Evaluating the Impact of Training on the Effectiveness of Peer Change Agents:

A Campus-wide Intervention

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ABSTRACT

The current study investigated the impact of a training program on a peer-to-peer intervention designed to increase the use of bicycle helmets on a large college campus. The training program was evaluated by the number of interactions a peer change agent--an individual who attempts to make a positive change in another person's behavior, had with bicyclists. The results suggest the training program may be effective in increasing change agent interactions for change agents who are already commitment to the intervention leading to more interactions per capita between committed trained change agents and bicyclists than untrained change agent and bicyclists. However, these results must be interpreted with caution due to small and unequal sample sizes.

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Introduction

The Center for Disease Control (CDC) reported nearly 800 deaths and 515,000 bicycle-related injuries in 2010 (“Bicycle-related injuries”, 2013). One of the main risk factors associated with bicycle injuries is not wearing protective headgear. Indeed, the CDC reports that “Bicycle helmets reduce the risk of head and brain injuries in the event of a crash” and they recommend all bicyclists wear a properly fitted helmet every time they ride (“Bicycle-related injuries”, 2013).

Research suggests head injury is a leading cause of bicycle-related injuries and fatalities. For example, a study conducted by Thompson, Rivara, and Thompson (1989) on the efficacy of bicycle helmets found 35% of hospitalized bicyclists had head injuries. Furthermore, their case study of 235 injured bicyclists found head injury to be the primary cause in 70% to 80% of bicycle-related fatalities (Thompson et al., 1989). Another study examined 173 bicycle fatalities and reported that approximately 85% of bicycle-related fatalities were due to head injuries (Fife, Davis, Tate, Wells, Mohan, & Williams, 1983).

Considering the large number of head injuries reported by bicyclists, it is important to examine the effectiveness of bicycle helmets. Wasserman, Waller, Monty, Emery, and Robinson (1988) interviewed bicyclists about their personal bicycle history, including helmet use and previous injuries and concluded, “Helmets afford protection from bicycling head injuries” (p. 1221). Thompson, Rivara, and Thompson (1989) assessed bicycle-related injuries at five hospitals. They examined both the type of injury and bicyclist helmet use for 235 patients with head injuries and concluded that wearing a helmet can reduce the risk for head injuries by as much as 85%.

A meta-analysis of bicycle-related injuries (Attewel, Glase, & McFadden, 2001) made a more conservative estimate of risk reduction while using helmets, reporting a reduction of 45% for head injuries and 29% for fatal injuries. This meta-analysis also found that half of the studies on fatal injuries from bicycle crashes reported no fatal injuries by helmet users (Attewel, Glase, & McFadden, 2001). It is noteworthy a re-analysis of the meta-analysis by Attewel et al. (2001) found the effects of helmets on reducing head injury reported to be slightly inflated (Elvik, 2011). Elvik (2011) concluded that due to publication bias and time-trend bias, the protective effect of bicycle helmets was overestimated in the original meta-analysis.

Although bicycle helmets are effective in reducing serious injury and death, the reported usage rates are surprisingly low. Self-report data from 4,346 randomly selected college students indicated only 18% of bicyclists reported always wearing their helmet, while 76% reported never wearing a helmet (Rodgers, 1995). However, the actual prevalence rates of helmet use may be even lower than suggested by self-report data. A field study that interviewed 516 bicyclists found only 7.8% of participants interviewed were observed wearing a helmet (Wasserman et al., 1988). One of the few studies that targeted helmet use among college students surveyed 5,652 students and found self-report of consistent use to be as low as 5% (Patrick & Covin, 1997). A later study on a large southeastern university campus observed 5,551 bicyclists and reported observed bicycle helmet use at 14.8% (Wiegand, 2006).

Barriers to Helmet Use

Many factors explain why bicyclists do not wear helmets. However, research suggests not owning a helmet is a major barrier to wearing a bicycle helmet. For example, research conducted by Page, Follet, Scanlan, Hammermeister, and Friesen (1996) investigated perceived barriers to helmet use among college students. Expense was a major barrier, with 25% of bicyclists who did not wear a bicycle helmet reported it was impossible for them to purchase a helmet due to cost (Page et al., 1996). Additionally, Fullerton and Becker (1991) reported only 33% of college student bicyclists even own a helmet. Other barriers mentioned were concern about comfort, convenience, not thinking about wearing a helmet, and social norms.

Wiegand (2006) performed a regression analysis on 173 self-report questionnaires about perceived barriers to helmet use and found that not owning a helmet accounted for 28.5% of the variance in observed helmet use. Additionally, Wiegand (2006) reported that 70.1% of 251 respondents reported they would wear a helmet if they owned one. Research points to the barrier of not owning a helmet as a strong deterrent to wearing a bicycle helmet. Consequently, the current intervention seeks to provide helmets to individuals at a reduced cost to make helmets more accessible.

Interventions to Increase Bicycle Helmet Use

Ludwig, Buchholz, and Clarke (2005) evaluated the impact of a social marketing intervention to increase bicycle helmet use on a small university campus. Social marketing is described as a customer-driven approach seeking to reduce the influence of competing behaviors or barriers. The intervention was designed to follow four methods recommended by Geller (1989). First, package the intervention in an attractive format. Second, promote the intervention to make the desired behavior change familiar. Third, conduct the intervention in a way that stimulates communication between change agents and the target population. Lastly, it’s important to minimize barriers. Ludwig et al. (2005) focused their intervention design on minimizing barriers to behavior change, and then making the intervention appealing and desirable for the target population (i.e., college students).

To reduce a main barrier to helmet use, Ludwig et al. (2005) provided coupons for free helmets to bicyclists observed not wearing a helmet. They also made it a priority to package the intervention in an attractive format. Specifically, a focus group was held five months prior to the start of the study. Twenty students on a southeastern university campus were recruited to help brainstorm slogans to promote bicycle helmet use. The focus group created five slogans, which were presented to 200 undergraduate students. The most popular slogan "Grateful Head" was selected. Furthermore, an information brochure containing bicycle-related injury facts, a "Grateful Head" program sticker, and a helmet use pledge card were distributed. All materials were presented along with a bicycle water bottle. If the bicyclist agreed to sign the pledge card, s/he was presented with a coupon for a free bicycle helmet provided by a local bicycle shop. The pledge card asked the participant to commit to wearing their helmet throughout the semester.

Fifteen bicyclists were recruited to act as peer change agents (CAs) in the study. The peer CAs were trained to approach bicyclists observed not wearing a helmet or wearing a helmet without a commitment sticker, and then ask the bicyclists to sign the pledge card. Peer CAs approached bicyclists during a five-week intervention period. Ludwig et al. reported 379 signed pledge cards and 242 redeemed coupons at the participating bicycle store.

A total of 9,737 observations of bicyclists' helmet use were recorded; independent observations were conducted on 23% of the total observations to assess inter-rater reliability. The inter-rater agreement rate was 98% for observations of helmet use. A total of 3,717 observations were made at the target university, which found mean helmet use of 26.1% of 1330 observations during Baseline, 49.3% of 1769 observations during the Intervention phase, and 44.4% of 618 observations during Withdrawal.

A Kruskal-Wallis analysis for both the target and control locations found a significant increase in bicycle helmet use at the target university over the course of the study ($H = 25.085$, $p < .05$) paired with a non-significant change at the control location ($H = 3.419$, $p = .844$). For follow-up observations, helmet use was maintained 38.6% at the target location after 32 weeks, 52% after 45 weeks, and 33.2% after 58 weeks. The control location reported stable bicycle helmet use at 11.8% of 1457 observations over the eleven-week study.

Current Intervention

Three phases of training. The only successful intervention to increase bicycle helmet use trained a total of 15 individuals to act as peer change agents (CAs) to deliver the intervention package (Ludwig et al., 2005). However, the training protocol was not specified. The present study was designed to test the impact of a training protocol teaching social influence techniques on the effectiveness of a peer-to-peer intervention. Specifically, the current study tested the effectiveness of teaching CAs how to use the foot-in-the-door technique, social norms, and secure verbal commitment on the participation and effectiveness of peer CAs in a community intervention.

Training programs should always be designed to achieve instructional needs. Goldstein and Ford (2001) outlined a three-phase model to maximize the utility of training programs. This model is supported by a recent summary of the major meta-analyses of factors influencing a training program (Salas, Tannenbaum, Kraiger, & Smith-Jentsch, 2012).

First, it is essential to conduct a needs assessment to identify organizational goals and needs. Second, a training program designed to meet instructional requirements and the organizational goals identified in the needs assessment should follow the needs assessment.

Lastly, the training system should be evaluated to test the validity of training assumptions (Goldstein & Ford, 2001).

The steps required to develop an effective training program are similar to the basic building blocks for a house. It is imperative to have a strong foundation (i.e., needs assessment) before beginning to build the home (i.e., develop the training program). Just like a house without a strong foundation, a training program that does not follow a needs assessment quickly collapses. In this example, the evaluation phase of a training program is analogous to an inspection of the home that follows construction. The inspection may identify problems with the other parts of development; holes might be found in the roof or a crack in the foundation.

Likewise, the evaluation phase for a training program should identify holes in the training program (e.g., failure of transference or failure in learning important knowledge, skills and abilities) or cracks in the needs assessment phase (e.g., misidentified or unidentified job components). This analogy may seem obvious, but many organizations conduct training without regard to the needs of the organization (Goldstein & Ford, 2001).

The assessment should insure organizational support and include an organizational analysis. The evaluation should also involve a requirements analysis, a task analysis, a knowledge, skills, abilities (KSAs) analysis, and a person analysis. In the needs assessment phase it is important to identify specific goals (Fleishman, Harris & Burtt, 1955) and identify the KSAs needed to accomplish the goals (Goldstein, Braverman, & Goldstein, 1991; Goldstein, Macey, & Prien, 1981; Goldstein, Zedeck, & Schneider, 1993; Prien, 1977; Prien, Goldstein, & Macey, 1987). This type of needs assessment is considered a "content-oriented job analysis" (Goldstein, Macey, & Prien, 1981; Prien, Goldstein, and Macey, 1985). Although this is a brief summary of a needs assessment, training peer change agents falls into a simpler context compared to a complex organization constantly evaluating the needs of employees to meet organizational objectives and profit margins.

After the needs assessment phase, a training program must be developed. Training programs should be designed to maximize potential outcomes. Training outcomes are reflected in participant learning and transference. Transference, the ultimate goal of a training program, is the transfer of KSAs learned in training to changes in task relevant behaviors. To maximize learning and transference, training programs should follow learning theory (Baldwin & Ford, 1988; Gagné & Dick, 1983; Goldstein & Ford, 2001).

Components of the intervention. For the current study, the theories used to develop the plan of instruction are Anderson's ACT* model (Anderson, 1987; Anderson, 1996), social learning theory (Bandura, 1977; Bandura, 1986; Wood & Bandura, 1989), and goal setting (e.g., Kim, 1984; Locke & Latham, 1990; Locke, Shaw, Saari, & Latham, 1981). It is noteworthy; the theories used to develop the training program for this study do not represent an exclusive list of useful theories.

Anderson's ACT* model posits learning happens in three stages. In the first stage, declarative knowledge, individuals acquire factual knowledge about a task. After acquiring the factual knowledge, learners begin to turn declarative knowledge into procedural knowledge in the second stage, known as knowledge compilation. Lastly, individuals apply learned knowledge in the third stage, proceduralization (Anderson, 1987; Anderson, 1996).

Anderson's ACT* model provides a basic framework that can be followed when developing a plan of instruction. It is important to first teach trainees the knowledge necessary for a given task (teach relevant KSAs). After teaching the relevant KSAs it is important to create an environment that allows for knowledge compilation or the transfer of declarative knowledge into procedural knowledge (skill modeling and roleplaying). Once this is accomplished, trainees are able to apply knowledge in conducting tasks.

Social learning theory (Bandura, 1977) can be used in combination with Anderson's ACT* theory when designing a training program. Social learning theory is the basis for a training technique known as behavioral role modeling. Behavioral role modeling focuses on changing the behavior of trainees using behavioral modeling (Goldstein & Ford, 2001). Specifically, trainees observe a modeled behavior and then practice the behavior. After practicing the behavior, trainees receive feedback to further improve the behavior. A key point of social learning theory is motivating individual's using goal setting and feedback (Goldstein & Ford, 2001; Wood & Bandura, 1989).

A review of goal setting by Locke and Latham (1990) provides suggestions for goal setting, which includes making goals specific, challenging, achievable, and supported by the organization (Goldstein & Ford, 2001). Goal setting is a key piece of social learning theory and has been shown to be effective in increasing desired behavior with relevant feedback (Goldstein & Ford, 2001).

To follow the suggestions made by Anderson's ACT* model (Anderson, 1996) and Bandura's (1977) Social Learning Theory, the current training program was broken into three stages: a lecture phase, a behavior-modeling phase, and a role-playing phase. Throughout training the trainees were taught important KSAs to increase their effectiveness as CAs (see Appendix B for task statements and KSAs). During the lecture portion, trainees were taught important knowledge for being an effective CA. After trainees were taught the relevant knowledge, they observed a model enacting both positive and negative interactions between a

“CA” and a “bicyclist”. Following the behavior modeling, trainees were asked to role-play interactions with a partner.

The lecture portion, which lasted one hour, provided trainees with appropriate declarative knowledge to perform required tasks (see Appendix C for the lecture PowerPoint). During the lecture, trainees were taught declarative knowledge to improve the likelihood of a successful interaction with a bicyclist. The declarative knowledge portion included how to use the foot-in-the-door technique, descriptive social norms, to garner verbal commitment, and how to set SMARTS goals.

The foot-in-the-door technique relies on the social influence principle of consistency (Cialdini, 2001) and is used to gain compliance for a large request by making a smaller request (Freedman & Fraser, 1966). The foot-in-the-door technique has been effective in multiple domains, including increasing organ donor signup (Cardduci, Deuser, Bauer, Large, & Ramaekers, 1989) and environmental sustainability (Scott, 1977). In addition, a meta-analysis evaluated the foot-in-the-door technique by reviewing 120 experimental groups and found the foot-in-the-door technique influences compliance (Beaman, Cole, Preston, Klentz, & Steblay, (1983).

The foot-in-the-door technique was taught to increase the likelihood of bicyclists redeeming the coupon as well as to provide trainees with a framework to begin an interaction with a bicyclist. In this case, trainees learned to ask the bicyclist they approached if they had a few minutes to answer a few questions about their bicycling safety. Specifically, trainees were instructed to use the questions from the communication impact survey (see Appendix A) to initiate the interaction. This process gave trained CAs a clear strategy to initiate an interaction that should also increase behavioral compliance.

After being instructed on the foot-in-the-door technique, trainees were taught how to use social normative messages to highlight the importance of wearing a bicycle helmet and increase the likelihood the bicyclist would redeem the coupon. Research has identified a large range of behaviors influenced by social norms, including tax evasion (Kahan, 1997), recycling (Schultz, 1999), littering (Kallgren, Reno, & Cialdini, 2000), and stealing behavior (Goldstein, Cialdini, & Griskevicius, 2008). Social norms have also been used to predict bicycle helmet use. Ramsey (2012) investigated the effects of the Big Five Inventory on helmet use and compared it to attitudes, perceived behavioral control, and subjective norms. In a regression analysis the Big Five only accounted for 1.8% of the total variance in bicycle helmet use whereas attitudes ($\beta = .168$), perceived behavioral control ($\beta = -.195$), and subjective norms ($\beta = .504$) accounted for 45% of the variance (Ramsey, 2012).

One important study by Goldstein, Cialdini, and Griskevicius (2008) identified "provincial norms" messaging as messaging that attempts to match the individuals' immediate circumstances as superior to other types of social normative messaging. For example, in their field study to increase towel reuse they posted messages following provincial norms that read, "the majority of guests in this room reuse their towels". The provincial normative messages were superior to other types of messaging in affecting behavior change. During the training program, trainees were taught to use provincial normative messaging (Goldstein, Cialdini, & Griskevicius, 2008) that placed the bicyclist into a group with other common bicyclist (e.g., most students who ride to commute wear their helmet or the majority of female bicyclists wear a helmet).

To increase the likelihood that the bicyclist would redeem the coupon, the trainees were instructed on the importance of garnering verbal commitment from the bicyclist to redeem the coupon and begin wearing a bicycle helmet. Voluntary commitment has been shown to improve behavioral compliance (Cialdini, Cacioppo, Basset, & Miller, 1978). According to Cialdini et al. (1978) a commitment technique will only be effective “when the initial decision was made with free choice” (p. 474).

Although free choice is an important aspect of behavioral compliance, effective commitment strategies include three important components: perceived choice, active, and public (Cialdini, 2001). When an individual has a sense of perceived choice s/he is more likely to believe the decision was self-directed and is less likely to resist change. Active commitments are more binding than passive commitments. Lastly, making a public commitment increases anticipated social consequences from individual behavior related to the commitment.

The success of commitment strategies is explained by the consistency principle (Cialdini, 2001). According to the consistency principle, people feel a desire to stay true with prior acts and statements (Cialdini, 2001). The consistency principle (Cialdini, 2001) incorporates the theory of cognitive dissonance (Festinger, 1957) and self-perception theory (Bem, 1967) to explain how people’s behavior can be influenced by personal commitment. Cognitive dissonance occurs when an individual’s behavior does not match internal attitudes, beliefs, or values. Such cognitive dissonance can be remedied by altering the behavior to match the internal value. On the other hand, self-perception theory postulates that we authenticate our attitudes, beliefs, and values by observing our behavior (Bem, 1967).

In general, when people make a voluntary commitment to perform a behavior, they are more likely to adhere to it (e.g., Clark, Schmitz, Conrad, Estes, Healy & Hiltibidal, 1999; Geller, Kalsher, Rudd, & Lehman, 1989; Nimmer & Geller, 1988; Rudd & Geller, 1985). In this case, bicyclists providing verbal commitment should increase their use of the coupon to purchase a bicycle helmet since the commitment was voluntary (i.e., they may receive a coupon regardless of commitment) and the commitment is active and public (i.e., made to the trained CA) (Cialdini, 2001).

To complete the lecture portion, trainees learned how to effectively set SMARTS goals, goals are specific, motivational, achievable, relevant, trackable, and shared (Geller, 2014). SMARTS goals represent a convenient way to teach individuals how to set appropriate goals and are derived from goal setting theory (e.g., Locke & Latham, 1990). In addition to learning the steps to set SMARTS goals, trainees were asked to set their own goals regarding their effort to interact with bicyclists, sign and return them to the researcher before leaving the training session. Specifically, the trainees were asked to make their own SMARTS goals about the number of bicyclists they would approach and the number of coupons they wanted to distribute per week.

The second portion of the training included a brief session of behavioral modeling. Following two specific scripts, research assistants conducted the behavioral modeling training (see Appendix D for behavior modeling scripts). The first interaction was a positive interaction between a "CA" and a "Bicyclist" where the individual is friendly and interested in the message. The second behavioral model script was of a negative interaction between a "CA" and a "Bicyclist". In this instance, the "Bicyclist" is not interested in the message and behaves rudely toward the "CA". After each behavior modeling demonstration, proper reactions to the "Bicyclist" was discussed with a primary focus on appropriate interaction with a rude "Bicyclist".

Another important consideration when developing a training program is the evaluation phase. The most commonly used training evaluation criteria in organizations follow Kirkpatrick's (1960, 1979, 1994) four levels of criteria: reaction, learning, behavior, and results (Goldstein & Ford, 2001).

Although important, participant reactions are typically measured via a self-report questionnaire and do not tell the whole story about the success of the training program. It is also important to measure trainee learning. These measures do not include actual measures of performance only simple tests of KSAs taught in training. This criterion has also been expanded (e.g., Alliger, Tannenbaum, Bennet, Traver, & Shotland, 1997) to include both immediate and retention measurements. These measures differentiate between information, which is easily recallable, and information retained by trainees over time.

The final two criteria for training evaluation assess the effects on task performance (behavior) and organizational objectives/goals (results). The measurement of task performance evaluates the transference of KSAs learned in training to the actual task. This can be accomplished with a behavioral checklist or a more objective measure of performance (e.g., an increase in sales). The measure of results should be a function of organizational objectives and goals identified in the needs assessment; this can be thought of as the organizational utility of training.

In the current study, trainees performed a pre-test measure of the KSAs being trained. To conduct this pre-test measure trainees were asked to go privately with the researcher and role-play an interaction between a “Bicyclist” and a “CA” before the training occurred. In this interaction the researcher always acted as the “Bicyclist” while the trainee always acted as the “CA”. While the interaction took place a second research assistant evaluated the trainees performance using a behavior checklist (see Appendix E, for the behavior checklist). The process was repeated following the behavior modeling session to gain a pre-test and post-test measure.

Untrained social influence. Generally speaking, social influence occurs when individuals compare themselves with peers to determine if their behavior is suitable in a given situation (Maxwell, 2002). Although, trained CAs were taught several important influence principles that can be used to increase compliance there are social influence principles active during routine interactions without direct intention. Essentially, social influence occurs on some level during day-to-day interactions.

Of particular interest to the current study is the behavioral influence of friends or peers. Peer social influence can have a huge impact on behavior, from safe to risky behaviors (Maxwell, 2002). In this case, peers do not need to be close friends; they can affect acquaintances and strangers when a person perceives a “unit relationship” (Heider, 1958). Such unit relationships are comprised of shared experiences or attributes between an individual and another individual or group: these unit relationships can be perceived when even minute or irrelevant similarities are present without any meaningful similarities (Heider, 1958).

An important social influence principle linked to building unit relationships is the principle of liking (Cialdini, 2001). The liking principle identifies an individual’s need to be associated with others who are viewed positively (Cialdini & Goldstein, 2004). The principle of liking postulates that the more individuals have in common with others, the more compliant they will be with their requests. Recently, the liking principle has been expanded to include a heuristic used when individuals are under heavy cognitive load, interacting face-to-face, in unexpected interactions, or when requests come from strangers (Burger, Soroka, Gonzago, Murphy, & Somervell, 2001). The liking heuristic does not need detailed or complex comparisons. Even similarity between names or birthdays can lead to increase in similarities (Burger et al., 2001).

In summary, both the untrained and trained CAs will exert differential influence over bicyclists based on the bicyclist’s perception of similarity between the bicyclist and the CA. This influence will be exerted regardless of receiving training. In accordance with all CAs exerting social influence on others based on perceived similarity the current study hypothesized that CAs who are the same gender as the bicyclist they interact with will have a higher proportion of coupons redeemed.

Hypothesis

In summary, the current intervention sought to increase the bicycle helmet use by targeted a common barrier to helmet use, not owning a helmet, while testing the effectiveness of a training program to increase intervention success. Thus, discounted bicycle helmets were made available to bicyclists via an intervention program. The current study compared trained CAs with untrained CAs. Both the trained and untrained CAs distributed discount coupons to bicyclists observed not wearing a helmet for the purchase of a bicycle helmet.

In the current study, the training program provided trained CAs with a strategy to initiate interactions using the foot-in-the-door technique to increase the CA's comfort starting an interaction. In addition, the trained CAs had the opportunity to view a behavioral model performing an interaction and to practice the interaction they would perform during the intervention. The behavioral modeling and the practice was used to further increase the CAs comfort in performing interactions. Due to training teaching CAs a strategy to initiate interactions and providing practice the following was hypothesized:

Hypothesis 1: On average, trained CAs will attempt to influence behavior more often than untrained CAs. Thus, the mean number of coupons distributed by trained CAs will be greater than the mean number of coupons distributed by untrained CAs.

The training program was designed to teach important KSAs to increase CAs' effectiveness. Specifically, the CAs were taught how to use to use social norms and to secure verbal commitment from bicyclists. Properly using social norms and securing verbal commitment should increase compliance after an interaction. During the training program, CAs practiced using the techniques taught in training providing CAs with the opportunity to increase their competency in using social norms and securing commitment. Considering the implemented training protocol the following was hypothesized:

Hypothesis 2: On average, trained CAs will be more adept at influencing behavior change compared to untrained CAs. Hence, the proportion of coupons redeemed will be greater for trained CAs compared to untrained CAs.

The training program provides CAs with knowledge and skills not used by people in everyday interactions. However, without special training the social influence principle of liking will still impact the outcome of interactions by all CAs. In this case, perceived similarity on gender between the CA and the bicyclist are believed to impact compliance with the request. Thus, the following is hypothesized:

Hypothesis 3: CAs who are the same gender as the participant (i.e., gender similarity) will have a higher proportion of coupon redemption compared to CAs who are not the same gender.

Method

Design

The present study used a non-equivalent group quasi-experimental design to compare participants who received a behavioral training program to participants who did not receive the training.

The two groups were recruited from separate participant pools to create a non-equivalent group quasi-experimental design for two reasons. First, the participants recruited from a research lab primarily concerned with conducting community interventions provided a sample of individuals who would be more likely to attend training programs and participate in a community intervention. Second, concerns existed for possible sample dependence if all participants were recruited from a research lab. Since the study was ongoing over a period of time, subjects would have been able to discuss the project with participants in the other condition if all participants were recruited from the same subject pool.

Participants

Change agents (CAs) were recruited to form two independent groups: an untrained group (n=99) and a training group (n=23). Frequencies for all categorical variables are presented in Table 2. A total of 99 CAs were recruited for the untrained group from a possible sample of 952 introductory psychology students representing a response rate of 10.4%. The sample was 67.68% (67 of 99) female, 73.2% (71 of 97, two participants did not report gender) Caucasian, 57.58% (57 of 99) freshman, and 68.69% (68 of 99) non-bicycle riders. On average participants in the untrained condition were 19.02 (18-30) years old with a standard deviation of 1.66. As a group the untrained change agents distributed a total of 182 (μ=1.84) coupons to participants and 2 were redeemed.

A total of 23 CAs were recruited for the trained condition from a possible sample of 59 representing a response rate of 38.98%. The sample was 78.26% (18 of 23) female, 91.30% (21 of 23) Caucasian, 43.48% (10 of 23) seniors, and 60.87% (14 of 23) non-bicycle riders. On average participants in the trained condition were 20.52 (18-24) years old with a standard deviation of 1.5. As a group trained change agents distributed 138 (μ=6.00) coupons and 7 were redeemed.

Outliers. During data collection, the researcher noticed three trained CAs turning in a large number of communication impact surveys (i.e., more than 20). These three CAs were approached by the researcher and asked to describe their strategy for distributing coupons. Of the three CAs, two CAs described approaching strangers at bicycle racks as suggested in the training. However, one CA described attending group meetings, such as environmental and outdoor related club meetings and providing a pitch to a large group.

The CA who approached large groups (participant #23), a 22-year-old Asian male non-bicycle rider, was eliminated from all analysis due to the nature of the interactions being reported. Essentially, the interest is the unit level interactions between one CA and one bicyclist. The other two outliers (participants 17 and 14) were included in all analyses because they reported following guidelines for approaching bicyclists.

Due to the nature of the research questions, no formal outlier analysis was conducted. Specifically, since the factors leading to an increase in behavioral interactions (coupons distributed) are of interest, it would be counter intuitive to remove any individuals who performed exceedingly well.

Removing participant #23 left a total of 22 CAs in the training condition for all analyses. The training condition sample used for analysis was 81.82% (18 of 22) female, 95.45% (21 of 22) Caucasian, 45.45% (10 of 22) seniors, and 59.09% (13 of 22) non-bicycle riders. On average participants in the trained condition were 20.45 (18-24) years old with a standard deviation of 1.5. As a group trained change agents distributed 93 (μ=4.23) coupons and 5 were redeemed.

Procedure

Participants were recruited from two subject pools to create two independent groups of CAs. One group was recruited to participate in an untrained condition that only received basic instructions on the project during a one hour lecture. The other group was recruited to participate in a training program designed for the experiment.

First, The CAs recruited for the untrained condition were recruited from the psychology department subject pool. Participating untrained CAs attended a one-hour lecture on the need for peers to look out for the safety, health, and welfare of others. During the lecture, the CAs in the untrained condition were informed of the duties of a peer CA (i.e., approach bicyclists and discuss bicycle safety and fill out the required paperwork). Participants in the untrained condition were offered course extra credit for completing prescreen questionnaires and turning in communication impact surveys (see Appendix A, for the communication impact survey) after approaching bicyclists.

Participants were offered ½ a point of extra credit for completing the prescreen questionnaires. Each of the first two communication impact surveys returned were worth ½ a point of extra credit. After the first two, each additional communication impact survey returned was worth ¼ of a point of extra credit. The untrained condition participants were allowed to earn up to six total extra credit points. One point of extra credit was worth approximately half of a percentage point on their course grade. In essence, trained condition participants were able to earn a total of three percentage points toward their final course grade.

The second group of participants was recruited from a psychology research lab that focuses on behavioral science and community involvement to participate in the training condition. The second group was recruited from a separate participant pool to avoid possible sample dependence. Since the study was ongoing over a period of time, subjects would have been able to discuss the project with participants in the other condition if all participants were recruited from the same subject pool.

The training group attended a behavioral training program designed to teach CAs important KSAs for being an effective CA. The CAs in the training group were offered research credit hours equivalent to the extra credit offered to the untrained group. Specifically, ½ hour of research credit was granted for completing the personality questionnaire. Identical to the untrained group, the first two communication impact surveys were each worth ½ hour of research credit, and each additional communication impact survey was worth ¼ hour of research credit. Unlike the untrained group, the trained group had no limit on the amount of credit they could earn.

Both trained and untrained CAs recruited bicyclists to participate in the study by offering them a discount coupon for a reduced cost helmet. The CAs were provided coupons to distribute that allowed the participants to purchase a bicycle helmet for 50% of the original price (actual cost of the helmet after discount was about twenty-five dollars). The CAs were instructed to target bicyclists who were observed not wearing a bicycle helmet. CAs were informed that approaching bicyclists observed at bicycle racks on campus would be an appropriate strategy if they were having difficulty approaching bicyclists; this enabled CAs to approach the bicyclists after observing helmet use, and engage them in a brief conversation. To start the conversation all CAs were instructed that it is imperative to ask bicyclists if anyone else has spoken to them about the availability of discount helmets.

Each time a CA handed out a discount coupon, the CA returned a communication impact survey to the research team. When bicyclists purchased a helmet with the coupon received in an interaction with a CA, the sales representative collected and stored the redeemed coupons. Additionally, bicyclists purchasing a reduced-cost bicycle helmet were asked by the sales representative at the bicycle shop if s/he would be interested in making a commitment to wearing their new bicycle helmet by signing the pledge poster (see Appendix F for a flowchart of requests made to bicyclists). The pledge poster followed the recommendations made by Cialdini

(2001) for an effective commitment strategy (i.e., perceived choice, active, and public). Regardless of their choice to sign the pledge poster, bicyclists were able to redeem their coupon for a discounted bicycle helmet.

The pledge stated: “By signing below I commit to wearing my bicycle helmet each time I ride my bicycle for the remainder of the semester”. This commitment is behavior-based, active and public because customers will be asked to sign the pledge poster with the sales representative watching. In addition, the pledge poster will include the signatures of other individuals (i.e., trained CAs) in order to employ social proof (Cialdini, 2001).

Bicyclists who agreed to sign the pledge poster were given one raffle entry for a $50 gift certificate to East Coasters. The raffle winner was selected by randomly drawing one ticket on May 9th. After the drawing the raffle winner was notified by email and the prize was claimed by the winner.

Any bicyclist who agreed to sign the pledge poster was asked to participate in a follow-up questionnaire by providing their email. Each bicyclist who agreed to participate was emailed a link to a short follow-up questionnaire by email (see Appendix G, for the follow-up survey).

Independent Variables

Training condition. The untrained peer CAs received limited instructions in a large classroom setting on how to approach bicyclists. In contrast, the trained CAs received detailed instructions on how to approach and interact with bicyclists in a two-hour behavior-based training session.

Measured Variables

Age of the CA. The age of the CA was a fill in the blank self-report measure.

Gender of the CA. The gender of the CA was measured as a dichotomous self-report variable. The CA had the option of circling male or female.

Ethnicity of the CA. The ethnicity of the CA was a self-report measure allowing the CA to circle Caucasian, Asian, African American, Latino, Native American, or other.

Class rank of the CA. The CA had the option of circling freshman, sophomore, junior, senior, or graduate student/faculty for the self-report measure of class rank.

Coupon number. The CA was asked to write down the coupon number that appeared on the coupon distributed.

Age of the coupon receiver. The age of the bicyclist was a fill in the blank reported by the CA after asking the receiver his/her age.

Gender of the coupon receiver. The gender of the bicyclist was measured as a dichotomous variable. The CA had the option of circling male or female after asking the receiver his/her gender.

Ethnicity of the coupon receiver. The ethnicity of the bicyclist was reported by the CA by circling Caucasian, Asian, African American, Latino, Native American, or other after asking the receiver his/her ethnicity.

Class rank of the coupon receiver. The CA reported the class rank of the bicyclist as freshman, sophomore, junior, senior, or graduate student/ faculty after asking the receiver his/her class rank.

Relationship between the CA and the coupon receiver. The CAs recorded their relationship with the coupon receiver on a five-point Likert scale. Anchors were Family/close friend (5), Acquaintance (3), and Complete Stranger (1).

Perceived reaction of the coupon receiver. Perceived reaction of coupon receiver was recorded on a five-point Likert scale ranging from negative (1) to positive (5) with neutral (3) in the middle.

Personal experience of the CA. The positive vs. negative experience of the CA was measured on a five-point Likert scale with the same anchors used when recording perceived reaction of the coupon receiver.

Gender similarity. The similarity between the CA and the bicyclist was recorded as either a match or non-match by the researcher.

Dependent Variables

Number of coupons distributed. The total number of coupons distributed was measured as a continuous variable by adding up the total number of communication impact surveys completed.

Mean number of coupons redeemed. Coupons were collected from the local retailer to determine if each coupon was redeemed. Coupon redemption was recorded as a dichotomous variable with two levels, yes or no.

Pledge signed. Bicyclists who purchase a reduced-cost helmet were asked to sign a pledge poster. The results were recorded as a yes/no dichotomous variable for each bicyclist.

Bicycle helmet use. Bicyclist helmet use was measured by self-report of bicycle helmet use on the follow-up survey.

Analysis

Testing Hypotheses and Post Hoc Analysis

Hypothesis 1: Trained CAs will distribute more coupons on average than untrained CAs. An independent samples t-test was used to test for mean differences between trained and untrained CAs.

Hypothesis 2: The average number of coupons redeemed will be greater for trained CAs compared to untrained CAs. A Chi-Square test for independence would have been most appropriate. However, the hypothesis was not tested due to the low outcome level. To conduct a Chi-Square test the expected value for each cell in the contingency table must be at least five. In this case the cell for the untrained group of redeemed coupons was 2. Conducting a test of this hypothesis to assess if differences existed between the trained and untrained CAs would have been unreliable.

Hypothesis 3: For CAs who are the same gender as the participant (i.e., gender similarity) will have a higher rate of behavior change compared to CAs who are not the same gender. To test hypotheses 3 a hierarchical linear model would have been most appropriate to deal with possible dependencies in the data structure. In this case the data represented a nested data structure where participants are nested within CAs nested within the training manipulation (See Figure 1 for nested data structure).

The nested data structure was of theoretical importance when investigating the influences on participant's (level 1) behavioral outcomes based on the training manipulation (level 3) and individual differences of the CAs within the training manipulation (level 2). Essentially, it would have been important to account for the nested structure of the data because we were interested in the effects of both the training manipulation and individual differences of the CA and bicyclist on the outcomes of the bicyclists approached.

Running a three-level fully unconditional hierarchical linear model, a model with no predictors, provides information on how the variation in an outcome measure is allocated across the three different levels (Raudenbush & Bryk, 2002). In the case of the three level model described here (participants nested within change agents, nested within training condition), the unconditional model would have described how the variation in target behavior (coupon redemption) varied across the three levels (i.e., proportion of variance of behavior attributed to each level of the model). Following hierarchical generalized linear models for binary dependent outcomes would have allowed for the addition of predictors to assess the proportion of variance at each level attributed to predictors at that level measured in log-odds (e.g., amount of level two variance attributed to the CAs gender).

Hypothesis (3) suffers from the same issue associated with hypothesis two: a small amount of outcome data. If a three level logistic hierarchical linear model had been run with this sample it would have had 2 level three units (trained vs. untrained), 121 level two units (CAs: 22 trained, and 99 untrained), and 275 level one units (participants recruited: 93 by trained CAs and 180 by untrained CAs). However, only 7 of the 275 level one units redeemed a coupon (redeeming a coupon: 5 participants recruited by trained CAs and 2 participants recruited by untrained CAs). The low amount of outcome data available for the model reflects a restricted amount of possible variance in the model.

Although hypotheses two and three could not be tested, the data still allows the opportunity to investigate an important part of change agent success: the number of successful behavior interactions between a change agent and a participant measured by the number of coupons distributed. Although the number of coupons distributed will not encompass every attempted interaction, it still provides interesting data to explore for predictors of successful behavioral interactions. This is especially interesting given the various possible explanations for the lack of behavior (outcome data) and the possible implications for CA recruitment.

Results

Training Manipulation Check

To ensure the training program successfully taught individuals the important social influence techniques to increase their efficacy as CAs participants completed both pre-training and post-training role-play interactions. These interactions were observed by a researcher and rated using a behavioral checklist (see Appendix E). Of the 22 trained CAs included in the analyses, three were research assistants who helped design and run the training program. Since they had extensive knowledge of the interactions, these three individuals were not included in the pre-test post-test comparison.

To assess differences in the pre-test ($\mu = 1.32$, $\sigma = 1.20$) and post-test ($\mu = 5.42$, $\sigma = 1.74$), a paired samples t-test was conducted ($t\ (18) = -7.60$, $p < .001$). The result of the paired samples t-test provides evidence that there was a significant difference between the pre-training interaction and the post-training interaction. In this case, the post-training interaction was significantly greater than the pre-training interaction, suggesting the training program was effective.

Descriptive Statistics

Means and standard deviations of all variables of interest are reported in Table 1. Additionally, the frequency of behavioral interaction is shown in Figures 2, 3, 4, and 5. These figures show 12 (54.55%) CAs from the trained group and 16 (16.16%) CAs from the untrained group for a total of 28 (23.14%) CAs who had zero behavioral interactions. This is critical for the trained group since more than half of the trained CAs did not have any behavioral interaction.

One other area for concern is that 67 (55.37%) CAs reporting exactly two interactions. The number of CAs with exactly two interactions was driven by the untrained group. In this case, the untrained group had 65 (65.66%) participants with two interactions, whereas only 2 (9.09%) trained CAs had exactly two interactions.

Finally, a correlation matrix is presented in Table 3. A notable significant correlation: a moderately strong positive correlation between the number of interactions performed by a CA and the training manipulation. The number of interactions was also significantly positively correlated with class rank; however, class rank and the training manipulation were significantly correlated. These correlations suggest the possibility that the number of interactions a CA reports is related to the training protocol and/or the class rank of the CA.

Other pertinent correlations are the strong positive correlations between the training manipulation and the age and class rank of the CA. This correlation is most likely a function of the recruitment method. The CAs in the untrained condition were recruited from Introductory Psychology a course made of predominantly freshman and sophomores; whereas the CAs in the training condition were recruited from a research lab which was primarily upperclassmen.

One surprising finding shown in the correlation table is the lack of significant correlations between the CAs average relationship to the bicyclist, the average perceived reaction of the participant reported by the CA, and CAs average reported personal experience to any other variables of interest. Not surprisingly, the average perceived reaction and the average personal experience were significantly positively correlated.

Hypothesis testing

An independent samples t-test was planned to test Hypothesis 1. Before conducting the test, the data were investigated for possible violations of the underlying assumption of an independent samples t-test. The underlying assumptions of a t-test are that the samples are: independent, have a normal distribution, and have equal variance. No statistical test exists to test for independent groups. However, in this experiment recruiting procedures were carefully conducted to limit individuals' participation to a single group and each group was provided no information about the other group in the study.

To test for normality a Shapiro-Wilk test (Shapiro & Wilk, 1965) was selected. The Shapiro-Wilk test was chosen because it has been reported to be the most powerful statistical technique for testing normality of data (Razali & Wah, 2011). The Shapiro-Wilk test was significant at an alpha level of .05 for both the untrained group (Shapiro-Wilk (99) = .632, $p < .05$), and the trained group (Shapiro-Wilk (22) = .685, $p < .05$). Therefore, the null hypothesis is rejected for both the untrained group and the trained group. The Shapiro-Wilk test evaluates a null hypothesis where the populations from which the data are collected are normally distributed. Thus, rejecting the null hypothesis supports the notion that the data are not normally distributed that violates the assumption of an independent samples t-test.

One way to deal with the assumption of normality being violated is to transform the data. Some example transformations are logarithmic (e.g., log base 10 or natural log), square function (i.e., square root or raising the variable to a power), or inverse transformation (i.e., 1/variable). However, for these data a fair number of CAs distributed zero coupons in both the trained and untrained conditions. Data points of zero make the useful transformations impossible. For example, a logarithmic transformation of zero is undefined and in basic algebra one cannot divide by zero. Since transformations are not a viable solution, a non-parametric version of the independent samples t-test was selected.

To test the assumption of equal variance, a Levene's test for homogeneity of variance was conducted (Levene, 1960). The Levene's test for homogeneity tests a null hypothesis stating the variances in populations from which the data are collected are equal against an alternative hypothesis that the variances are not equal. In this case the Levene's test for homogeneity based on the median was used since the data are not normally distributed and the mean is impacted by outliers in the data. The Levene's test for homogeneity was significant at an alpha level of .05 (Levene (1,119) = 24.122, $p < .05$). In this case, the null hypothesis was rejected and the alternative hypothesis was supported. Thus, the samples do not have equal variances and the assumption of equal variances in an independent samples t-test was violated.

Since both the assumption of a normal distribution and the assumption of equal variances were violated for an independent sample t-test, a non-parametric version was selected. In this instance a Welch's t-test for unequal variance (Welch, 1947) was conducted. In instances where equal variances are violated the Welch's test has been strongly recommended over other tests, such as the Mann-Whitney test (Ruxton, 2006). The Welch's t-test tested a null hypothesis that the trained group and the untrained group did not differ from one another on the number of behavioral interactions. The result of the Welch's t-test for unequal variance provided a non-significant result at an alpha level of .05 (t (21.438) = 1.664, $p = .111$). Thus, the test failed to reject the null hypothesis and the two groups were found to not significantly differ from one another. This null result indicates the trained CAs did not perform more interactions per individual compared to the untrained CAs.

Post-hoc Analyses

Due to the large number of trained CAs who reported no interactions, a second Welch's t-test for unequal variance was conducted. The post-hoc test was conducted due to the large number of participants who did not conduct a single interaction to evaluate the training program effectiveness for individuals who performed at least one interaction. In essence, the training program may have been effective at increasing the number of behavioral interactions for CAs as long as they participated in the intervention. Since the CAs were rewarded for completing the training program and for completing preliminary surveys it is possible the CAs had no intention of participating and instead completed the pre-intervention tasks for the reward. Thus, it is important to test the difference between trained and untrained CAs who performed at least one interaction to test the effectiveness of training for CAs who participated in the intervention.

A total sample size of 93 participants remained when only participants who had at least one interaction were included. These 93 participants included 83 untrained CAs and 10-trained CAs. A breakdown of frequencies for all CAs who had at least one interaction is presented in Table 4.

The sample for the untrained group included in post-hoc analyses was 67.47% (56 of 83) female, 75.31% (61 of 81, two participants did not report their gender) Caucasian, 54.22% (45 of 83) freshman, and 59.88% (58 of 83) non-bicycle riders (See Table 4). On average participants in the untrained condition were 19.00 (18-23) years old with a standard deviation of 1.30. As a group untrained change agents distributed a total of 182 (μ=2.19) coupons and 2 were coupons redeemed.

The sample for the trained group included in post-hoc analyses was 80% (8 of 10) female, 100% (10 of 10) Caucasian, 50% (5 of 10) seniors, and 60% (6 of 10) non bicycle riders. On average participants in the trained condition were 20.40 (18-24) years old with a standard deviation of 1.65. As a group trained change agents distributed 93 (μ=9.30) coupons and 5 were redeemed.

The Welch's t-test compared the trained group with the untrained group, but only CAs who had at least one interaction were included. The result of the Welch's t-test yielded a significant result at alpha .05 ($t(9.075) = -3.101$, $p = .013$). Thus, the null hypothesis was rejected and the two groups were found to significantly differ from each other. This test indicates that for CAs with at least one interaction trained CAs had more interactions per individual than untrained CAs.

Discussion

The current study was designed to test the impact of a training program to increase CA effectiveness in promoting bicyclist helmet use. In this case CA effectiveness was defined primarily as behavioral interactions (coupons distributed) and secondarily as behavioral compliance (coupons redeemed). The study aimed to evaluate the impact of a training program on both the primary and secondary measure of CA effectiveness. However, due to the small amount of actual target behaviors (less than 5%) the primary index of CA effectiveness was not investigated.

The effectiveness of the training program was found to be non-significant when all CAs were considered which did not support hypothesis 1. However, when only CAs who had at least one behavioral interaction were considered the training program was found to be significantly different from the untrained condition. This finding suggests the training program may be effective for some individuals (i.e., individuals who reported at least one interaction), but ineffective for others (i.e., individuals who reported no interactions).

Another possible explanation for the effect of the training program is the reward structure in place for participants acting as CAs. Specifically, the effect of the training program may have been driven by the nature of the reward structure. In the untrained group participants were able to earn one research credit hour worth one point of extra credit for completing two interactions and filling out the individual differences questionnaire. Although the magnitude of reward was equivalent for each group, the participants in the untrained group may have appraised the reward in terms of extra credit only. In this case, untrained CAs were able to earn a total of ten extra credit points for their class. Thus, one point of extra credit is 10% of the possible extra credit.

On the other hand, the trained CAs were rewarded one research credit hour without a possible alternative cognitive appraisal. Although the number of research hours is the same, the trained CAs were required to earn a total of 84 research hours to pass their research lab. The one research credit the trained CAs received only accounted for about 1% of their total hours. If the untrained group had considered their reward as a portion of the total course grade the reward would have also been about 1% of the course grade.

The possible difference in perceived value of the reward may have led to differing cognitive appraisal of why they completed the task. Specifically, they students in the untrained condition may have assigned the reward as their reason for performing the task since it was a large portion of their possible extra credit. While the trained CAs after performing at least one behavior may have attributed their actions more to an internal value. This follows from a classic experiment by Festinger and Carlsmith (1959) where students who were paid 20 dollars were more likely to attribute their actions to the reward compared to students who were paid 1 dollar.

Alternatively, the trained CAs who did not perform any interactions may have felt the intervention was not worth their effort. A convenient model to investigate a CAs propensity to perform the target behavior is the empowerment model (Geller, 2014). The empowerment model is derived from Bandura’s self-efficacy theory (Bandura, 1977) and asks three simple questions to determine if an individual is likely to take action. 1) “Can I do it?”, 2) “Will it work?”, and 3)

Is it worth it. The first question refers to the idea of self-efficacy, which is the belief that the individual can perform the needed actions (Bandura, 1977). The second question reflects response efficacy or the belief that the behavior is useful for a certain mission (Geller, 2014). Lastly, the third question represents outcome expectancy, or the belief the expected consequence justifies the response effort (Bandura, 1977).

In the case of the trained CAs who did not perform any behavioral interactions, they may have answered yes to the first question, "Can I do it?" because the training program taught the CAs how to use useful social influence techniques when interacting with bicyclists. Although untested, the social influence techniques, the behavioral modeling, and the practice should have enhanced the CAs self-efficacy to perform the interactions (Bandura, 1982). However, if trained CAs self-efficacy was not increased they likely answer question one with no.

The second question "Will it work?" may be answered with a yes since the training covered the value of a bicycle helmet in preventing serious injuries. Yet, if the trained CAs do not believe that bicycle helmets will help to prevent serious injuries they will answer no. Finally, trained CAs without any interactions may have answered no to the third question "Is it worth it?" since the training did not address all possible barriers to helmet use.

For example, if a CA felt an unaddressed barrier would prevent behavior adaption the fourth question would be answered no. Specifically, a CA might believe people will not wear a helmet even if they own one because it may mess up the bicyclist's hair. Essentially, the trained CA may have felt fully confident in their ability to have an interaction with a bicyclist, but might have felt the interaction would not have any impact on the bicyclist's behavior.

In summary, the post-hoc results provide limited support for the effectiveness of the training program for CAs who participated in the intervention. Although the trainees learned the intended declarative knowledge and used the knowledge in the post-test practice, there are other plausible explanations for why the training program appears to be effective and the results should be interpreted with caution.

Limitations

The primary limitation of the study is the recruitment strategy used to limit possible dependency in the data. Specifically, the CAs who were recruited into the training condition held higher class rank compared to the CAs in the untrained condition. This was due to the recruitment strategy targeting an introductory undergraduate course that was predominantly underclassman for the untrained condition and targeting a research laboratory which was predominantly upperclassman for the trained group. The recruitment procedure led to high correlations between the training condition, class rank, and age. Class rank and age were expected to be highly correlated since many people progress at a standard rate over time. However, the training condition was highly correlated with both. The individual differences observed between the two groups limit the inferences from the study.

Future Research Directions

Future research should investigate the factors that differentiate CAs who perform behavioral interactions from those who do not. Specifically, future research should investigate additional individual differences that distinguish between CAs who respond to training not investigated in this study. These individual differences may include personality variables, such as extroversion or measuring self-efficacy. In fact, individual differences, such as extraversion, may interact with self-efficacy to predict the number of behavioral interactions a trained CA would perform. For example, perhaps an individual high on extroversion, but with low self-efficacy would perform more interactions on average while an individual high on extroversion and high on self-efficacy would perform more interactions on average than even the individual with high extroversion and low self-efficacy.

Another avenue for follow-up research is to strengthen the current study design by investigating behavioral outcomes, such as helmet use by individuals over time. This could be accomplished by providing free helmets to participants following an interaction, thereby eliminating the barriers of proximity and cost. However, the participants would need to be followed over time. This method could apply experience sampling methodology having participants report their helmet use for a set period of time after receiving a free helmet.

Conclusion

The results of the current study provide limited support for the training programs effectiveness in increasing the number of interactions per individual. However, training programs can be costly and time consuming to create and test. The current study suggests an appropriate training program should be used to increase CA effectiveness. In some situations a training program may be too costly or time consuming and another approach may be used, such as recruiting many individuals to act as CAs without training. In fact, in this study, the untrained group outperformed the trained group in raw metrics. The untrained group had a total of 182 interactions while the trained group had 93. However, caution must be used when considering the use of a large untrained group since there were 99 untrained CAs and only 22 trained CAs.

If the time and resources are available, a training program should be designed to fit the intervention strategy. In addition, recruitment for the training program should be carefully considered. Specifically, CAs should be recruited who are likely to consider the intervention a personal issue. Alternatively, the training program could be designed to specifically address all three questions posed by the empowerment model (Geller, 2014).

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Figure 1. Nested Data structure for CAs

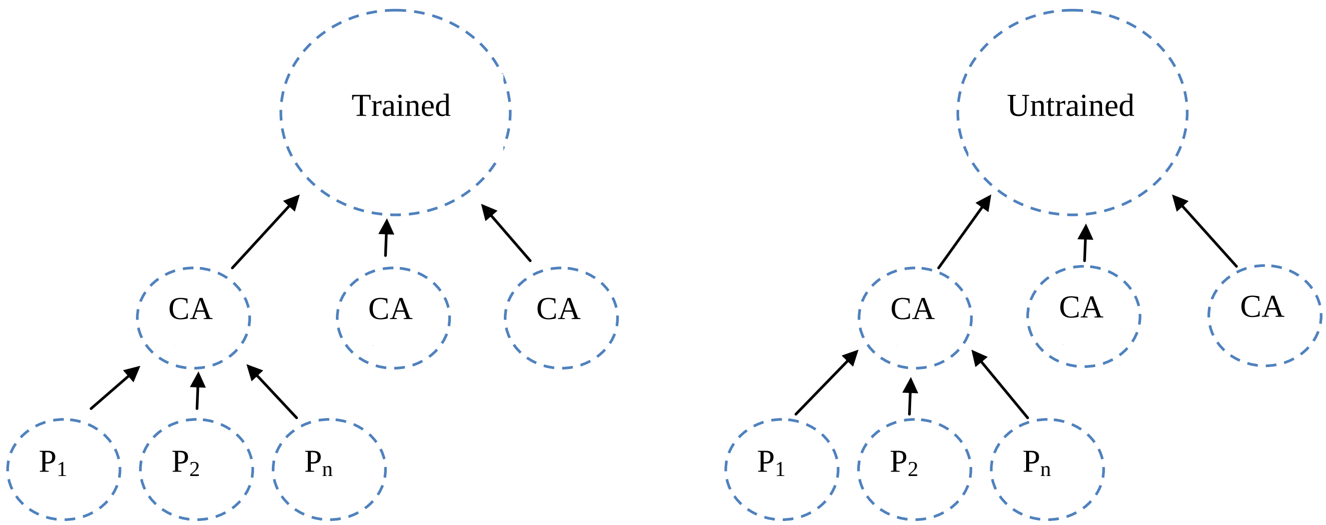


Figure 2. Frequency of Behavioral Interaction for all Participants

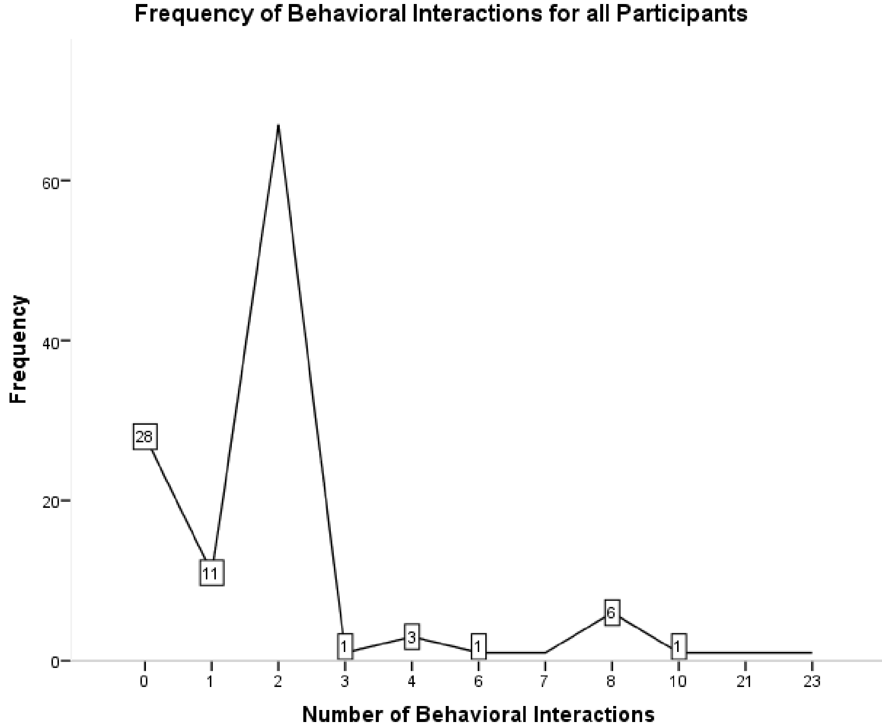


Figure 3. Frequency of Behavioral Intearcations for Untrained CAs

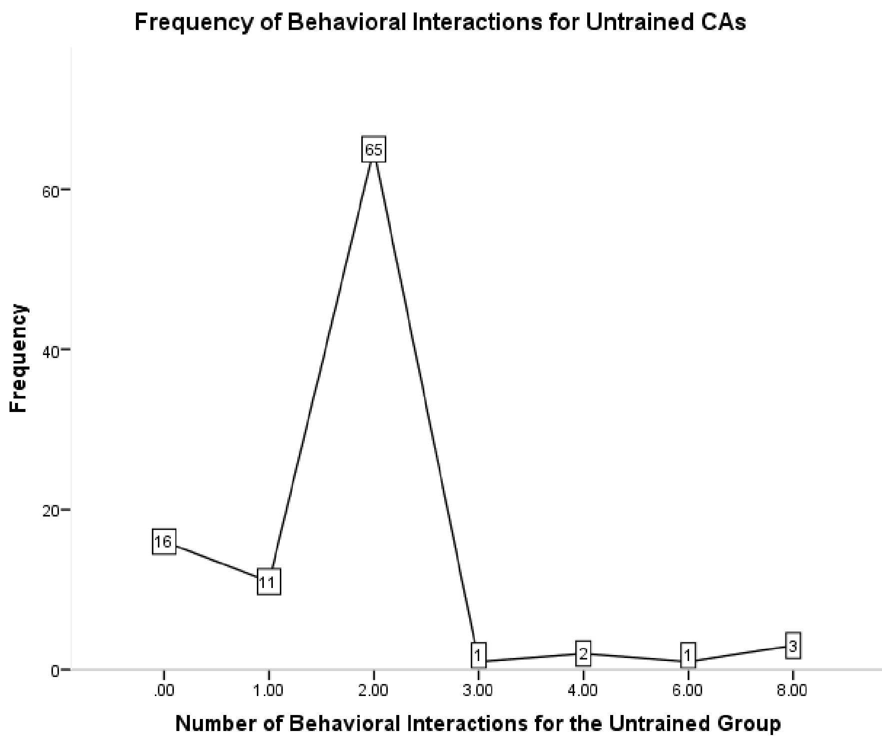


Figure 4. Frequency of Behavioral Interactions for the Trained Group

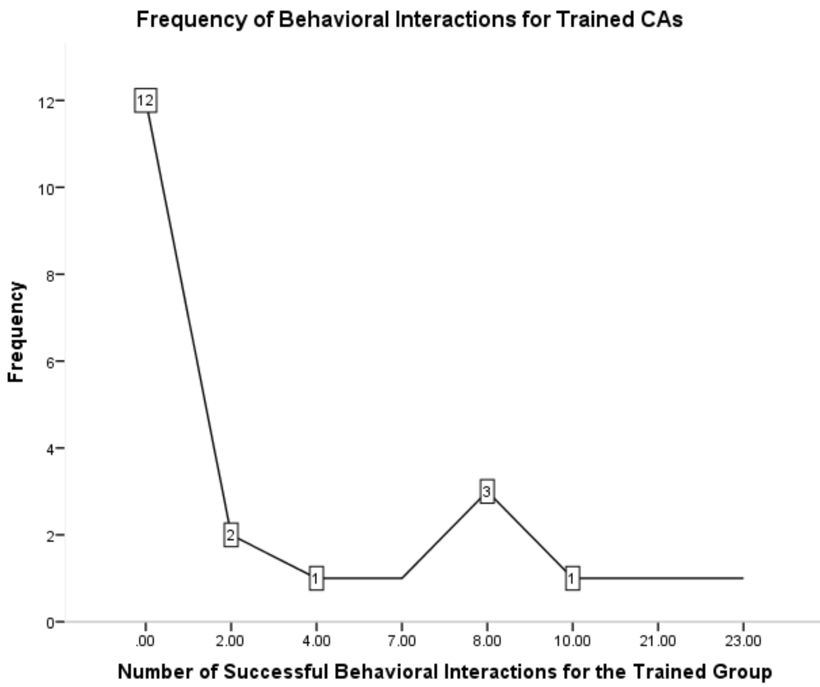


Figure 5. Histogram of Behavioral Interaction Frequency by Training Condition

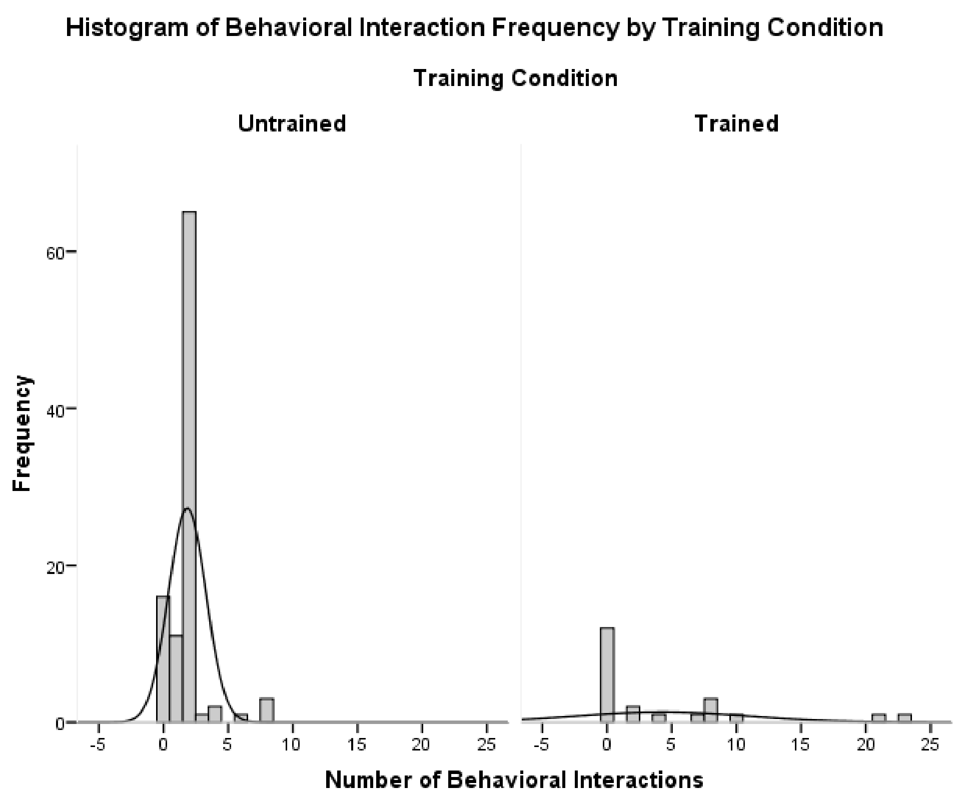


Table 1. Means and standard deviation of all CA variables

Descriptive Statistics			
Change Agent:	Mean	Standard Deviation	Sample Size
Training Condition	.18	.387	121
Age	19.29	1.723	119
Gender	.30	.459	121
Ethnicity	1.43	1.005	119
Class Rank	1.99	1.129	121
Rides a Bicycle	.33	.472	121
Owns a Helmet	.96	.898	121
Wears a Helmet	.75	.725	108
Number of Interactions	2.27	3.227	121
Avg. Relationship	2.754	1.339	93
Avg. Reaction	3.599	.798	93
Avg. Experience	4.029	.810	93

Table 2. Frequencies of all categorical variables for untrained and trained CAs included in analyses

		Frequency (%) Untrained CAs	Frequency (%) Trained CAs	Total
Gender	Male	32(32.32)	4(18.18)	36
	Female	67(67.68)	18(81.82)	85
	Total	99(81.82)	22(18.18)	121
Ethnicity	Caucasian	71(73.2)	21(95.45)	92
	Asian	15(15.46)	1(4.55)	16
	African American	5(5.15)	0(0)	5
	Latino	5(5.15)	0(0)	5
	Other	1(1.04)	0(0)	1
	Total	97(81.51)	22(18.49)	119
Class Rank	Freshman	57(57.58)	1(4.54)	58
	Sophomore	19(19.19)	5(22.73)	24
	Junior	17(17.17)	5(22.73)	22
	Senior	6(6.06)	10(45.45)	16
	Graduate Student	0(0)	1(4.54)	1
	Total	99(81.82)	22(18.18)	121
Rides a Bike	Yes	31(31.31)	9(40.91)	40
	No	68(68.69)	13(59.09)	81
	Total	99(81.82)	22(18.18)	121
Owns a Helmet	Yes	19(19.19)	5(22.73)	24
	No	39(39.4)	12(54.54)	51
	Not at Tech	41(41.41)	5(22.73)	46
	Total	99(81.82)	22(18.18)	121
Wears a Helmet	Yes	34(39.53)	11(50)	45
	No	39(45.35)	6(27.27)	45
	Not applicable	13(15.12)	5(22.73)	18
	Total	86(79.63)	22(20.37)	108

Table 3. Correlations for all variables

Change Agent	Training	Age	Gender	Ethnicity	Class Rank	Rides Bike	Owns Helmet	Wears Helmet	Number of Interactions	Avg. Relationship	Avg. Reaction	Avg. Personal Experience
Training	1											
Age	.324*	1										
Gender	-.119	.008	1									
Ethnicity	-.182*	-.067	.193*	1								
Class Rank	.518*	.757*	-.188*	-.156	1							
Rides Bike	.079	.155	.119	.051	.130	1						
Owns Helmet	-.146	-.105	-.031	.048	-.058	.249*	1					
Wears Helmet	.143	-.187	.000	.131	-.107	-.207*	-.101	1				
Number of Interactions	.287*	.110	-.111	-.083	.273*	-.021	-.010	-.043	1			
Avg. Relationship	-.015	.071	.013	-.043	.058	-.099	-.099	.137	-.156	1		
Avg. Reaction	.094	.047	-.111	-.007	.034	.124	.098	.004	.069	.198	1	
Avg. Personal Experience	.118	-.106	-.112	.085	-.069	.127	.040	.066	.123	.177	.358*	1

*Significant at alpha = .05

Table 4. Frequencies for untrained and trained CAs included in post-hoc t-test

		Frequency (%) Untrained CAs	Frequency (%) Trained CAs	Total
Gender	Male	27(32.53)	2(20.00)	29
	Female	56(67.47)	8(80.00)	64
	Total	83(89.25)	10(10.75)	93
Ethnicity	Caucasian	61(75.31)	10(100.0)	71
	Asian	11(13.58)	0(00.00)	11
	African American	4(4.94)	0(00.00)	4
	Latino	4(4.94)	0(00.00)	4
	Other	1(1.23)	0(00.00)	1
	Total	81(89.01)	10(10.99)	91
Class Rank	Freshman	45(54.22)	1(10.00)	46
	Sophomore	16(19.28)	2(20.00)	18
	Junior	16(19.28)	1(10.00)	17
	Senior	6(7.22)	5(50.00)	11
	Graduate Student	0(0)	1(10.00)	1
	Total	83(89.25)	10(10.75)	93
Rides a Bike	Yes	25(30.12)	4(40.00)	29
	No	58(59.88)	6(60.00)	64
	Total	83(89.25)	10(10.75)	93
Owns a Helmet	Yes	15(18.07)	3(30.00)	18
	No	32(38.56)	4(40.00)	36
	Not at Tech	36(43.37)	3(30.00)	39
	Total	83(89.25)	10(10.75)	93
Wears a Helmet	Yes	27(38.57)	8(80.00)	35
	No	33(47.14)	2(20.00)	35
	Not applicable	10(14.29)	0(00.00)	10
	Total	70(87.50)	10(12.50)	80

Appendix A
Communication Impact Survey

Participant Code

Please fill in the following questions about the bicyclist

Coupon number: ________

Age: ________

Gender: Male Female

Ethnicity: Caucasian Asian African American Native American Latino Other

Class Rank: Freshman Sophomore Junior Senior Graduate Student/Faculty

What is your relationship to the coupon recipient at the time you gave them the coupon?

1 2 3 4 5

Complete Stranger Acquaintance Family/Close friend

How did you perceive the reaction of the recipient?

1 2 3 4 5

Negative Neutral Positive

What was your personal experience giving out the coupon?

1 2 3 4 5

Negative Neutral Positive

Appendix B

Peer CAs task statements

Target bicyclists observed not wearing a helmet

Thank bicyclists seen wearing a helmet

Use icebreakers as an introductory statement (i.e., Can I look out for your safety?)

Communicate with individuals to promote bicycle safety

Offer bicyclists a coupon for a reduced cost helmet

Ask bicyclists for verbal commitment to redeem the coupon

Provide information about intervention material

Thank individuals

Peer CAs KSAs

Knowledge:

Know the target behavior

Know the target population

Know details about intervention materials (e.g. the coupon)

Know the intervention message (e.g., the benefit of bicycle helmet use) and the campaign slogan

Know the properties of effective goals

Know about social norms and how they influence individuals

Abilities:

Communicate using social norms to influence bicyclist behavior

Secure commitments of participants

Engage individuals in discussing the value of bicycle safety

Set appropriate individual goals (e.g., number of coupons to give out each week)

Appendix C

Training Lecture


Influencing Bicycle Riders
You cannot effect change without
英
COURAGE


Get your foot-in-the-door
What is the foot-in-the-door technique?
How can you implement it?
NORMALLY
Hello sir, would you have $2 for a bus ticket?
Please?
...
VINHLY
What time is it, sir? I need to catch the bus...
Yes, it is 5:30 pm
Thank you so much!
... I think I'm $2 short for the bus. Could you help me a bit?
Let me check...
www.vinh.ly

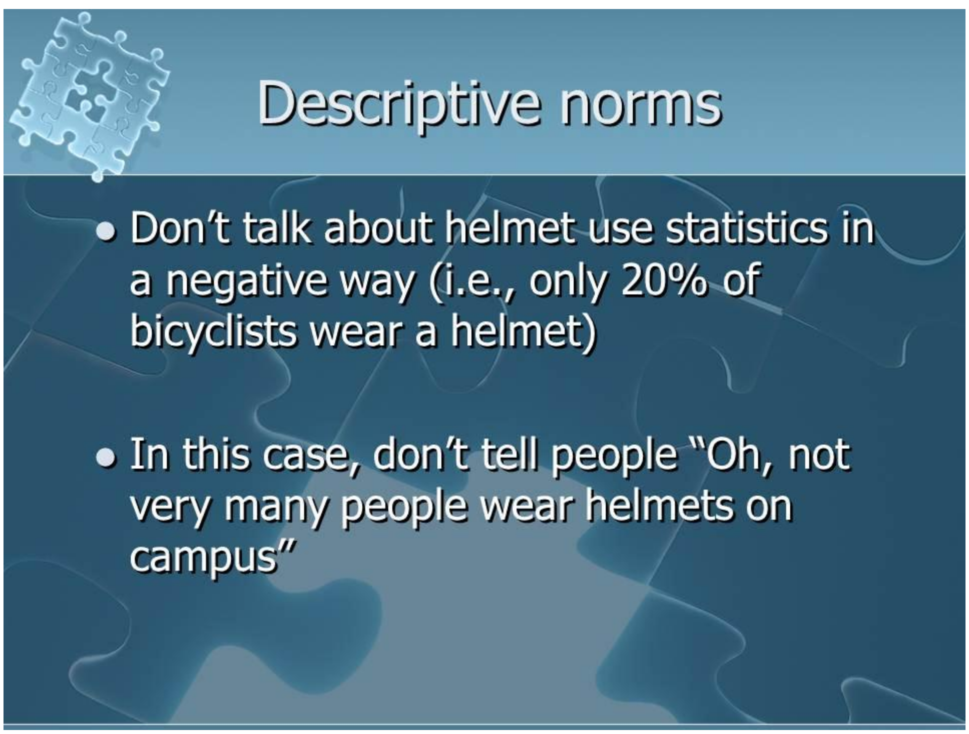
Engage

- Ask a question that will engage people.
  - "Do you have a few moments to answer a few questions about your bicycling?"

Important*

- It is crucial to ask people if they have been talked to about bicycle safety by anyone else
- This will help to protect the integrity of the study


Social Norms
Descriptive Norm
Injunctive Norm
RULES!
1. You SHALL!
2. You WILL!
3. You MUST!


Descriptive norms
Don’t talk about helmet use statistics in a negative way (i.e., only 20% of bicyclists wear a helmet)
In this case, don’t tell people “Oh, not very many people wear helmets on campus”

Descriptive norms

- Instead spin a positive descriptive norm
- I see more and more bicyclists protecting themselves from serious head injury by wearing a bicycle helmet.

Augment descriptive norms

- Add grouping to descriptive norms
- For example, tell people that 88% of participants who accepted a coupon redeemed it for the quality bicycle helmet
  - This places people into a group of coupon receivers.

Coupon

- Offer the bicyclist a coupon
  - 50% off a quality helmet
  - 1 of every 20 helmets purchased is FREE
- Coupons can be redeemed at East Coasters

Commitment

- Secure a verbal commitment

Communication Impact Survey

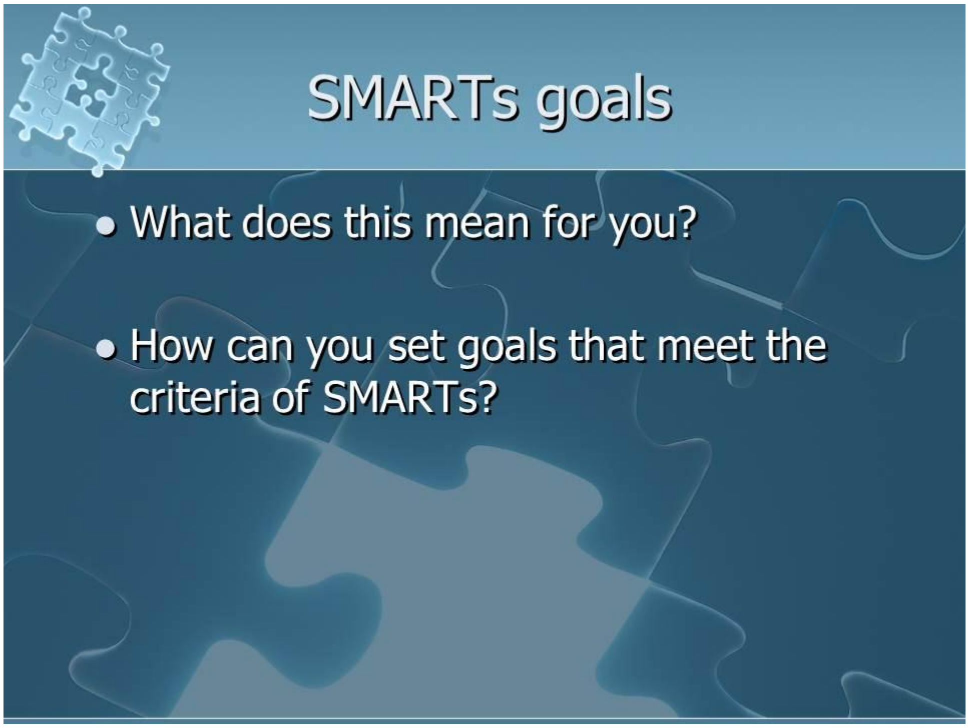
- Fill out a communication impact survey each time you hand out a coupon
- Do your best to fill out all of the information about the bicyclist
  - You will need to ask some questions
- If you don't get all the information leave it blank and still turn it in

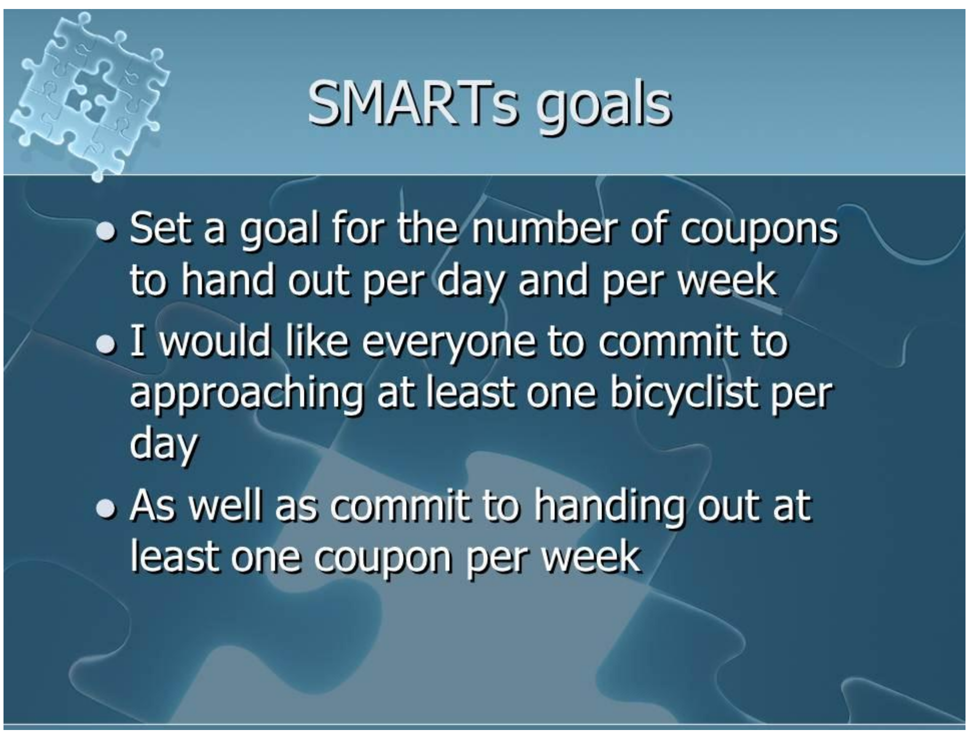
Show Appreciation

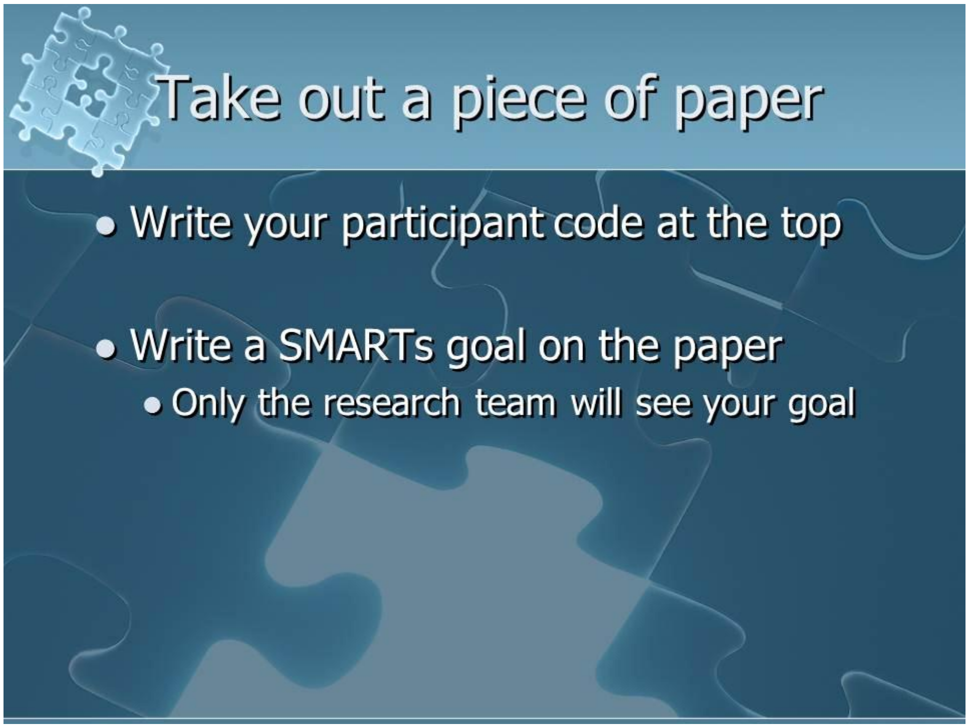
- Don't be afraid to spread the message
- Tell friends
- Provide support for bicyclists seen wearing a proper bicycle helmet

Goal setting

- How to set goals
- Specific
- Motivational
- Achievable
- Relevant
- Trackable
- Shared


SMARTs goals
What does this mean for you?
How can you set goals that meet the criteria of SMARTs?


SMARTs goals
Set a goal for the number of coupons to hand out per day and per week
I would like everyone to commit to approaching at least one bicyclist per day
As well as commit to handing out at least one coupon per week


Take out a piece of paper
Write your participant code at the top
Write a SMARTs goal on the paper
Only the research team will see your goal

Appendix D

Positive behavior model script:

Change agent: “Hi, excuse me; can I look out for your safety?”

Bicyclist: Sure, I consider myself safe.

Change agent: I noticed you were not wearing a helmet, is there any specific reason?

Bicyclist: I don’t own one because they are expensive.

Change agent: Really, don’t you think they are worth the cost? I was in a bicycle crash and my helmet saved my life.

Bicyclist: Yeah, sure, but I don’t ride my bicycle very far. I won’t get into an accident.

Change agent: Keep in mind; you can’t control everything around you. When I had my crash, a car swerved into my bicycle less than a mile from my home. Maybe I could interest you in a coupon for a discounted bicycle helmet?

Bicyclist: Well, what do I have to do for it?

Change agent: It’s simple, just promise me that you will take it and redeem it. Coupons are limited so it’s important I know you plan on taking it to the bicycle shop.

Bicyclist: Okay, I guess it couldn’t hurt.

Change agent: The coupons are only redeemable at East Coasters at 1301 North Main Street. I do want you to know that I am not affiliated with the bicycle store but they have graciously agreed to provide helmets for 50% and give away one helmet for every twenty purchased.

Bicyclist: Cool, I will stop by later.

Change agent: Thank you so much for taking the time to talk to me, I don’t always ride a bike but when I do I wear a helmet. I hope you have a nice day.

*****Keep in mind this is nearly a perfect interaction. Actual interactions will not be this perfect

Negative behavior model script:

Change agent: “Hi, excuse me; can I look out for your safety?”

Bicyclist: Sure I guess.

Change agent: I noticed you aren’t wearing a bicycle helmet, I rarely see anyone on campus without one.

Bicyclist: Maybe you should open your eyes, no one wears helmets they make people look stupid.

Change agent: I am sorry you feel that way; do you at least own a bicycle helmet?

Bicyclist: No, they are a waste of money.

Change agent: What if you could purchase one for 50% off?

Bicyclist: Look I’m not interested in what you are selling. I don’t know why you are wasting my time.

Change agent: Well thank you for taking the time to talk to me. I hope you have a nice day.

*****The interaction may go awry at any time. Do your best to make the best of any situation by using descriptive norms and other strategies to influence individuals.

Appendix E

Behavior checklist

Behavior Check List for Bicycle Safety

1. Did the change agent ask the bicyclist if they had been talked to about bicycle safety?

   Yes No

2. Used foot-in-the-door technique (i.e., ask them to answer a few questions)?

   Yes No

3. Used a descriptive norm while talking to the bicyclist?

   Yes No

4. Used a descriptive norm that included grouping into a category

   Yes No

5. Explained the coupon?

   Yes No

6. Did the change agent ensure that the bicyclist would be likely to redeem the coupon (i.e., secure verbal commitment)?

   Yes No

7. Did the change agent inform the bicyclist of the location of East Coasters?

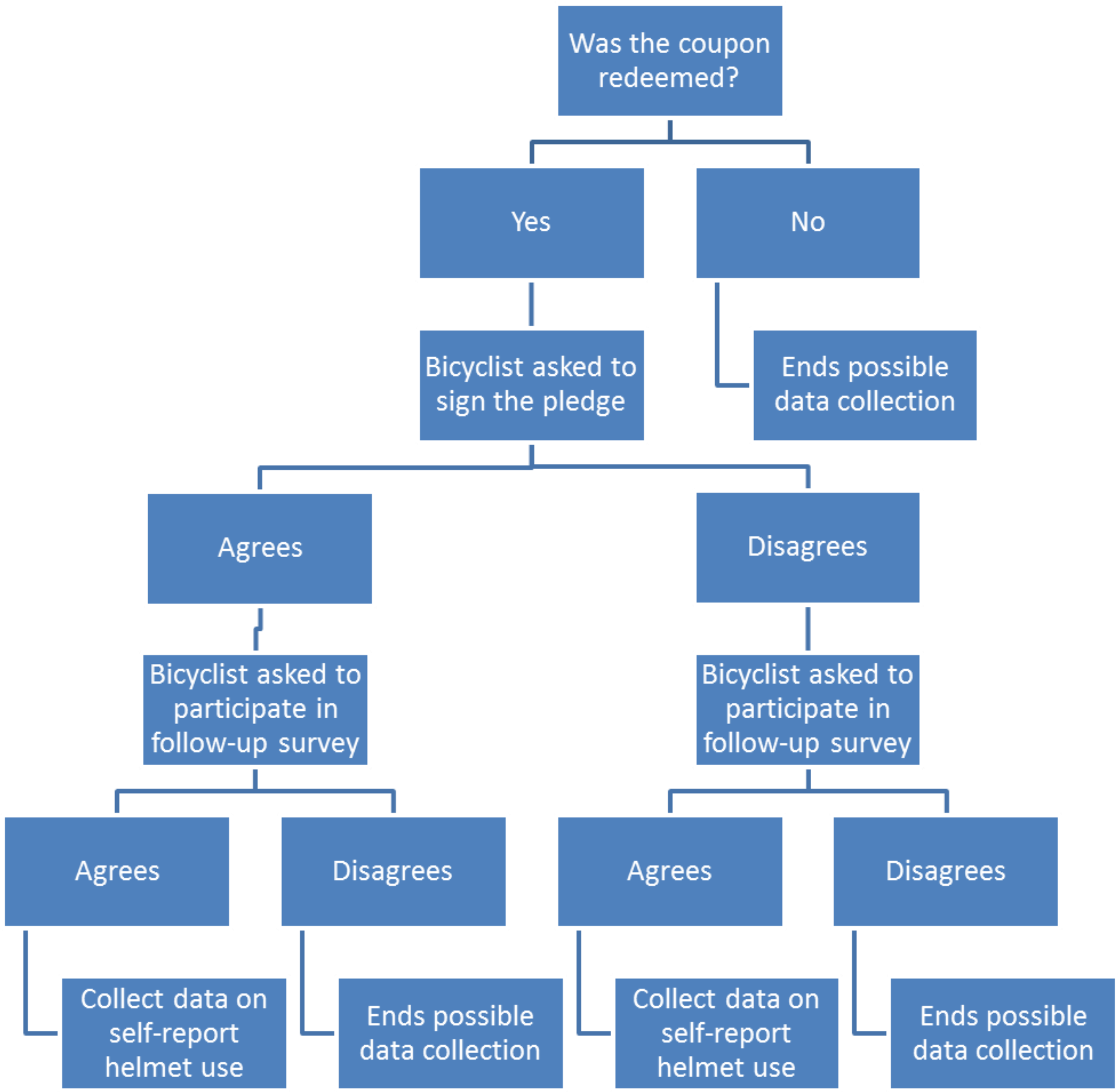
   Yes No

8. Did the change agent thank the bicyclist for taking the time to speak with them?

   Yes No

Appendix F

Requests made to Bicyclists



Appendix G

Follow-up survey

Thank you for agreeing to participate in our follow-up survey please respond yes or no to the following questions.

Question 1: Have you ridden a bicycle in the past week?

Question 2: If so did you wear a helmet at least once?

Question 3: Did you wear a helmet purchased from East Coasters as part of the bicycle safety movement at least once?

Please respond to the following questions with a numerical answer

Question 4: If you answered yes to Question 1 please write how many times you rode your bicycle in the last week.

Question 5: If you answered yes to Question 2 please write the number of times you wore a helmet.