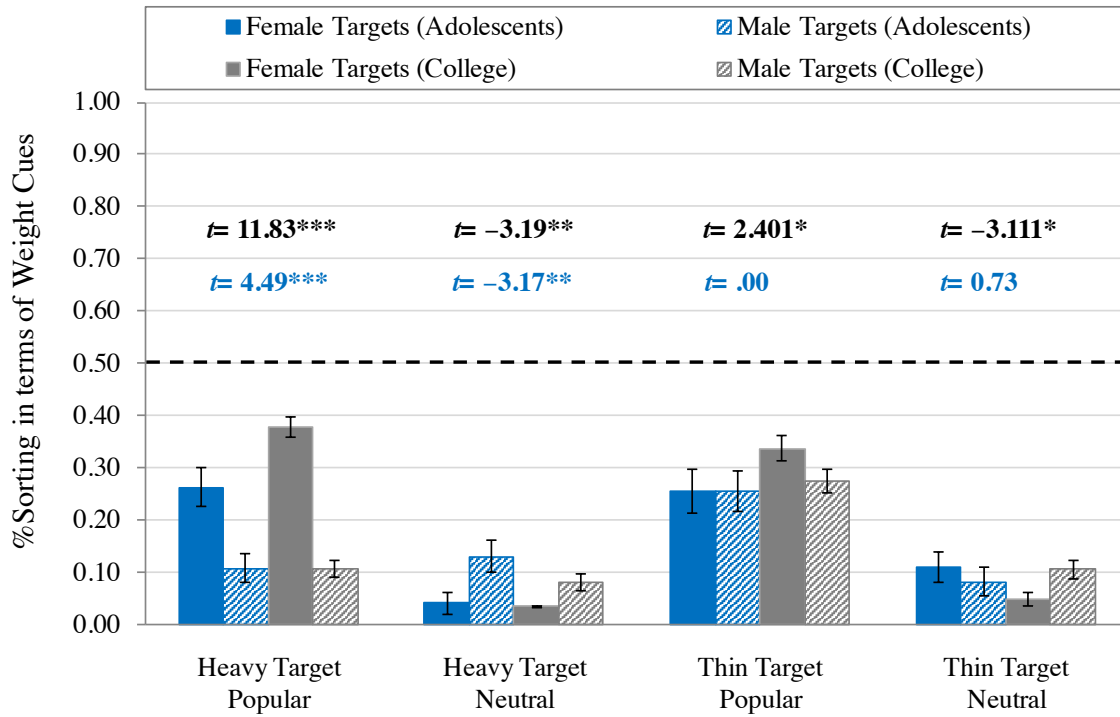


Figure 5. Average latencies in a weight social categorization task, broken by age group (Adolescents, N=74; College adults, N=203).

Notes: Error bars indicate  $\pm 1$  standard errors. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$ .

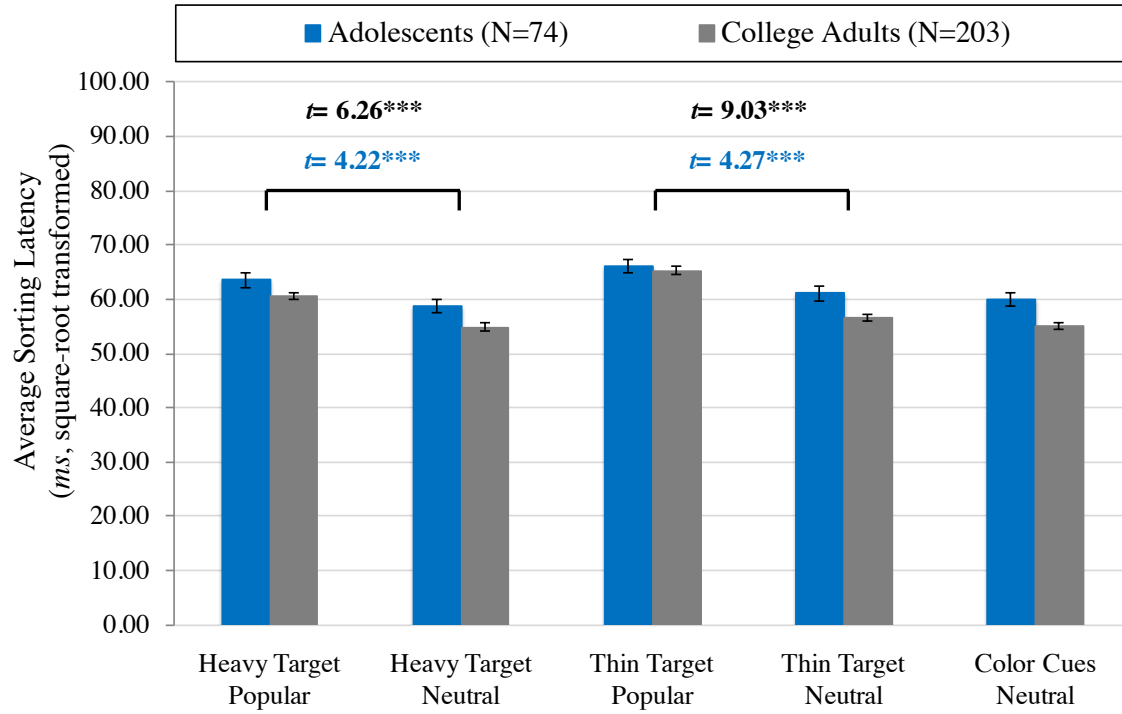


Figure 6. Effects of target weight and attractiveness in causal attribution, broken by age group (Adolescents, N=75; College adults, N=203).

Notes: Error bars indicate  $\pm 1$  standard errors. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$ .

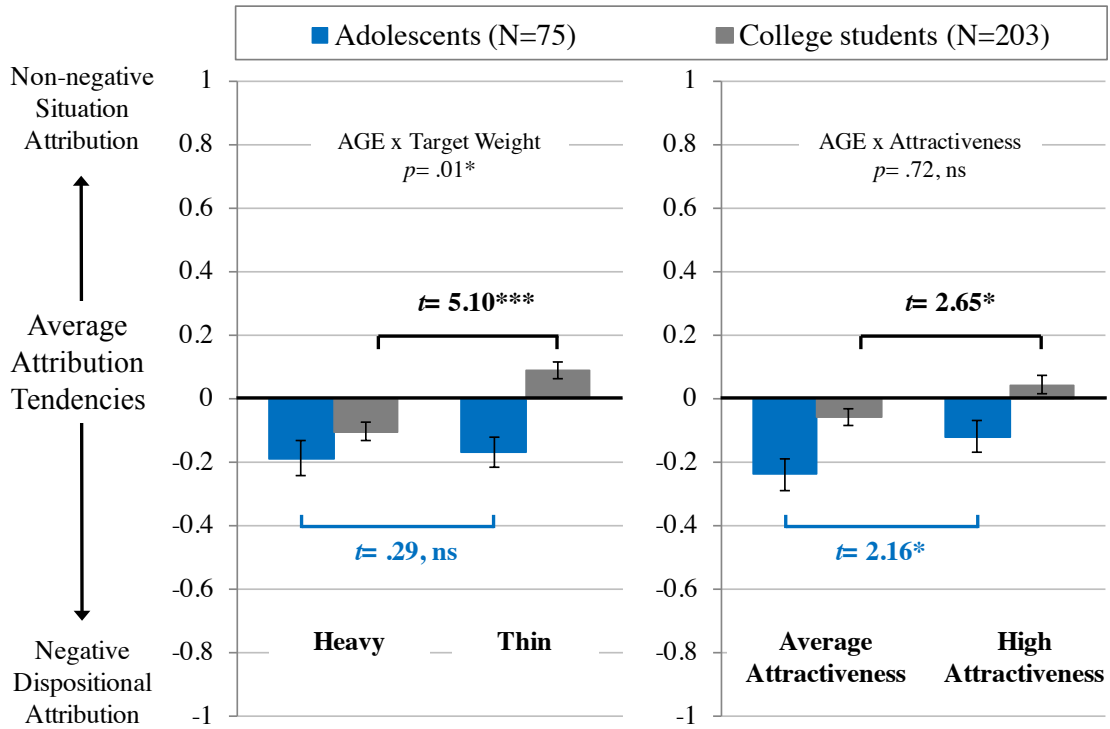
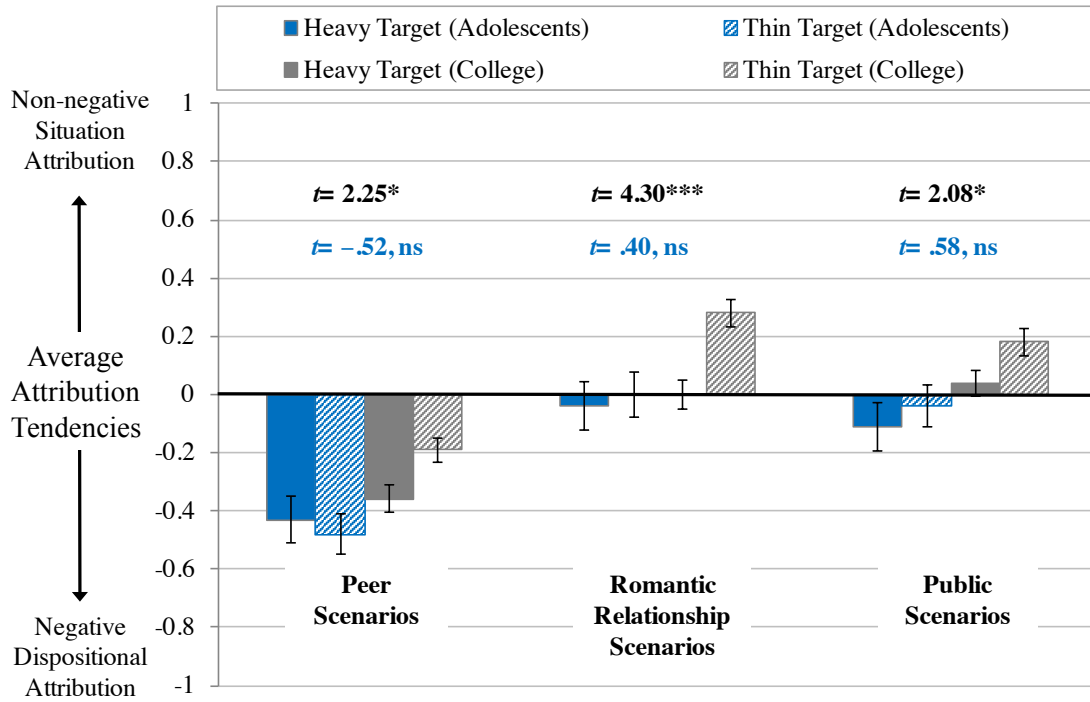


Figure 7. Social context effects in weight attribution (Adolescents, N=75; College adults, N=203).

Notes: Error bars indicate  $\pm 1$  standard errors. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$



## **APPENDICES**

### **APPENDIX A. MEASURE OF WEIGHT-SOCIAL STATUS PROBABILISTIC JUDGMENT**

In the following questions, you will read a brief story about a person and then asked to make guesses about how likely or unlikely each of the statements describe the person.

Please imagine the person in the story, and then answer the question in the following section.

*“Hanna is 15 years old, outgoing and very bright. She is somewhat taller than other girls, and she is somewhat heavy. She enjoys writing and is interested in news articles. As she works on the school announcements team, she often meets with other students in her school and interviews their stories.”*

For each of the statements below, how *likely* or *unlikely* it is that the description could reflect Hannah’s characteristics? Please indicate your opinions in the slide bar between 0 and 100. Drag the bar around to adjust the number.

0 = Extremely Unlikely ~ 100 = Extremely Likely

	0	10	20	30	40	50	60	70	80	90	100
Hannah enjoys workout and goes to the gym every morning.											
Hannah is very popular.											
Hannah wants to become a journalist.											
Hannah doesn't have a boyfriend.											
Hannah volunteers at a local hospital.											
Hannah is very popular and doesn't have a boyfriend.											



In the following questions, you will read a brief story about a person and then asked to make guesses about how likely or unlikely each of the statements describe the person.

Please imagine the person in the story, and then answer the question in the following section.

*“Jennie is 16 years old, adventurous and very caring. She has average height in her age, and she is quite slim and skinny. She enjoys comedy movies and is interested in filming. As a member of the school movie club, she often goes out to watch movies with other club members, and posts reviews in her personal blog.”*

For each of the statements below, how *likely* or *unlikely* it is that the description could reflect Jennie’s characteristics? Please indicate your opinions in the slide bar between 0 and 100. Drag the bar around to adjust the number.

0 = Extremely Unlikely ~ 100 = Extremely Likely

	0	10	20	30	40	50	60	70	80	90	100
Jennie enjoys workout and runs every morning.											
Jennie is very popular.											
Jennie wants to become a movie director.											
Jennie doesn't have a boyfriend.											
Jennie volunteers at a local library.											
Jennie is very popular and doesn't have a boyfriend.											

**APPENDIX B.**  
**MEASURE OF WEIGHT SOCIAL CATEGORIZATION TASK**

[Intro]

**TASK 1**

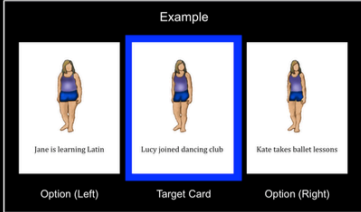
This task is a card matching game.  
In each trial, you will see three cards.  
Each card will describe a person's characteristics.  
Please press the SPACEBAR to continue.

[Instructions]

**INSTRUCTIONS**

A target card will always appear in the center of the screen.  
Click the card in the LEFT or RIGHT that makes the best match to the card in the middle.  
Please press the SPACEBAR to continue.

Example




Option (Left)      Target Card      Option (Right)

[Transition]

Practice trials will begin on the next page.  
Please press the SPACEBAR to continue.

[Practice #1]

Who goes with whom?  
Please match the cards below




Amber runs everyday

Morgan is in glee club

Susie likes singing

[Practice #2]

Who goes with whom?  
Please match the cards below



Kevin likes reading

Jason is adventurous

Tony loves travel

[Instructions]

Practice is now over.


Click the LEFT or RIGHT card that makes the best match with the card in the middle.

Try to make your judgment as quickly as possible.

When you are ready to begin, press the SPACEBAR.

[1.  
Thin–Popular–Female  
]

Who goes with whom?  
Please match the cards below



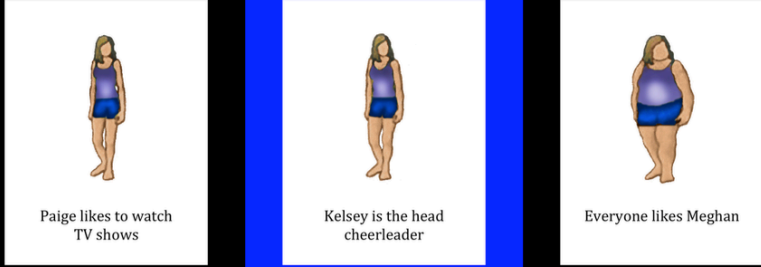
Kayla is the president of student council

Ashley always got invited to parties

Jessica is on the school swim team

[2.  
Thin–Popular–Female  
]

Who goes with whom?  
Please match the cards below




Paige likes to watch TV shows

Kelsey is the head cheerleader

Everyone likes Meghan

[3.  
Thin–Popular–Male]

Who goes with whom?  
Please match the cards below






Chris has many friends

Jordan always got invited to parties

Daniel enjoys running




[4.  
Thin–Popular–Male]

Who goes with whom?  
Please match the cards below

 Jacob is a member of drama team	 Michael has a girlfriend	 Tim has lots of Twitter followers
--	--	--




[5.  
Heavy–Popular–Female]

Who goes with whom?  
Please match the cards below

 Laura is very organized	 Julia has many friends	 Annie is very popular
---	---	---


[6.  
Heavy–Popular–Female]

Who goes with whom?  
Please match the cards below

 Madison likes to go to mall	 Taylor has lots of Twitter followers	 Emily has a boyfriend
--	--	--

[7.  
Heavy–Popular–Male  
]

Who goes with whom?  
Please match the cards below




Tyler is the president of student council

Mark has many friends

Dylan rides on a skateboard

[8.  
Heavy–Popular–Male  
]

Who goes with whom?  
Please match the cards below




Andrew is the captain of football team

Joshua is very popular

Zach is good at math

[9.  
Thin–Neutral–Female  
]

Who goes with whom?  
Please match the cards below






Haley is conservative

Courtney plays Nintendo

Brittany loves computer games




[10.  
Thin-Neutral-Female  
]

Who goes with whom?  
Please match the cards below

 Jennifer is reserved	 Sarah is talkative	 Anna is on the debate team
---	--	---




[11.  
Thin-Neutral-Male]

Who goes with whom?  
Please match the cards below

 Eric likes to volunteer	 Sam likes to watch baseball	 Nathan is a sports fan
---	--	--

[12.  
Thin-Neutral-Male]


Who goes with whom?  
Please match the cards below

 Brian is good at chemistry	 Nick speaks French	 John is fluent in German
---	--	---



[13.  
Heavy-Neutral-Female]

Who goes with whom?  
Please match the cards below




Victoria has puppies

Sydney is in school orchestra

Brianna plays violin

[14.  
Heavy-Neutral-Female]

Who goes with whom?  
Please match the cards below



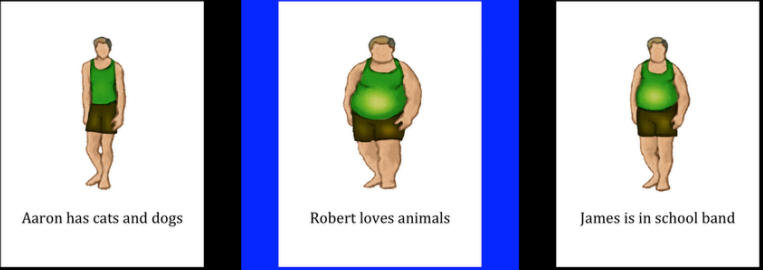
Rachel loves shopping

Amanda makes all A's

Olivia is very smart

[15.  
Heavy-Neutral-Male]

Who goes with whom?  
Please match the cards below



Aaron has cats and dogs

Robert loves animals

James is in school band

[16.  
Heavy-Neutral-Male]

Who goes with whom?  
Please match the cards below

Justin plays guitar

Ryan has his own blog

Steven enjoys writing

[17.  
Color-Neutral-Female]

Who goes with whom?  
Please match the cards below

Alyssa likes winter sports

Joy enjoys snowboarding

Meryl loves Sci-Fi movies

[18.  
Color-Neutral-Female]

Who goes with whom?  
Please match the cards below


Molly often rides a bike

Bailey is good at cooking

Isabel loves baking

[19.  
Color-Neutral-Male]

Who goes with whom?  
Please match the cards below



The image shows three cards on a black background. Each card features a male figure in a tank top and shorts. The first card on the left has a green tank top and the text "Sean loves team sports". The middle card, which is highlighted with a thick blue border, has a purple tank top and the text "William is in soccer team". The third card on the right has a purple tank top and the text "Tim is good at painting".


Sean loves team sports

William is in soccer team

Tim is good at painting

[20.  
Color-Neutral-Male]

Who goes with whom?  
Please match the cards below



The image shows three cards on a black background. Each card features a male figure in a tank top and shorts. The first card on the left has a green tank top and the text "Josh likes to go to concerts". The middle card, which is highlighted with a thick blue border, has a green tank top and the text "Jackson loves animals". The third card on the right has a purple tank top and the text "Adam has puppies".

Josh likes to go to concerts

Jackson loves animals

Adam has puppies

[Ending instructions]

Task 1 is over.  
When you are ready to begin the next task, please press the spacebar.

**APPENDIX C.**  
**STIMULI OF ACTOR WEIGHT MANIPULATION IN WEIGHT ATTRIBUTION TASK**

[Actor Stimuli Rating Questionnaire]

<b>[Perceived Weight]</b>	Very Underweight	Somewhat Underweight	Slightly Underweight	Normal Weight	Slightly Overweight	Somewhat Overweight	Very Overweight
Q. How much do you think this person weighs?	1	2	3	4	5	6	7
<b>[Perceived Attractiveness]</b>	Very Unattractive	Somewhat Unattractive	Slightly Unattractive	Neutral/ Undecided	Slightly Attractive	Somewhat Attractive	Very Attractive
Q. To what degree do you think this person is attractive or unattractive?	1	2	3	4	5	6	7
<b>[Perceived Popularity]</b>	Very Unpopular	Somewhat Unpopular	Slightly Unpopular	Neutral/ Undecided	Slightly Popular	Somewhat Popular	Very Popular
Q. How likely do you think this person would be popular in high school?	1	2	3	4	5	6	7

**[Perceived Age]**

Q. How old do you think this person would be? Please enter the estimated age of this person with a number.







[Thin-Highly Attractive Actors]

Stimuli						
#No.	Thin-Att.01	Thin-Att.02	Thin-Att.03	Thin-Att.04	Thin-Att.05	Thin-Att.06
Mean Weight	3.9	3.8	3.9	3.4	3.8	4.1
Mean Attractiveness	5.9	5.2	5.9	5.8	5.6	6.0
Mean Popularity	5.9	5.7	5.9	6.1	6.2	6.1
Mean Age	18.7	17.8	19.5	18.4	20.8	19.3

[Heavy-Highly Attractive Actors]






Stimuli						
#No.	Heavy-Att.01	Heavy-Att.02	Heavy-Att.03	Heavy-Att.04	Heavy-Att.05	Heavy-Att.06
Mean Weight	5.7	5.1	5.7	5.5	5.6	5.4
Mean Attractiveness	4.5	4.5	4.8	4.8	4.4	5.1
Mean Popularity	4.6	4.4	4.6	4.7	4.6	5.1
Mean Age	19.7	20.1	21.1	19.9	22.7	19.2

[Thin-Average Attractive Actors]

Stimuli						
#No.	Thin-Unatt.07	Thin-Unatt.08	Thin-Unatt.09	Thin-Unatt.10	Thin-Unatt.11	Thin-Unatt.12
Mean Weight	3.8	3.9	3.9	3.7	3.8	3.8
Mean Attractiveness	4.2	4.2	3.9	4.8	4.6	4.2
Mean Popularity	4.4	4.1	4.2	4.9	5.1	4.7
Mean Age	17.1	17.6	19.4	14.7	19.6	17.7



[Heavy-Average Attractive Actors]

Stimuli						
#No.	Heavy-Unatt.07	Heavy -Unatt.08	Heavy -Unatt.09	Heavy -Unatt.10	Heavy -Unatt.11	Heavy -Unatt.12
Mean Weight	5.7	5.2	6.1	5.1	5.4	5.1
Mean Attractiveness	3.4	3.5	3.0	4.1	4.4	3.8
Mean Popularity	3.6	3.2	3.1	3.9	4.3	4.1
Mean Age	18.1	17.7	20.7	15.9	20.8	18.1

**APPENDIX D.**  
**MEASURE OF WEIGHT ATTRIBUTION TASK**

[Intro]


**TASK 2**

In this task, you will see various people in social situations.  
First, you will view a person and then a brief scenario will follow.  
Soon after, you will be asked to make judgment about the event.  
Press the SPACEBAR to continue.

[Keyboard input instructions]

**HOW TO RESPOND**

Press 'F' key to choose the LEFT option on the bottom.  
Press 'J' key to choose the RIGHT option on the bottom.  
Press the SPACEBAR to begin practice trials.



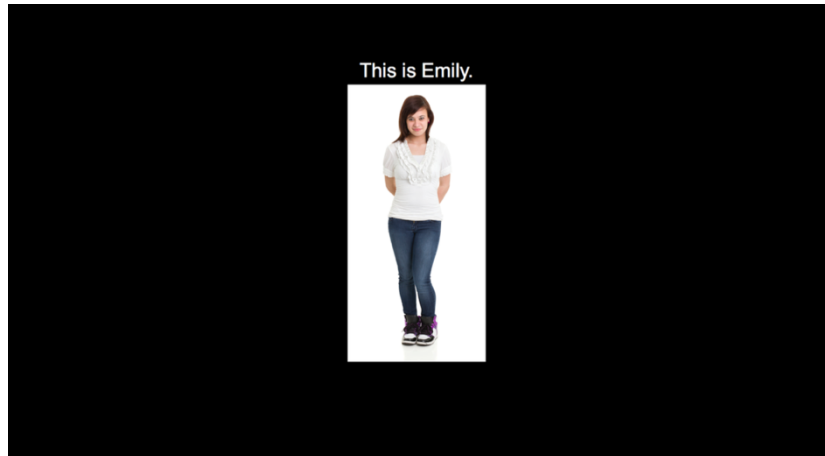
[Task Instructions]

**INSTRUCTIONS**

You will now begin practice trials.  
Once the question appears, you will have 6 seconds to respond.  
Please respond as quickly and truthfully as possible.  
Press the SPACEBAR when you're ready.

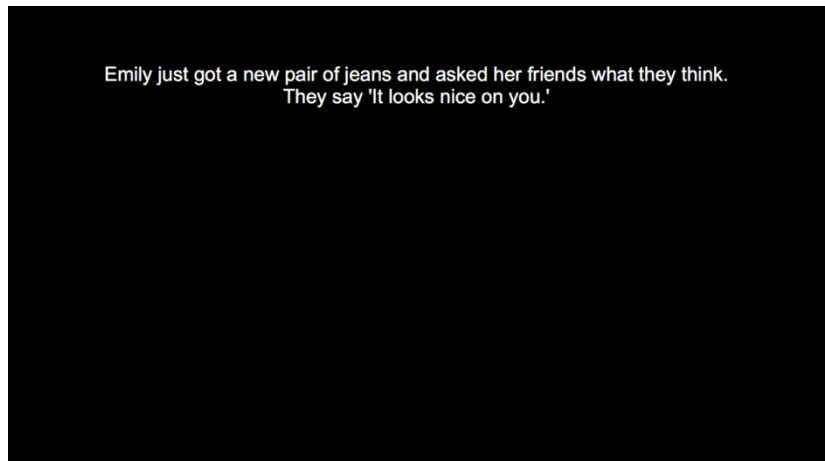
[Practice #1]

Actor manipulation



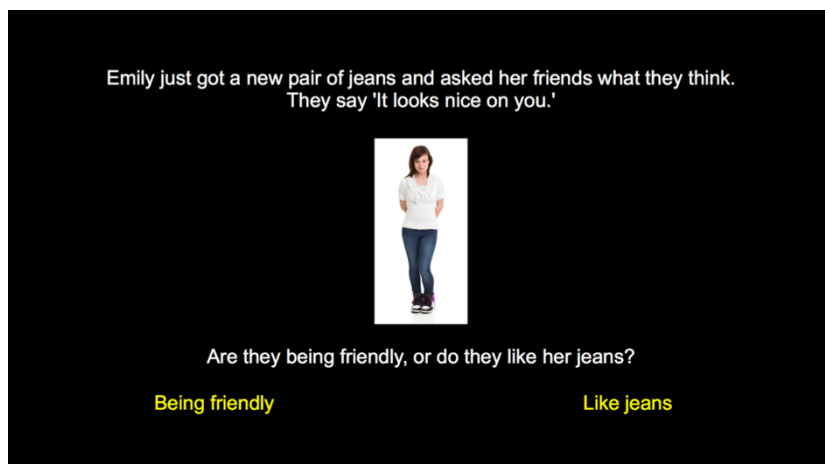
[Practice #1]

Ambiguous social event



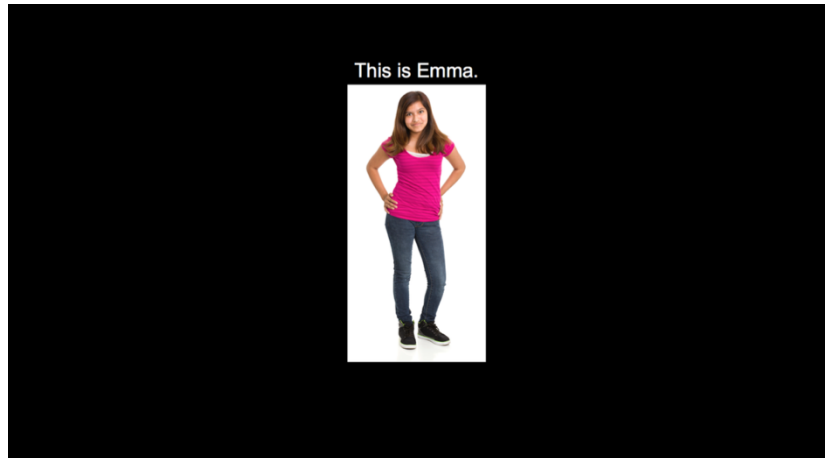
[Practice #1]

Probe question



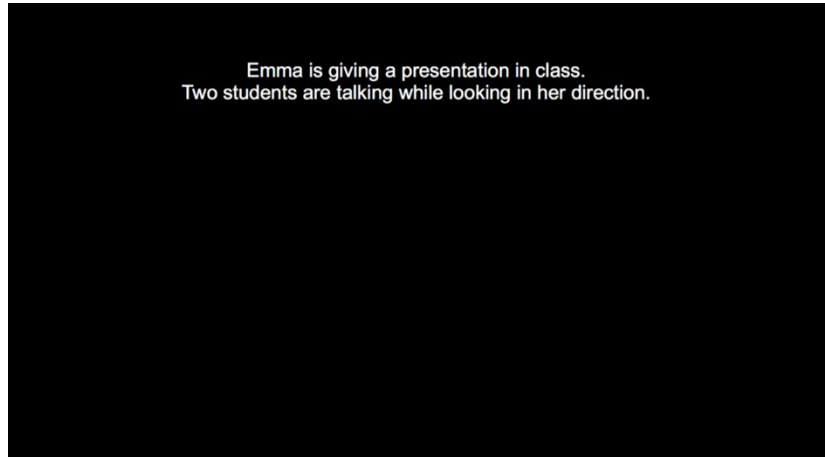
[Practice #2]

Actor manipulation



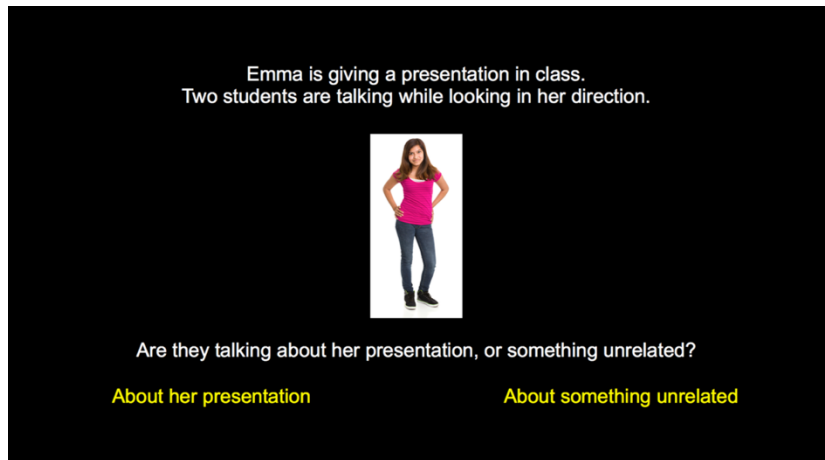
[Practice #2]

Ambiguous social event

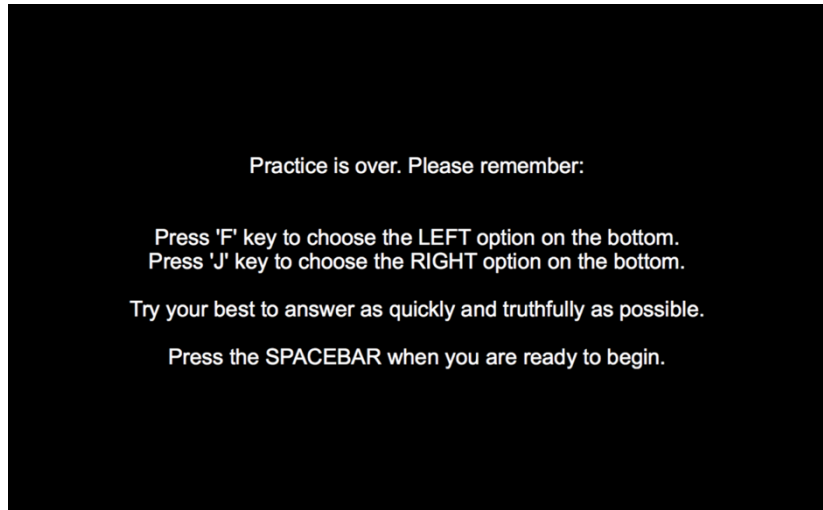


[Practice #2]

Probe question

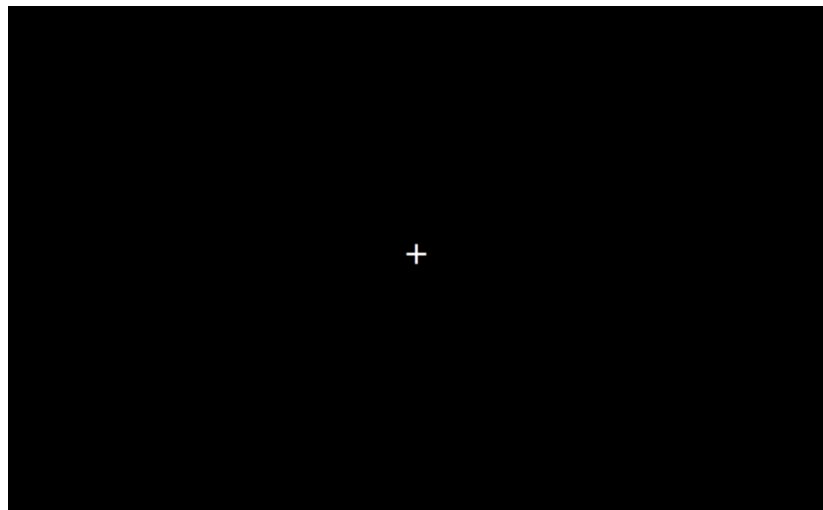


[Start instructions]



[Fixation]

\*Fixation was presented for 2 seconds in the beginning of each trial. Hereafter this fixation page will be omitted due to space limit.



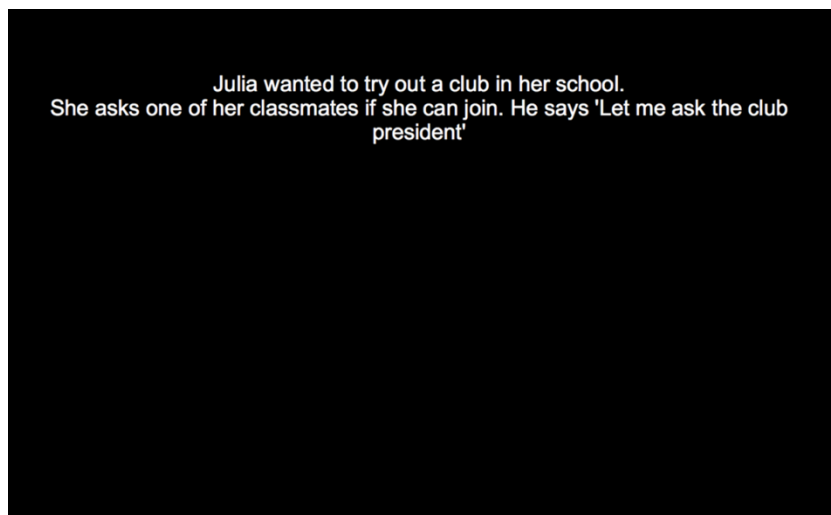
[1. Thin-Attractive-Peer]

Actor manipulation



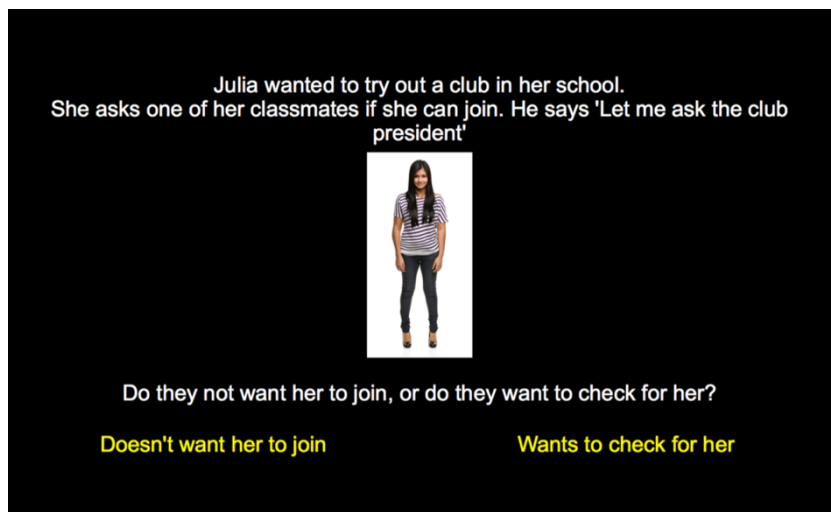
[1. Thin-Attractive-Peer]

Ambiguous social event



[1. Thin-Attractive-Peer]

Probe question



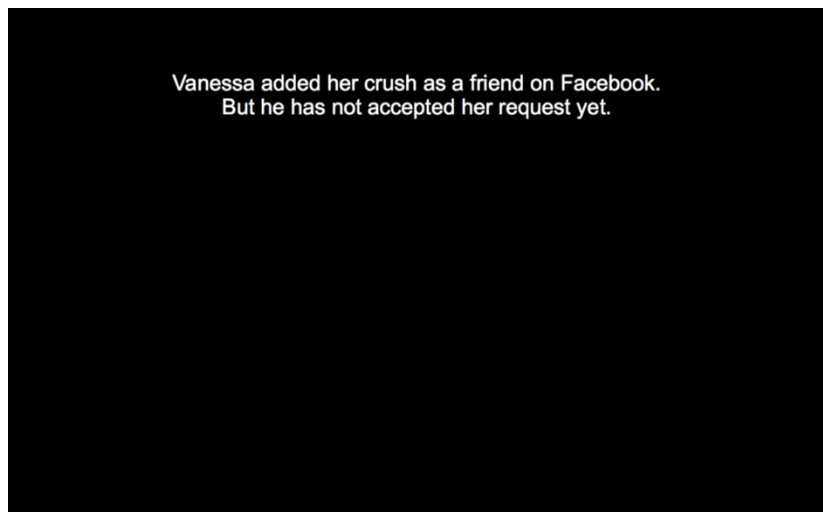
[2. Thin-Attractive-Romance]

Actor manipulation



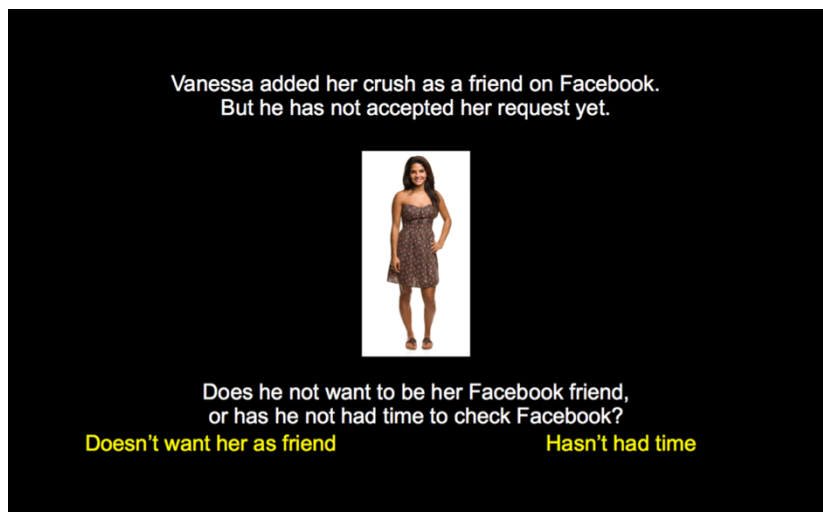
[2. Thin-Attractive-Romance]

Ambiguous social event



[2. Thin-Attractive-Romance]

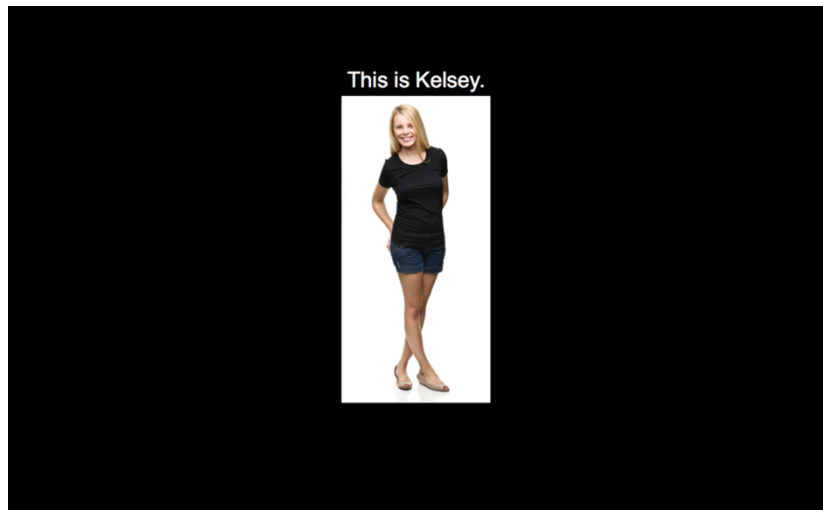
Probe question





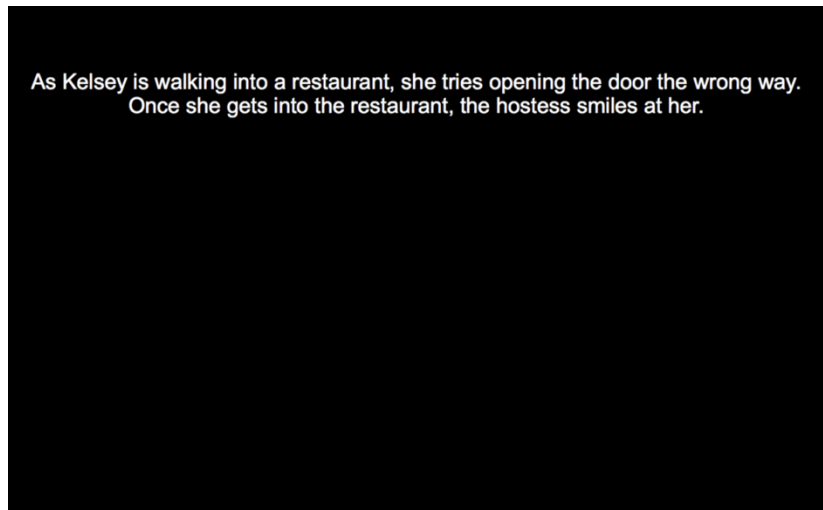
[3. Thin-Attractive-Public]

Actor manipulation



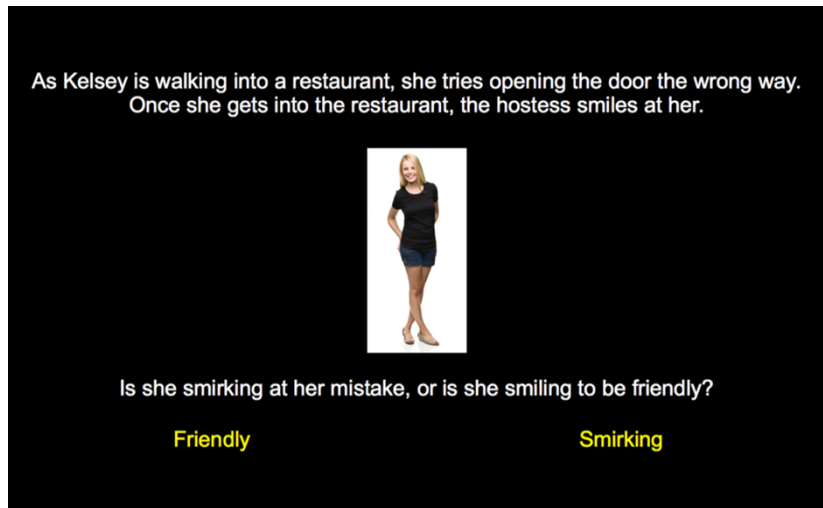
[3. Thin-Attractive-Public]

Ambiguous social event



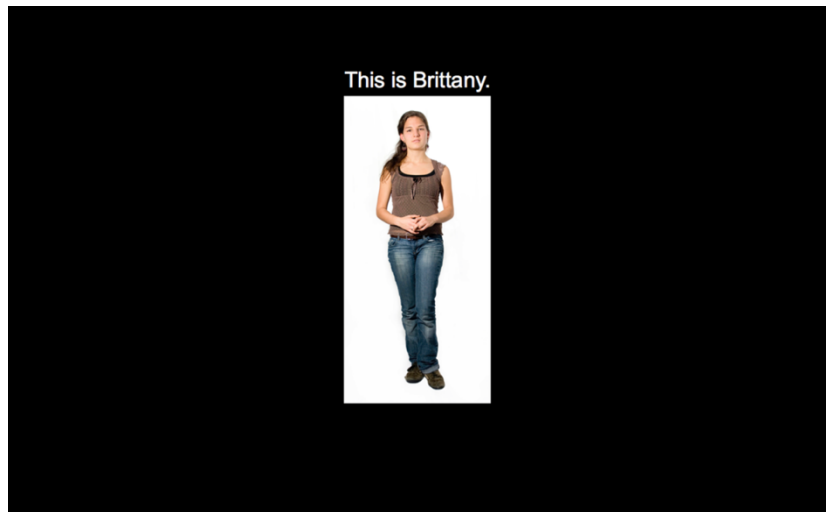
[3. Thin-Attractive-Public]

Probe question



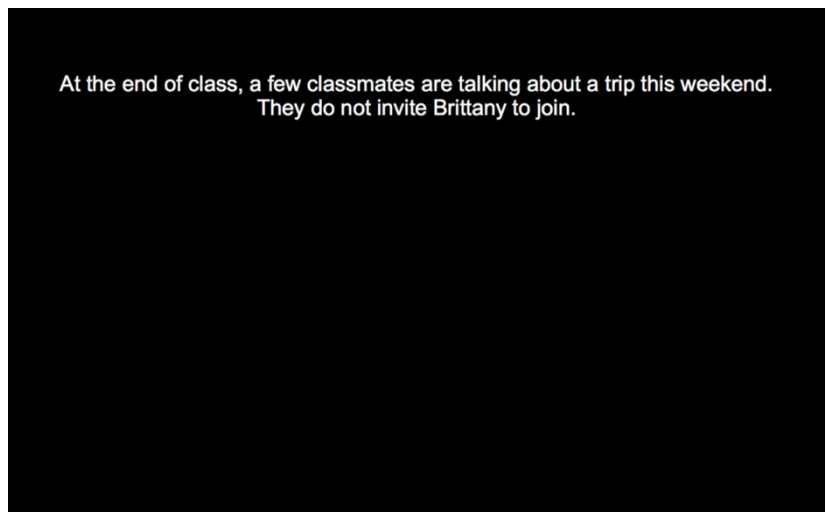
[4. Thin-Average Attractive-Peer]

Actor Manipulation



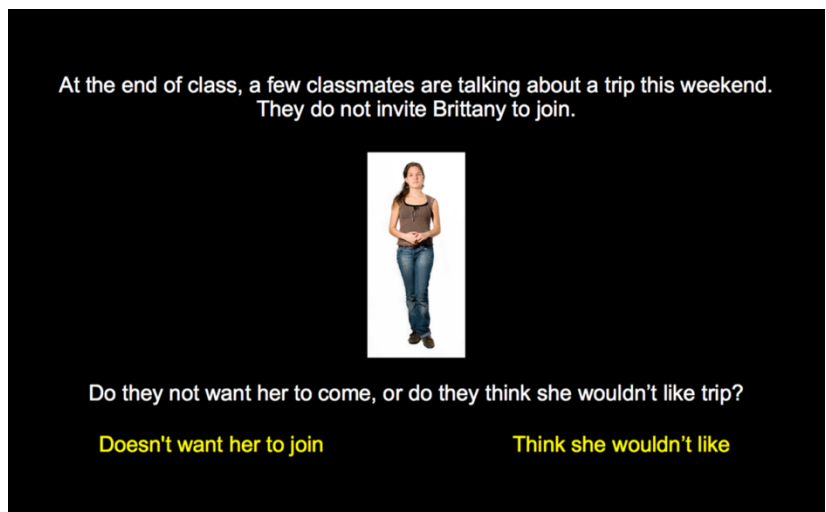
[4. Thin-Average Attractive-Peer]

Ambiguous social event



[4. Thin-Average Attractive-Peer]

Probe question



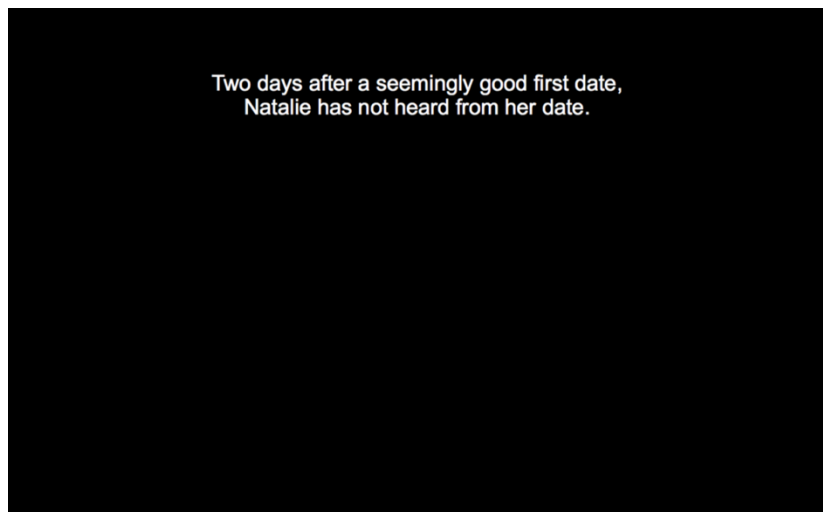
[5. Thin-Average Attractive-Romance]

Actor manipulation



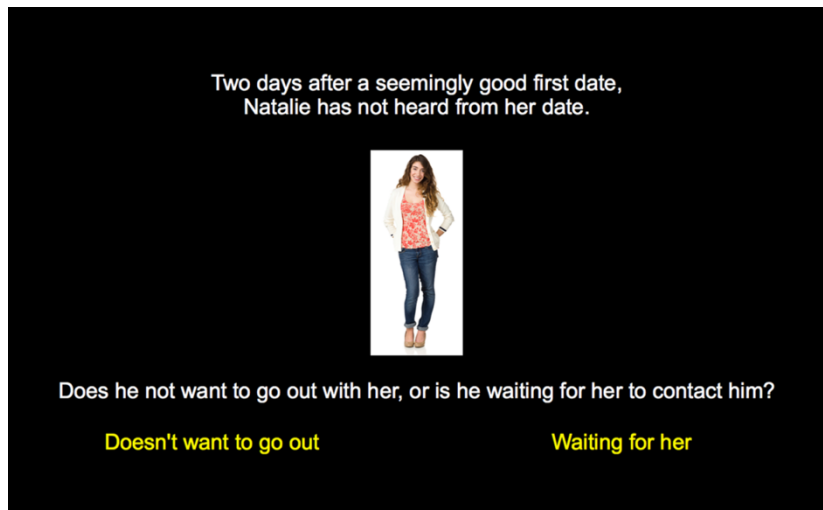
[5. Thin-Average Attractive-Romance]

Ambiguous social event



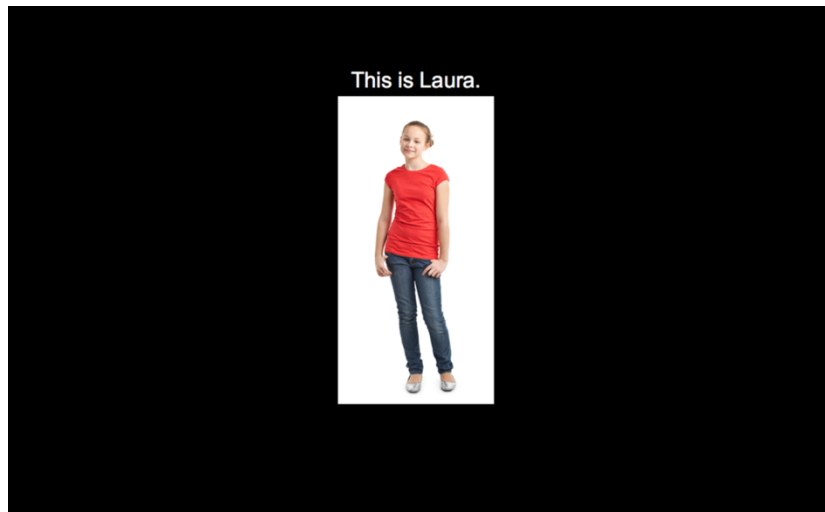
[5. Thin-Average Attractive-Romance]

Probe question



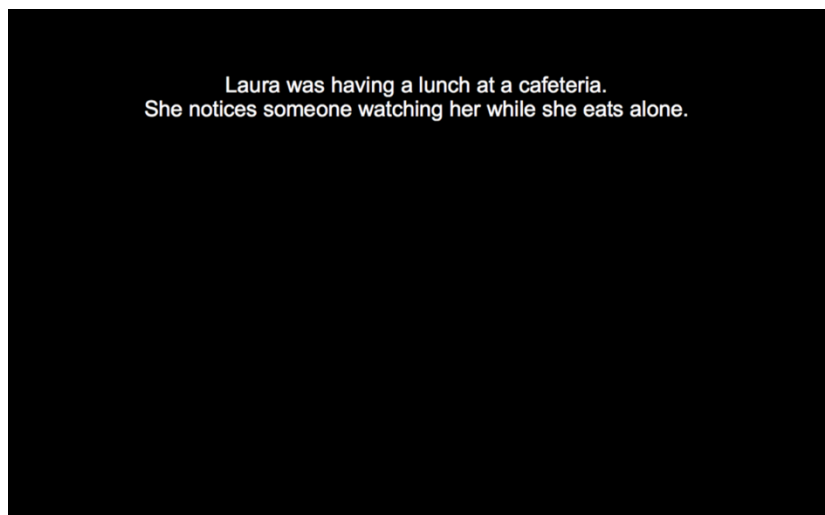
[6. Thin-Average Attractive-Public]

Actor manipulation



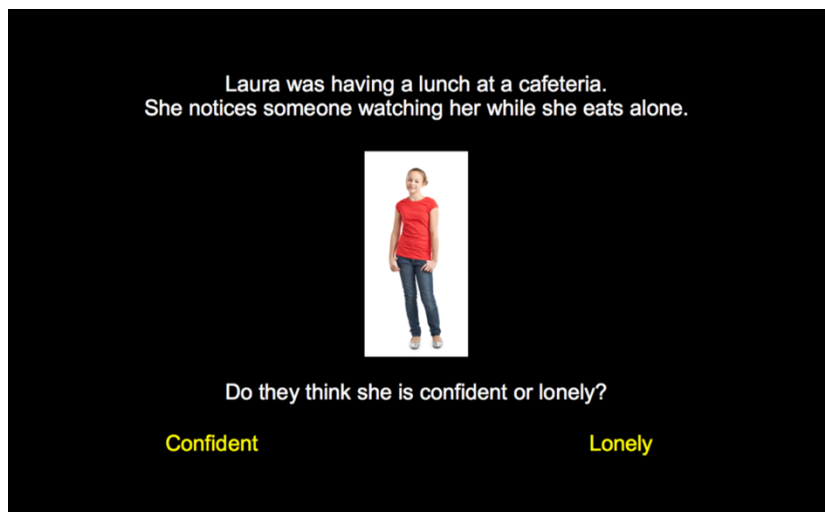
[6. Thin-Average Attractive-Public]

Ambiguous social event



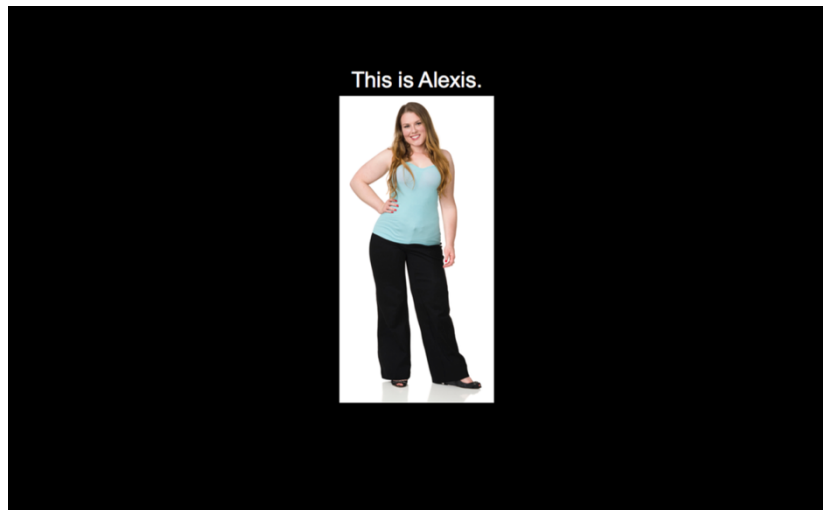
[6. Thin-Average Attractive-Public]

Probe question



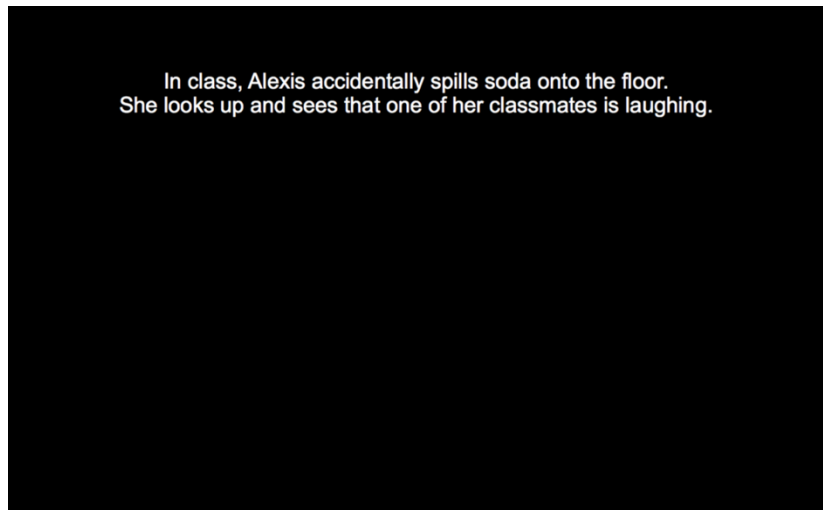
[7. Heavy-Attractive-Peer]

Actor manipulation



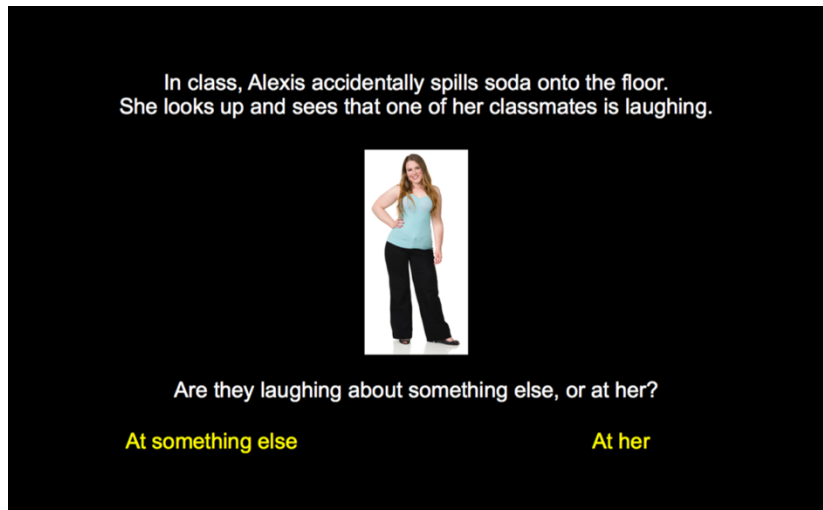
[7. Heavy-Attractive-Peer]

Ambiguous social event



[7. Heavy-Attractive-Peer]

Probe question



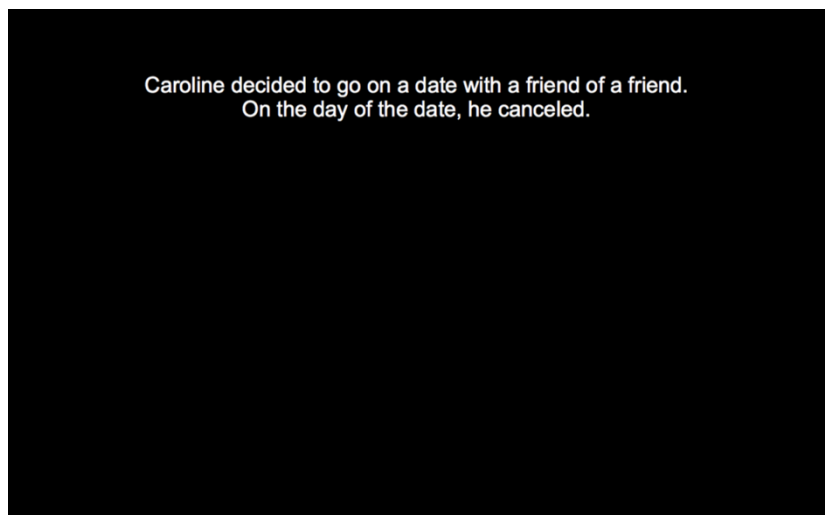
[8. Heavy-Attractive-Romance]

Actor manipulation



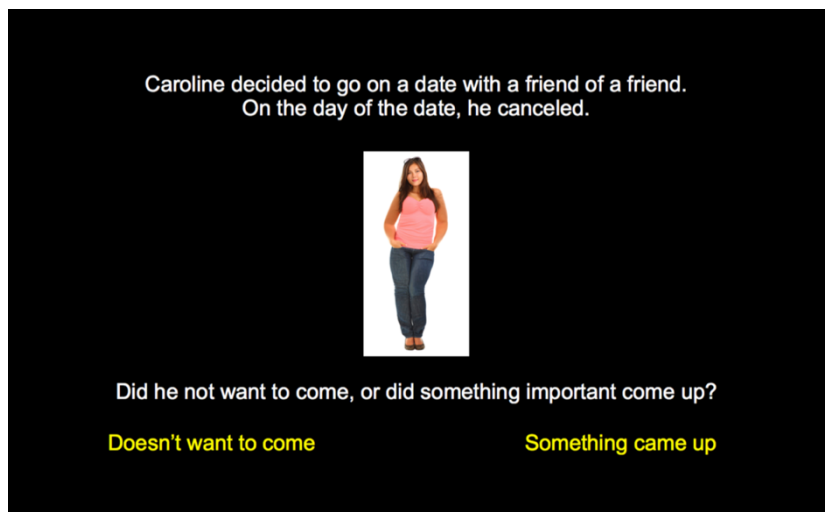
[8. Heavy-Attractive-Romance]

Ambiguous social event



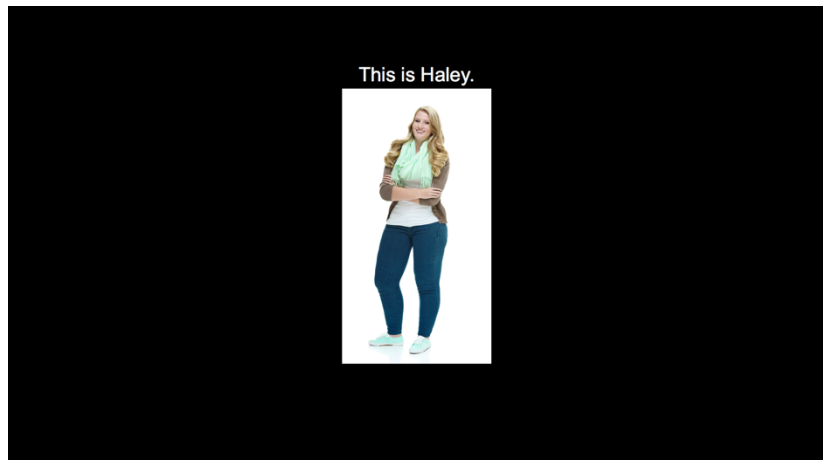
[8. Heavy-Attractive-Romance]

Probe question



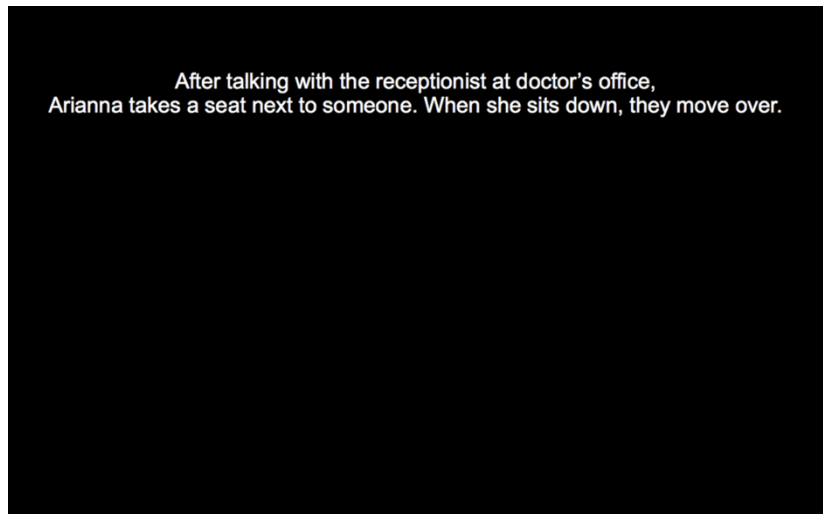
[9. Heavy-Attractive-Public]

Actor manipulation



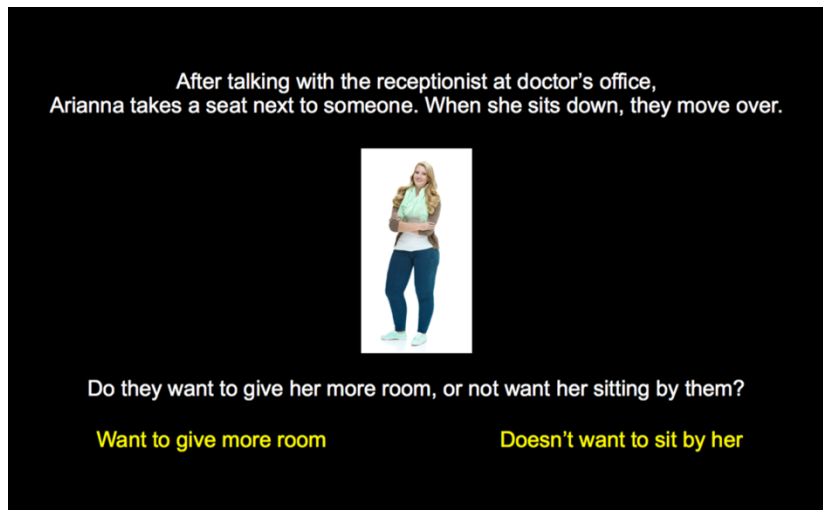
[9. Heavy-Attractive-Public]

Ambiguous social event



[9. Heavy-Attractive-Public]

Probe question



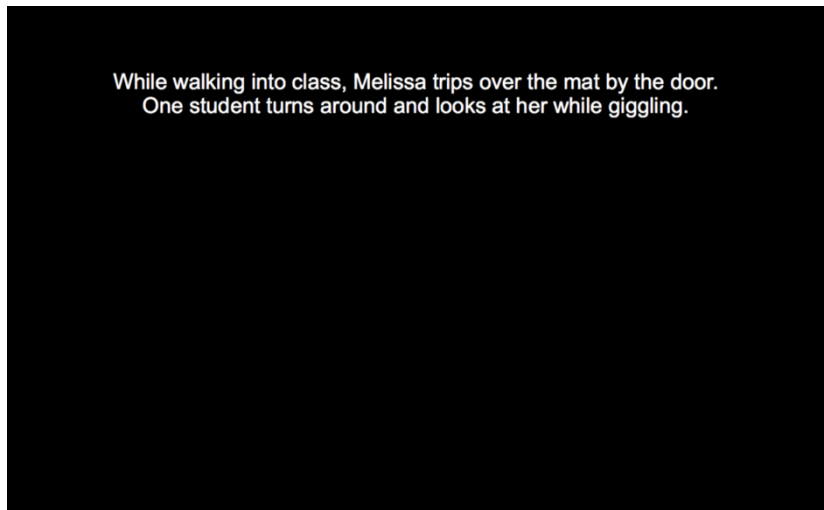
[10. Heavy-Average Attractive-Peer]

Actor manipulation



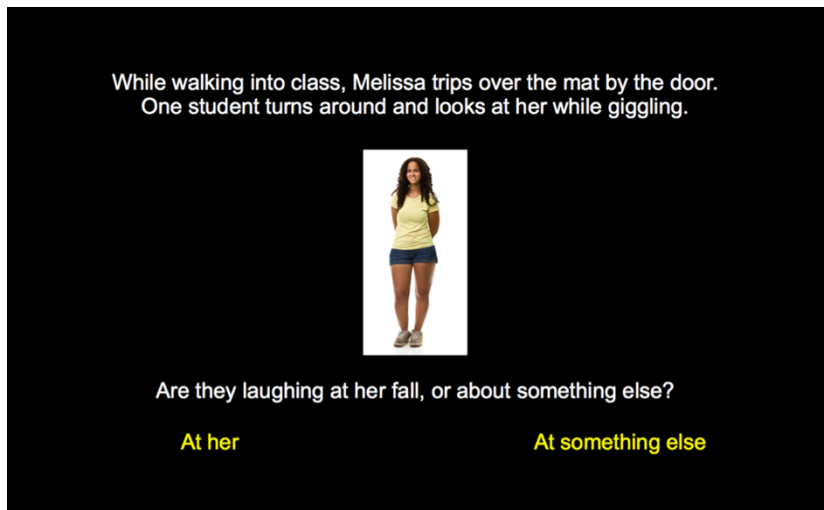
[10. Heavy-Average Attractive-Peer]

Ambiguous social event



[10. Heavy-Average Attractive-Peer]

Probe question





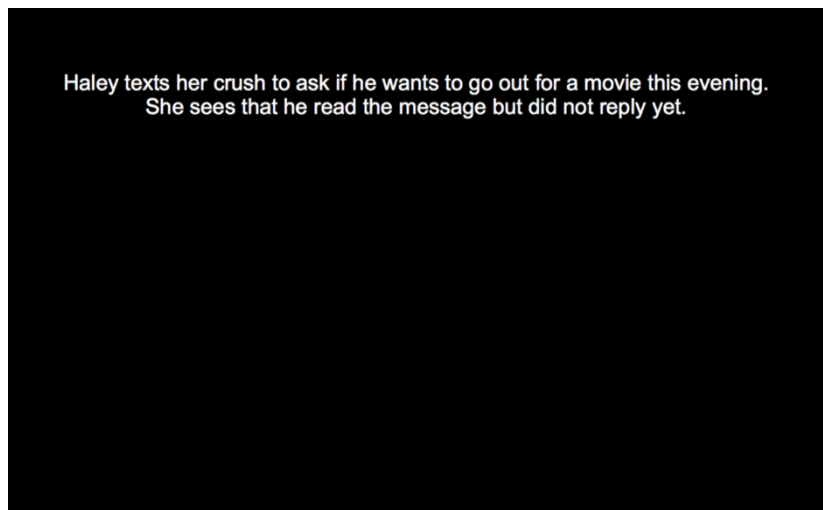
[11. Heavy-Average Attractive-Romance]

Actor manipulation



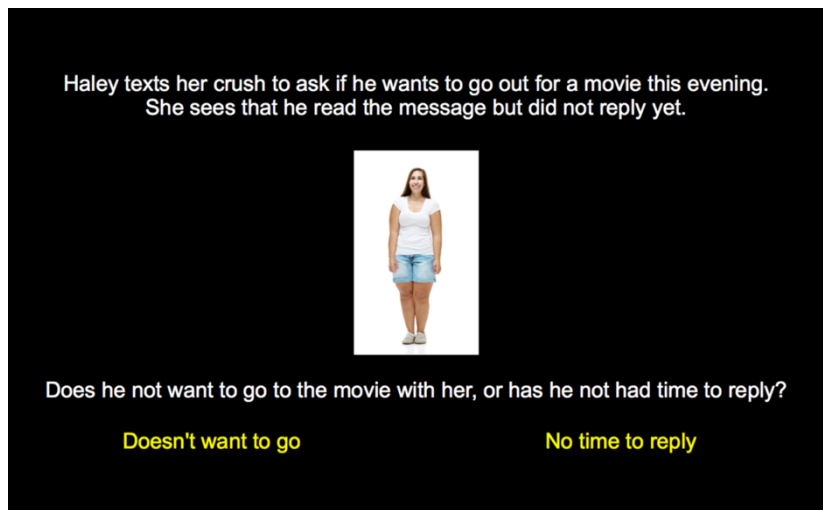
[11. Heavy-Average Attractive-Romance]

Scenario



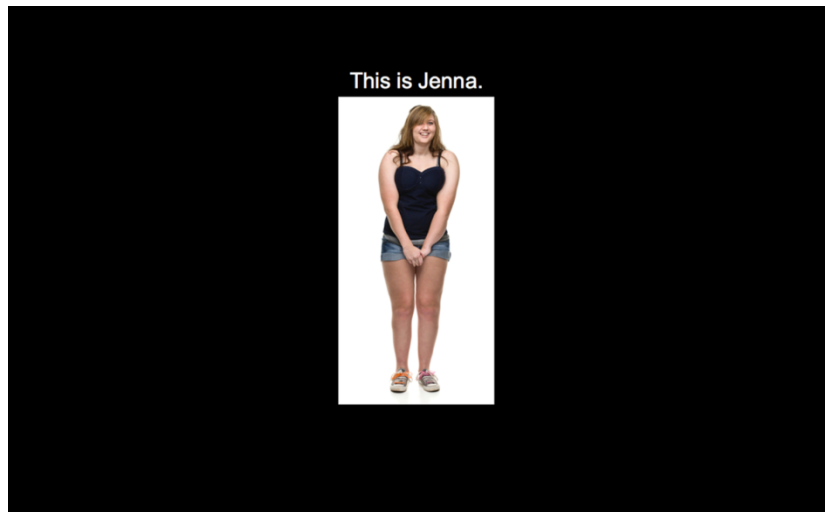
[11. Heavy-Average Attractive-Romance]

Probe question



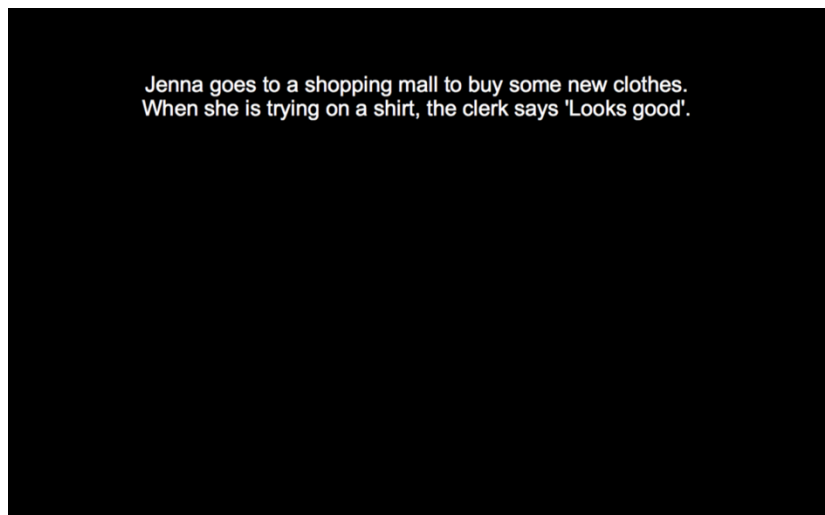
[12. Heavy-Average Attractive-Public]

Actor manipulation



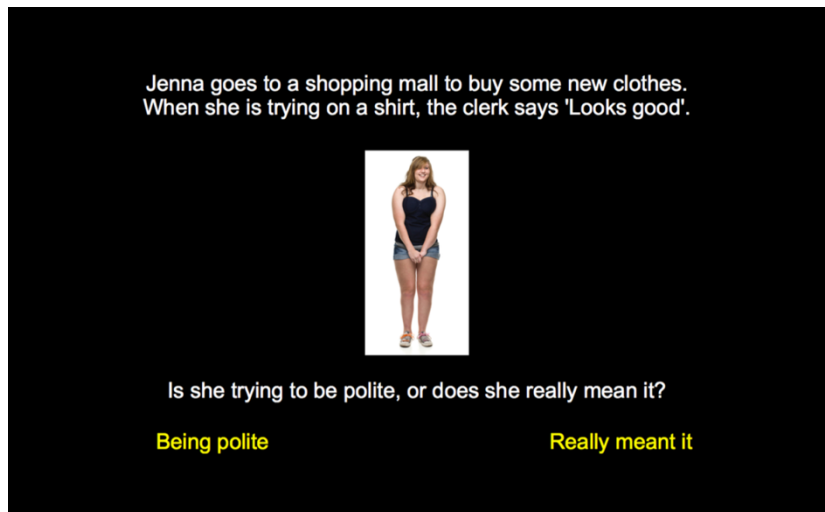
[12. Heavy-Average Attractive-Public]

Ambiguous social event



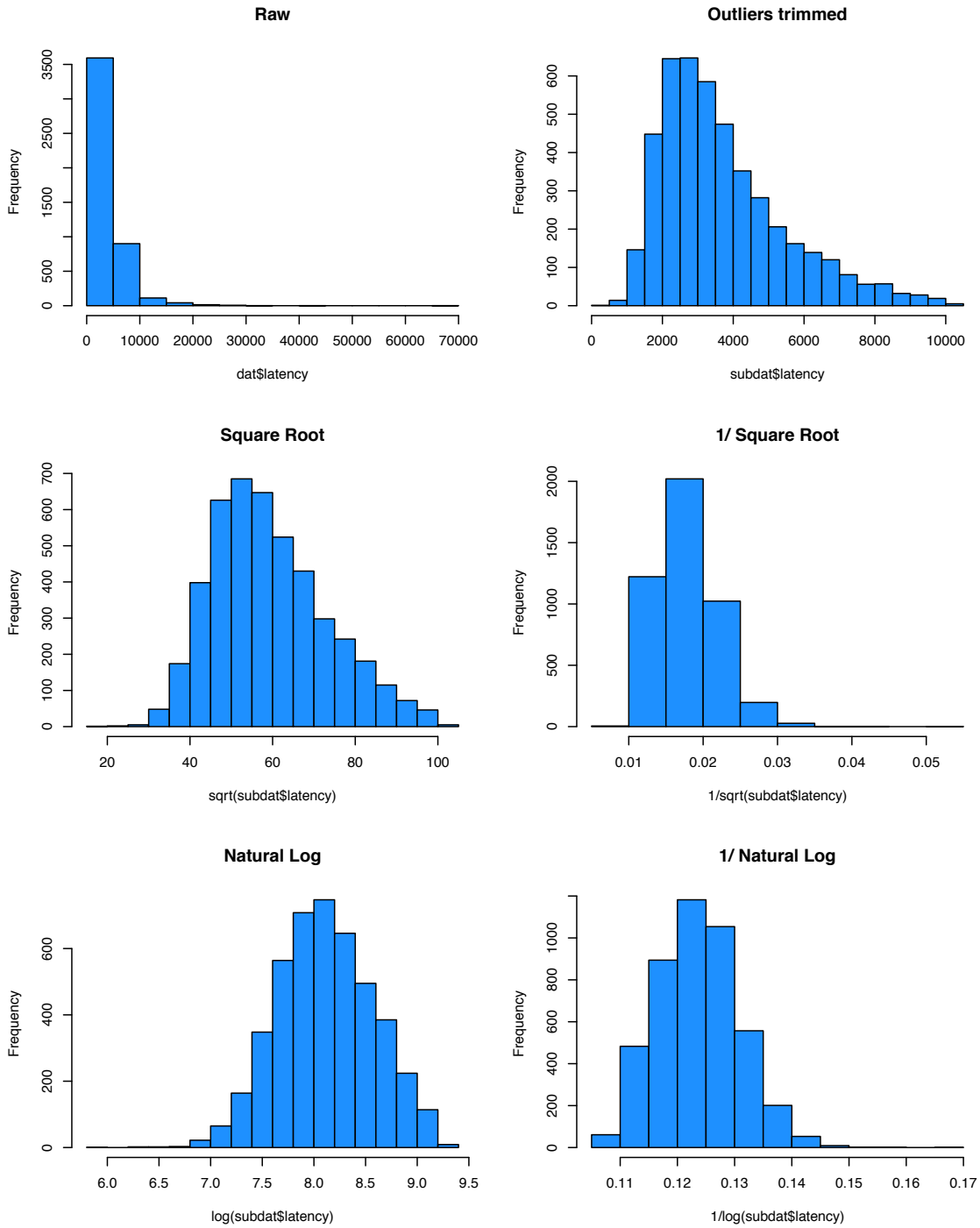
[12. Heavy-Average Attractive-Public]

Probe question



**APPENDIX E.**  
**FIGURE OF WEIGHT SOCIAL CATEGORIZATION TASK LATENCY DISTRIBUTION**

**Figure. Weight Sorting Task Latency Distribution: Raw, outliers trimmed, and transformed latency variables**



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