

THE MODERATING EFFECTS OF SOCIAL VALUES AND
SOCIAL SUPPORT ON THE RELATIONSHIP BETWEEN
SELF-AUTHORED TEXT MESSAGES AND SMOKING
CESSATION

By

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Between Self-Authored Text Messages and Smoking Cessation

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Previous research has examined the effectiveness of text message based intervention systems and have found that tailored messages written by peers rather than distinct others are more effective (Kreuter & Holt, 2001; Smith, Atkin, Skubisz, Nazione, & Stohl, 2009). These studies have focused on the relationship between the authorship and subsequent effectiveness ratings, rather than the written components of the text messages. The current study examines the effect of the presence of social values (SV) on the perceived effectiveness ratings of self-authored text messages aimed at aiding smoking cessation. Participants (N= 60) received text messages either written by themselves or a health organization for a period of three weeks, six times a day, responding to each message with an effectiveness rating (1-5). Results reveal that social values are a significant factor in the effectiveness of text-messages as an intervention system, and that a presence of social support (SS) magnifies this relationship.

Keywords: *social support, social values, smoking cessation, text message, self-authored*

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Introduction

In the last four decades, the prevalence of smoking has been cut by over 50% and around 68% of current smokers report that they would like to quit smoking completely (Christakis & Fowler, 2008; CDCP, 2000-2010). However, cigarette smoking is a predominant issue in today's society, remaining one of the leading preventable causes of death in the United States and contributing to over 440,000 deaths annually (Nicholas & Fowler, 2008; Centers for Disease Control and Prevention [CDCP], 2013). Due to the physiological dependence on nicotine and the influence of various social factors like social context and social groups, quitting smoking and maintaining this cessation can be a very difficult and stressful task (Mermelstein, Cohen, Lichtenstein, Baer, & Kamarck, 1986). As such, developing an understanding of what factors aid in smoking cessation is imperative to helping further increase the numbers of individuals who succeed in smoking cessation.

Influences of Social Groups and Context

Past literature generally divides the issue of smoking into three components: initiation, maintenance, and cessation. Several lines of work separate these components into various avenues, one of which being the effect of social influence. In particular, previous research has focused on the effect of members of social groups (e.g. friends, family, peers) on cigarette use in an individual. It has become widely recognized that these social relationships have powerful effects on an individual's mental and physical health (Berkman, Glass, Brissette, & Seeman, 2000).

Within the focus of initiation, peer influence seems to play an important role.

Having friends that smoke can make an individual two to seven times more likely to begin smoking (Alexander, Piazza, Mekos, & Valente, 2002; Van Roosmalen & McDaniel, 1992). Even being surrounded by individuals who smoke has been found to increase the likelihood that an individual will smoke by six fold (Rogovska, 1996).

This effect has also been seen in various types of social relationships, especially for adolescents. A study investigating the effects of context on smoking found that children with parents who smoke are twice as likely to smoke as compared to a child whose parents do not smoke (“Smoking: Psychological and Social Influences,” 2005). Poor family relations have also been found to increase the likelihood of adolescents to become smokers (Van Den Bree, Whitmer, & Pickworth, 2004; Flay et al., 1998). While the effect on each gender is slightly different, these results still affirm the influence of social factors on smoking initiation.

Other research has documented the impact of family, close peers, and social groups on an individual’s smoking patterns, specifically regarding the strength of the relationship of the individual to the smoker and the extent to which the latter smokes (Bobo & Huster, 2000; Flay, et al., 1994; Leatherdale, Manske, & Kroeker, 2006; Flay, Hu, & Richardson, 1998). Such findings indicate that smoking is not necessarily a choice made solely in isolation. Instead, they are made by groups of people connected to each other, both directly and indirectly, in the form of collective pressures (CDCP, 2000-2010).

Research on the preventative effects smoking cessation via behavioral interventions brings a more optimistic light to this issue. Individuals with nonsmoking family members or physicians have been found more likely to quit smoking (Lou, Zhu,

Chen, Zhang, Yu, Zhang et al., 2013). Indeed, multiple research studies have suggested that the strongest predictor of sustained smoking is whether or not family members smoke (Bobo & Huster, 2000; Flay et al., 1994; Lou et al., 2013).

The findings summarized thus far have established a correlation between social networks on an individual's cigarette use, but have limited their studies to correlational research. Few of these studies have experimentally manipulated variables to see what might aid in smoking cessation. As such, there is currently a gap in research relating to the specific factors that cause these trends. The following sections illustrate the effects of two forms of social groups on the use of cigarettes by individuals and their contribution to smoking cessation.

Social Ties and Social Networks

In order to fully explain the aims of the current study, it is important to clarify the influence of social groups on individuals and possible causes of the correlations described above. Until now, the term 'social groups' has been used interchangeably with terms like 'social relationships' and 'social factors'. However, these terms are inherently vague and can encompass multiple variables including family, friends, peers, and significant others with whom an individual makes a connection. Additionally, these terms fail to explore the magnitude of the relationships found; instead they only analyze these interpersonal connections in respect to the individual.

When research becomes more focused on picking apart these groups, many terms arise including 'social ties' and 'social networks'. These terms, although often used interchangeably in literature, are very specific and unique concepts. 'Social ties' refers to information-carrying connections between people. These intrapersonal ties can

range in strength from very weak ties, like that of an individual with various acquaintances, to very strong, such as the ties between an individual and their significant other or best friends. Social ties can therefore include any form of relationship between two people. ‘Social networks’, a term developed by Barns (1954) and Bott (1957), are systems of social ties that focus on the type of personal relationship and social interaction present in the tie. In this way, social networks can transcend traditional family kinship, social class, and geography (Berkman, Glass, Brissette, & Seeman, 2000).

In the current study, the presence of social ties and social networks in written messages will be assessed together in what will be coined “social values”. This term will describe any relationship between two individuals, such that the individual being studied believes the relationship to be present. Like social ties, strong components of social values in written messages include mention of intimate relationships, including that between family members and close friends referred to by name. Conversely, weak components of social values encompass insubstantial relationships, like that between acquaintances or unnamed peers or friends. Any form of social tie or social network not explicitly constituting a strong component of social values will be categorized as a weak component of social values.

Social Support

One of the primary pathways in which social networks influence mental and physical health is through support from social ties, to be denoted from here on as social support (Berkman et al., 2000). In the context of the current study, social support can also be described as the satisfaction of emotional or psychological needs and as the

relationships between participants in a social network (Colletti & Brownell, 1982).

Social support can help an individual maintain the needed motivation to achieve and maintain a change in behavior and provide social influence in the form of modeling of how the desired, or undesired, behavior can effect behavior change (Mermelstein et al., 1986). Furthermore, social support can modify other factors so as to influence the target behavior and subsequently play an indirect role in shaping behavior or performance (Mermelstein et al., 1986).

A variety of studies have looked at the effect of social support on smoking cessation. General trends on the relationship between social support and smoking cessation feature a negative correlation between social support and levels of smoking, as well as a positive correlation between social support and smoking cessation (Gulliver, Hughes, Solomon, & Dey, 1995; Rayens, Hahn, & Nicholson, 2011; Coppotelli & Orleans, 1985; Hanson, Isacson, Jonzon, & Lindell, 1990). Research has also supported the notion that social support from all types of social facilitates an individual's ability to cope, which allows them to initiate and maintain behavior change (Murray, Johnston, Dolce, Lee, & O'Hara, 1995; Thoits, 1986). Individuals with relatively high levels of social support have been found to also have lower rates of mortality and fewer reported psychological and physical symptoms than individuals with lower levels of support (Mermelstein et al., 1986).

To summarize, past studies have conclusively indicated social support as a contributor to mental and physical health, primarily because it provides motivation for a positive behavioral change and helps individuals cope with the difficulty of such a change. Although these studies illustrate a correlation between social support and

behavioral change, they do not provide illuminate the cause and magnitude of the correlation. One way to investigate this is by analyzing the components of social support in written messages.

Components of Social Support

Hobfoll (1988) defined social support as “those social interactions or relationships that provide individuals with actual assistance or that embed individuals within a social system believed to provide love or sense of attachment to a valued social group or dyad” (as cited in Norris & Kaniasty, 1996). This definition does an excellent job of presenting two discrete facets of social support: received support and perceived support. Received social support refers to supportive behaviors that an individual is provided with from others in real time and can be a fairly precise measure of actual support. Perceived social support encompasses an individual’s belief that they are receiving helping behaviors from others, or that these behaviors would be provided from others when needed (Norris & Kaniasty, 1996). Studies comparing received and perceived support have found relatively weak correlations between the two facets of social support, suggesting that the two facets are only mildly related (Haber, Cohen, Lucas, & Baltes, 2007; Sandler & Barrera, 1984; Barrera, 1986, Lakey et al., 2002).

Received social support can be difficult to measure, as it generally requires a large amount of time and money to test that the support is present and to make the support equal across some designated level for all participants. Additionally, this component of social support requires real time use of people to physically be around and support the participant. In an experimental study, measuring received social support could entail participants being followed by another individual who would

actively support the participants in some way during the duration of the study (in some way previously identified and concluded as a valid measure) while a researcher observed and recorded the data. Such a method would be incredibly time intensive to accurately train individuals in participant's social networks to correctly support the participants and would also incur other factors like higher costs and an elevated number of confounding variables.

One worksite smoking cessation study found that social support was initially unrelated to the cessation of smoking, but predicted the maintenance of smoking cessation after both 6 and 12 months (Curry, Thompson, Sexton, & Omenn, 1989). These results indicate that received support might not be the best indicator of short-term smoking cessation.

As an alternative mechanism to quantify support, perceived social support can be measured with far less resources, time, and effort. This method therefore presents a low-cost and easily implemented modification to an intervention that would otherwise be very challenging to run. Mermelstein et al. (1986) found that short-term maintenance and cessation were positively associated with the perception of both partner support and general support. This indicates the important mediating effects of perceived social support on facilitating healthy behavioral change among all social networks (Berkman & Glass, 2000; Rayens et al., 2011). Measuring perceived support has also been indicated to allow for a more accurate assessment of the effect on an individual's coping ability with various problems (Wethington & Kessler, 1986).

Other studies have shown that received social support can be less effective than perceived social support at creating a change. Research measuring the effect on well-

being of both received and perceived support found no evidence that received support accounted for the relation between perceived support and well-being (Lakey & Cassady, 1990; Wethington & Kessler, 1986). These results indicate that effects on well-being present with perceived support are not always found with received support, and point to an inherent difference between these facets of social support. Individuals might overestimate or underestimate the perceived support they receive, whether or not there actually is received support present at the time. This speaks against the idea that perceived support is only found in cases where support is received, and instead promotes the notion that perceived support can be an orthogonal dimension of social support, perhaps originating as a construct of the individual.

In summary, perceived social support can be measured in a far easier and cost-effective manner, and can be subject to individual differences without necessarily affecting the generalizability of the results (Lakey & Drew, 1997; Sarason, Sarason, & Pierce, 1995). Furthermore, although perceived support might be a less accurate measure of actual support, this does not affect its ability to influence behavioral change. Consequently, the current study will measure the effect of social support through perceived support, but with a very different operationalization than usual: content of text reminders, not self-reported beliefs about level of support.

Comparing Social Values to Social Support

Some distinctions are necessary to clarify between the two social factors to be analyzed in the current study: social values and social support. These factors are not mutually exclusive, nor are they reliant upon each other; each factor can be present individually, or with the other factor. For example, the phrase, “Remember Jane”,

includes a strong component of social values, as it lists a specific name of an individual. Were the phrase changed to, “Remember your friends”, this vague term of “friends” would signify a weak component of social values. If the sentence were changed instead to, “Remember Jane wanted you to quit”, this sentence contains not only a strong component of social values, but also a strong component of social support. It can also be possible for sentences to contain aspects of social support without referencing a social value, for example the sentence, “You are doing great, you should be proud of yourself”. This sentence contains weak references to social support without referencing any social value like naming a specific person or social tie. For more information on comparing these two social factors, see Appendix B.

Text-Message Based Intervention

Text messaging interventions have only appeared in the past decade (Neville, Greene, McLeod, Tracey, & Surie, 2002). They have been used for a wide variety of health-related interventions, with smoking cessation being one of the most widely used methods within this system (Head, Noar, Iannarino, & Harrington, 2013). Although this is still a relatively new area of research, many studies have established high efficacy of text messaging based interventions on decreasing the target behavior (Head et al., 2013). Therefore, in recent years, studies have begun to branch out to analyze different variables that may contribute to and mediate the effectiveness of these interventions.

One specific area of research has focused on the relationship of the text message to the individual. Initial researchers questioned whether or not creating text messages more tailored to individuals would increase the effectiveness of the text message as a

behavior modifier and decrease the targeted behavior. Their specific purpose of tailoring messaging was to enhance message impact by modifying behavioral determinants of goal outcomes (Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008). Almost a decade later, it is now established that messages tailored according to individual differences are more effective than non-tailored messages, and that messages authored by close peers, rather than by distant peers, are also more effective (Kreuter & Holt, 2001; Smith, Atkin, Skubisz, Nazione, & Stohl, 2009).

Although messages authored by peers or others have been heavily documented, past research has not touched upon the effect of having a social tie with a strong relationship with an individual, as in a close friend or family member, author text messages for that individual. While this group could very possibly produce text messages that would be perceived as highly effective by an individual, these measures may be complicated by the wide variety of close social ties. For example, if an effect is seen, it might not be the cause of strong text messages authored by the social tie, but the cause of some other factor like the strength of the relationship. If looking at the social tie of a participant with a friend, perhaps the strength of the friendship would affect the perceived effectiveness of the text message. However, as there is no conclusive way to measure the strength of a friendship, this tie would be hard to measure. Therefore, although a main focus of this study investigates the role of social support from social values and social networks in moderating the effectiveness of a self-authored text messages, this study only examines self-authored and distant other-authored text messages.

Whether self-authored messages are more effective than peer-authored messages or distant-other authored messages, like computer-generated messages, is not yet conclusive. It is still problematic for health practitioners and researchers to determine what makes individually tailored messages more effective than other types of messages. This is mainly because research has yet to determine what components of self-authored messages can make them most effective.

Research Direction

The current study analyzes data collected from a larger study at University of Oregon led by Dr. Berkman and members of his social and affective neuroscience lab. The general aim of the larger study is to compare the effectiveness of self- vs. peer- vs. distant other-authored messages in aiding cigarette-smoking cessation using an automated text message delivery system. The current study also adopts the viewpoint made in the larger study, based on prior evidence, text messaging health-based interventions have high efficacy, especially for those regarding cigarette cessation.

As there is no research on self-authored text message intervention, there is a great deal of possible relationships available to investigate. The current study focuses on which components of a self-authored message make a message perceived as a more effective means of health-based intervention. The aims of the current study are to determine three things: the possibility that social values and social support can influence the effectiveness of a self-authored text message at aiding smoking cessation, the extent to which this effect occurs, and the nature of this relationship. In order to evaluate these factors, the current study examines whether or not the presence of social values and

social support in a self-authored text message will make the message perceived as more effective at aiding smoking cessation.

The current study argues that coping mechanisms are affected by perceived social support, such that increased social support will make it easier to cope with stress, and thus increase smoking cessation. The knowledge that self-authored messages are arguably the most tailored type of message and that targeted messages are more effective than non-targeted messages works to support the effectiveness of self-authored messages. In order to determine how to make self-authored messages even more effective, the current study also codes for the presence of the social perceived support from social groups (e.g., family, friendships, peer relationships) in self-authored text messages.

First Specific Hypothesis: The presence of social values will moderate the effectiveness of self-authored text messages on perceived effectiveness of the text message.

Second Specific Hypothesis: The presence of social support will moderate the effectiveness of self-authored text messages on perceived effectiveness of the text message.

Third Specific Hypothesis: Text messages that are other-authored will not include components of social values or social support.

Overarching Hypothesis 1: Social values will moderate the effect of self-authorship on effectiveness, such that among self-authored texts messages, the degree of social values will positively correlate with higher effectiveness of the text message as an intervention.

Overarching Hypothesis 2: If social support is present in self-authored text messages with social values, it will magnify the moderating relationship between self-authorship and smoking cessation, such that self-authored text messages with both social support and social values will have the highest effectiveness level related to the other text messages as an intervention.

Methods

Participants

This study consisted of 60 subjects from the Eugene area (42 male, 17 female, 1 other) older than age 25. Requirements included that all participants have an intention of quitting smoking but not be amidst any quitting attempt at the onset of the study. Fliers about the study were distributed around the downtown Eugene area and individuals were given a number to call if they wished to participate in the study. They then called the number and participated in a pre-screen session to ensure their eligibility to participate in the study. The participants deemed eligible to participate in the study then came to the first behavioral session. The participants were rewarded with monetary compensation, once at the behavioral baseline session, and again at the second session.

Materials

Participants wrote their text messages on Qualtrics, an online survey program. They received their texts via QuitJuice, an automated text message delivery system.

Procedure

At the baseline session, participants completed measures of smoking behavior including demographic information and biological measures of smoking. They also

completed questions regarding their motivation and attitude towards quitting. Participants were then given up to two hours and were instructed to write 60 quit-smoking messages. All participants were told to write whatever they thought might be beneficial to hear during their attempt to quit smoking in the following weeks. Participants were randomly assigned to one of three groups. One third of the participants were assigned to an experimental group and were given help with writing the different messages by being taught how to use implementation intentions, i.e., an if-then scheme. An example of a text message based on this scheme could be 'If I feel the urge to smoke, then I need to remember that I am doing this for my family'. The other two thirds of the participants wrote the text messages without these implementation intentions.

The participants in the implementation intentions group received their text messages. Half of the participants in the group without implementation intentions received their text messages, while the other half of participants in that group were placed in a control condition and received text messages written by a health organization that generally contained impersonal information on cigarettes and smoking.

Three days after this baseline session, the participants started receiving text messages, 6 messages a day for 3 weeks. During this time, participants attempted to quit but were not rewarded or punished in any way by the experimenters for progress or lack thereof. The timing of the messages was adjusted for each participant to be evenly spaced throughout the day, beginning at wakeup and ending 15 minutes before they go to sleep. In order to minimize perceived repetition in the text messages, the order of the

messages was pseudo-randomized such that each message was read no more than three times, separated by at least 10 days. After each text, the participants were to respond to message with their own text message with a 1-to-5 Likert scale rating of their perceived effectiveness of the text message. Participants were not punished if they forgot to respond to a text message and rate its effectiveness.

After these three weeks, participants returned to the lab for another behavioral session, where they again were assessed on multiple measures including biological measures and the participant's motivation and attitude towards quitting. No data from the second session were used for the present study.

Data analysis procedure

Participants received each text message at least three times. Those participants who originally wrote fewer text messages or who's texts had technical problems received their text messages from three to six times each. For each participant, the average effectiveness rating for each individual text message was taken. These scores were then separated into five categories based on the magnitude of social support (SS) and social values (SV) found in the text message: SS and SV of 0, SS and SV of 1, SS and SV of 2, SS of 1 and SV of 2, and SS of 2 and SV of 1. In addition, the average effectiveness score was taken per participant for texts with only SS (SS of 1 and SS of 2) and for texts with only SV (SV of 1 and SV of 2). The average score for each participant was found for each of these categories. These results were then compiled and averaged between participants to get a composite score for each of the categories.

The z-score of each text message was taken within each participant, such that a score of 0 is the mean, a score > 0 signifies data above the mean, and a score < 0

signifies data below the mean. Z-scores were then averaged among participants for text messages with components of SS of 0, $SS > 0$, SV of 0, and $SV > 0$. The z-scores were also averaged among participants for text messages with components of SS and SV, and neither SS nor SV.

The z-score analysis was deployed in order to control for variation in average ratings across participants. For example, it might have been the case that participants who tended to rate messages as highly effective also tended to compose more messages with SS or SV, even in the absence of any genuine differences between these messages and those without SS or SV. The average z-scores of all of the text messages for each participant were then taken to run the various t-tests.

A paired samples t-test was conducted to compare the average z-scores in text messages with $SS = 0$ and $SS > 0$. Another paired samples t-test was conducted to compare the average z-scores in text messages with $SV = 0$ and $SV > 0$. A third paired samples t-test was conducted to compare the average z-scores in text messages with no SS or SV and messages with both SS and SV components.

In order to compare the average effectiveness rating in text messages with $SS = 1$ and $SS = 2$, a paired samples t-test was conducted. Another paired samples t-test was conducted to compare the average effectiveness rating in text messages with $SV = 1$ and $SV = 2$.

Results

Data collected in the behavioral study were formatted into Excel files. A coding scheme was developed to rate the extent of social support and social values in each text message. Each text was coded for a presence of SS or SV, where a score of 0 meant no

presence, a score of 1 meant some presence/ a weak presence, and a score of 2 meant a strong presence. More information on the coding schema can be found in Appendix B.

In order to ensure reliability of the data coding, two different individuals coded the data. Both of these individuals had been previously trained on how to code text messages in the same manner, such that all messages were coded with the same criteria of what constitutes each number on coding scale. The correlation between the two sets of coded data was very high ($r = 0.97$), signifying that the coding schema was very reliable. The participants' responses to the effectiveness rating of each text message were downloaded from the database within the program from which the text messages were sent. These responses were made on a 1-to-5 scale of effectiveness, and were thus left unchanged. Once both sets of data were coded, several analyses (described below) were run on the data to determine the relationship between the perceived effectiveness of a text message and the amount of SV and SS present in the text.

Participants' data could only be used if they wrote at least 30 text messages and responded to these text messages. If they chose to drop out of the study at any time, their data was also dropped. This process decreased the sample of this study to 47 participants.

Text messages that had zero perceived SS or SV were used as a control, such that average effectiveness of these text messages was contrasted with the average effectiveness of messages rated as a 1 and messages rated as a 2 for SS and SV. This enabled these components to be compared on various levels so as to better ascertain if they act as a moderator on the effectiveness of self-authored text messages in aiding smoking cessation, and to what extent.

A series of t tests revealed that texts with a presence of both components SS and SV ($M = .022, SD = .067$) were rated as more effective than texts without these components ($M = .337, SD = .706$) and $t(47) = -3.389, p < 0.01$, and the second series of t-tests extends these results to texts including only one component of SS ($M = .350, SD = .641$) and $t(47) = -3.825, p < 0.01$, or SV ($M = .206, SD = .586$) and $t(47) = -2.555, p < 0.05$. These results indicate that text with any level of either SV or SS were more effective than texts without.

The effectiveness of text messages with strong components of SS ($M = 4.38, SD = .744$) compared to weak components ($M = 4.54, SD = .554$) were not found to be statistically significant $t(7) = .561, p = .592$. However, this could be due to the marginal number of texts containing SS without SV. In contrast, text messages with strong components of SV ($M = 4.43, SD = .566$) verses weak components ($M = 3.65, SD = 1.05$) were significantly more effective $t(7) = -3.723, p < 0.01$. This indicates that the strength of the relationship affects the perceived effectiveness of the text message.

The number of texts an individual wrote including SV ($M = -1.64, SD = 3.12$) or SS ($M = .85, SD = 5.42$) was not found to correlate strongly ($r = .18; r = .31$ respectively) with the average effectiveness ratings of their text messages.

General trends indicated that the average effectiveness rating was highest for texts including SS (4.25), and these ratings increased the larger the presence of SS in the text (SS of 1 = 4.22 and SS of 2 = 4.41). This trend was found to a lesser extent for texts containing SV (4.21, SV of 1 = 3.9, and SV of 2 = 4.26). The text messages with the highest effectiveness ratings were those with strong components of both SS and SV

(4.46). All text messages containing some level of SS or SV, on average, had higher effectiveness rating than texts with no level of SS or SV (3.74).

Discussion

Summary of Results

The results of the current study support the overarching hypotheses that SV and SS will both moderate the effect between of self-authored text messages on aiding smoking cessation. Text messages including neither component of social support nor social values were significantly less effective than those texts with a presence of one or both social components, regardless of the strength. In addition, the amount of texts including SV or SS that a participant wrote was not related to the average effectiveness rating of that participant's text messages, denoting that high effectiveness ratings of texts with SV and SS come from these social factors rather than some participant variable. These results support the hypothesis that SS and SV, rather than some other factor, moderate the relationship self-authorship on perceived text message effectiveness, and thus on smoking cessation. The trends in effectiveness ratings of the text messages support all three specific hypotheses of the current study, and also support both of the overarching hypotheses.

These results support past research that social relationships and networks can powerfully influence an individual's physical and mental health (Berkman et al., 2000). As the strength of social support in text messages increased, text messages became perceived as more effective at aiding smoking cessation, and this result agrees with the findings of a plethora of studies regarding the positive influence of social group and

social support on behavior change (Gilliver et al., 1995; Rayens et al., 2011; Murray et al., 1995; Curry et al., 1989; Mermelstein et al., 1986).

The purpose of the current study was to examine what components helped to make self-authored text messages more effective than author-authored texts. As 98.36% of text messages other-authored did not contain any component of SV or SS, the current study can conclude that the presence of these aspects is unique to self-authored text messages (in the context of these two variables), excluding outliers. These findings affirm past research that tailored texts messages are more effective than non-tailored ones (Kreuter & Holt, 2001; Smith et al., 2009). Texts containing components of SS and SV can be viewed as a more tailored form of self-authored text messaging, and as such, the results of the current study work as an extension of this body of research.

Limitations and Potential Sources of Error

A limiting factor for the current study comes from the basis of the data. The current study uses data attained from the larger study months before the current study began. Consequently, many behavioral assessments were never taken that could have been pertinent to the current study. This includes, but is not limited to, questions regarding: participant's major values, their relationship with their friends and family, whether or not they perceive support from any of their social ties (especially close social ties), and their level of self-efficacy. These factors might influence the extent to which a participant will include measures of SS or SV in their text messages, as well as the extent to which participants might find these measures effective at aiding smoking cessation. Perhaps some variables, like self-efficacy, impact the effect of self-

authorship, SS, or SV on the perceived effectiveness of text messages, such that participants with low levels of self-efficacy will find text messages less effective, regardless of their presence of these other factors.

Zimet, Dahlem, Zimet, & Farley (1988) created a multidimensional scale of perceived support that was used as a guide during the creation of the coding scheme. The measures for creating the coding scheme in the current study were different from theirs, as they had different levels for significant other, friends, and family members. However, their research overlapped with that of the current study in the investigation of the effect of these measures (family, significant other, and friends) on the general population. They found that these measures were more accurate compared to the general population at decreasing stress, all of which was considered in creating the current study's coding scheme (Zimet et al, 1998).

Another limitation comes from the variance in the number of texts per participant. Although each participant was meant to write 60 texts, many were unable to do so, or had texts dropped for other reasons, resulting in a variance of 30-60 texts per participant. This limits the amount of data attained from the current study and introduces the possibility of a relationship between total number of messages and some other unmeasured variable (e.g., motivation to succeed in quitting) effecting the data. However, the use of within-subject analyses (e.g., by comparing the effectiveness rating of SS to SV messages) minimizes this confound.

The variance in number of texts per participant also disrupted the amount of times participants viewed each text. Participants who wrote fewer texts saw their text more often as compared to people who wrote 60 texts. This could be problematic, as

texts that were viewed more frequently than others might have become perceived as less effective to participants, which would skew the results of the current study.

The small sample size in the current study (N=48) might have contributed to the variability of the results. However, this should not affect the validity of the results presented in the current study.

Potential error comes from the chance that other extraneous variables mediate the effect of self-authored messages on the perceived effectiveness of text messages. Perhaps the magnitude of the relationship moderates how effective the text message is perceived, such that a text message with strong SS from a strong SV would be perceived as more effective than one written with equal support, but by a weaker SV.

Implications for Future Research

There are few studies that investigate what specific components in a text message make them more effective than others. Therefore, the results from the current study will be of interest to future researchers investigating how to make text message-based interventions more effective. As the results of the current study did support both overarching hypotheses, they have a wide range of implications. For example, these findings could extend to helping practitioners develop better programs for health-based behavior interventions. Future studies can use the results of the current study to learn more about the relationship between social support, social values, and maintaining a behavioral change, in both text messaging interventions and otherwise. In addition, future studies can assess other possible components of text messages that might alter their perceived effectiveness. As the current study was limited to participants in the

Eugene area, future research can also try to replicate these findings with other populations.

The current study was also limited to analyzing factors that can make text messages more effective at supporting smoking cessation. Future studies should seek to investigate whether or not the effectiveness of a text-message based intervention system is associated with long-term smoking cessation.

With the advent of the current study, the larger study under Dr. Berkman and his colleagues has adapted to also include a measure of perceived social support. If data is collected quickly and enough data is present to give a credible analysis (at least around 30 participants, preferably more), then it can be possible to also use this new data in the future as another means of analyzing how social support influences smoking cessation, and therefore ascertain more generalizable and valid results.

Tables

		Social Support	Social Values
Average Response Score (1-5)	Score of 1 or 2	4.25	4.21226415
	Score of 1	4.21686747	3.9
	Score of 2	4.41176471	4.26373626

Table 1: Average Response Score for Texts with Social Support or Social Values

	No SS or SV	Either SS or SV	Both SS & SV of 1	Both SS & SV of 2	SS of 1 & SV of 2	SS of 2 & SV of 1
Average Response Score (1-5)	3.74	4.21	3.85	4.46	4.28	4.00

Table 2: Average Response Score for Social Support and Social Value Combinations

		Social Support	Social Values
Effectiveness Rating	Score of 0	-0.02	-0.02
	Score > 0	0.35	0.20

Table 3: Average Z-score for text messages with SS and SV

	No Social Support or Social Values	Both Social Support & Social Values
Effectiveness Rating	-0.02	0.34

Table 4: Average Z-score for text messages with SS and SV

Figures

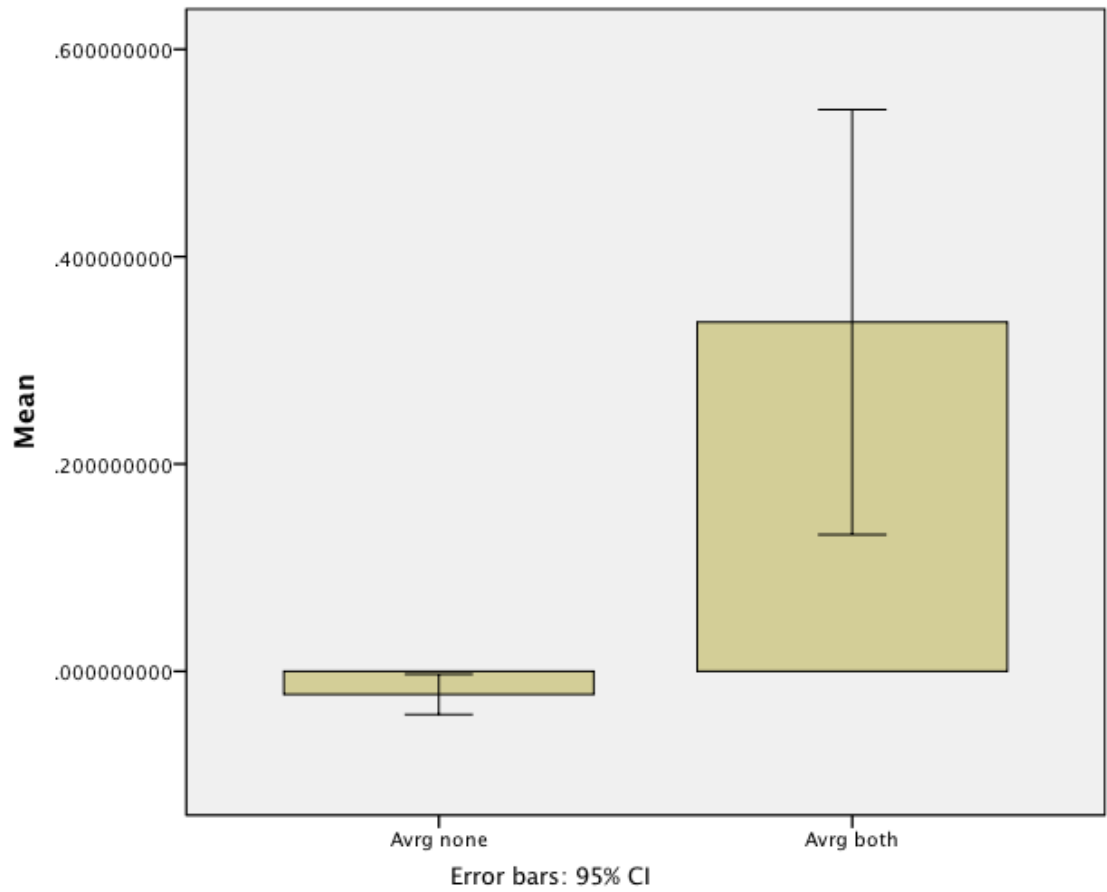


Figure 1: The average effectiveness rating (Mean) for texts messages with neither SS nor SV (Avrg none) and for text messages with both SS and SV (Avrg both).

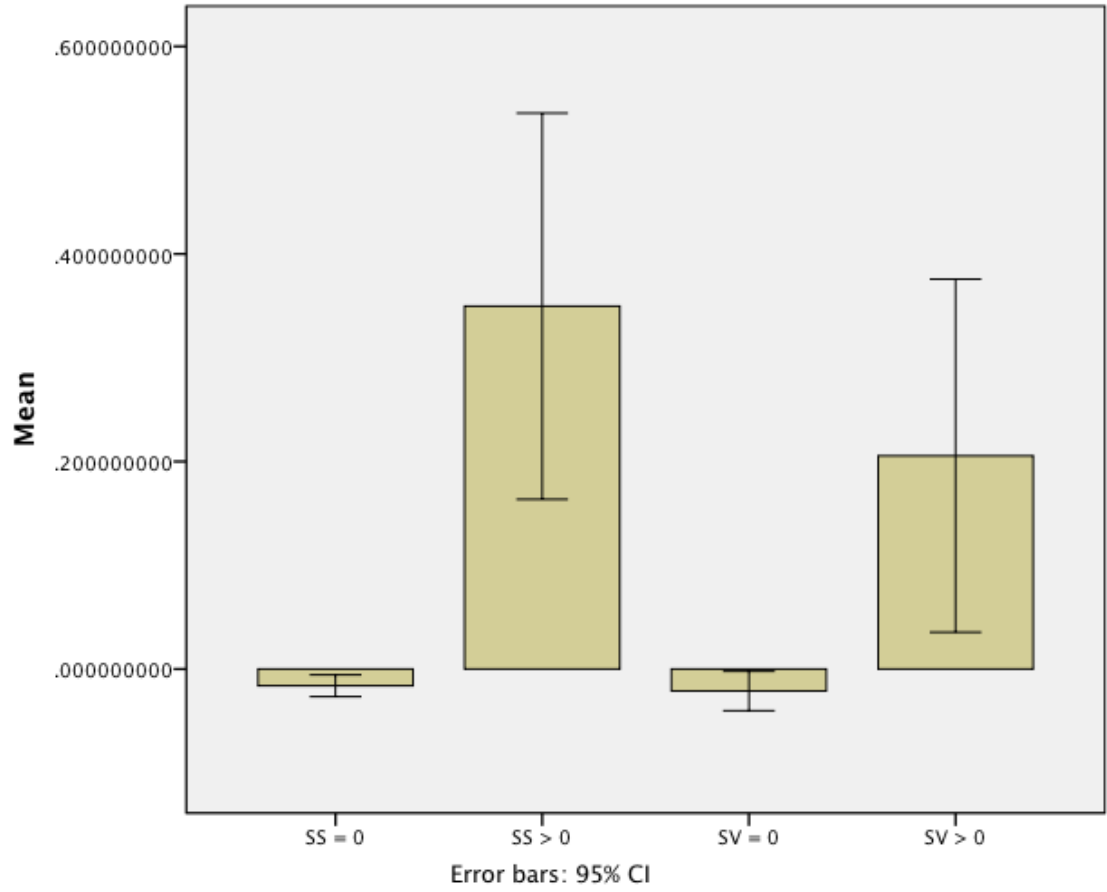


Figure 2: The average effectiveness rating (Mean) for texts messages with no SS (SS=0), some SS (SS>0), no SV (SV=0), and some SV (SV>0).

APPENDIX A

GLOSSARY

Coding — The process of assigning a code to something for the purpose of identification or classification.

Coding Scheme — A set of rules that maps elements of one set, on to another set. In the case of this study, the coding scheme would be mapping social support from the text messages (the first set) into the computer (the second set).

Correlated Dimensions — When one dimension constrains the other. (Contrasted with orthogonal dimensions).

Moderator variable — A variable that acts as a third variable, affecting the magnitude and direction of the strength of the relationship between two variables- one dependent and one independent. In other words, it explains the strength of a relationship.

Negative Correlation — As one variable increases, the other variable decreases.

Orthogonal Dimensions — When two dimensions are mutually exclusive, meaning that one dimension does not predict the other. (Contrasted with correlated dimensions).

Positive Correlation — As one variable increases, the other variable increases; as one variable decreases, the other variable decreases.

Social Networks — Systems of social ties that focus on the type of personal relationship and social interaction present in the tie; specifies the type of relationship present in the social tie.

Social Support — The satisfaction of emotional or psychological needs, and as the relationships between participants in a social network; support from social ties.

Social Ties — Information-carrying connections between people, describes essentially any relationship between a person and another individual.

Social Values — Encompass both social ties and social networks; refers to any form of relationship between two individuals that elicits feelings of a perceived connection; can vary on intensity.

Valid — Meaning a mechanism measures what it purports to measure.

APPENDIX B

Coding Schema

** For the purposes of this experiment, mention of spiritual support (i.e. from God or any other spiritual figure) does not constitute social support or a social value.

Average Response Score

Mean score is rounded to the closest interval. (i.e. 0.5 is rounded up).

Measures of Social Values

0. These texts do not mention social values or social values.
 - a. Do not mistake the presence of words relating to individuals as social values. “People” or “somebody” or “that girl” do not constitute a social tie. Any spiritual being, for the sake of the current study, will be operationalized as not encompassing a social value.
 - i. *Example*: “Remember what you said to that girl who smoked, ‘I’ll bet kissing you is like licking an ashtray’”. This text refers to a person but does not fit her into any category of a social tie.
1. These texts reference social values but in an inherently vague and less personal way.
 - a. For example, these texts might refer to “friends” or “peers” of the individual. Texts referencing a participant’s doctor also receive a score of 1. These texts can include family members so long as it precedes the familial characterization with “the”, as in “do it for *the* kids”. This example sentence is more informal and might not

necessarily create the connection to think of family members individually. (Note that this exception is particular for social values preceded by “the”).

2. Any family title or name mentioned is automatically grouped into this category, as well as a significant other and any friend mentioned by name. Mentioning something not specifically related to a family member, like a family tree, does not count as a presence of social values and would receive a score of “0”.

Measures of Social Support

0. Texts with a score of 0 mean have no mention or indication of social support.
1. Texts with a score of 1 reference or imply some level of perceived support.
 - a. This can be seen as attempting to quit smoking for someone else, as this implies that that other individual wants the individual to stop smoking, and thus implies a presence of perceived support. Listing a person as their reason for quitting smoking constitutes this level of perceived social support. This can also be seen as referencing the ability to call someone who can help, but only if it is vague, using words like “someone” or “people.”
 - b. Setting an example for others does not constitute any level of social support. Just because you set the example does not mean that individuals wish to follow your example or that people support your actions.

- c. Texts referencing informing a participant's doctor also receive a score of 1.
 - d. Proving something to someone does not count as social support.
2. Texts with a score of 2 explicitly state perceived support or heavily imply it.
- a. These text messages follow the same rules as a rating of 1 but are more specific. They will overtly indicate the perceived feeling of social support by the individual. These texts can reference social ties as being "proud", "impressed", "happy", or feeling other positive attributes towards the individual for their attempt to quit smoking.
 - b. This can also reference the ability to call a friend for help, but must reference the name or title of that friend in relation to the individual, like "my sister" or "my best friend". Social support can only come from people (not animals and not oneself).

Example text messages and what ratings they would receive:

1. "By creating a support team of even just one person, you create accountability and give yourself that extra encouragement to be smoke-free."
- a. This text would receive a score of 0 on social values as it does not reference or explicitly state any member of a social tie.
 - b. This text would receive a score of 0 on social support because although it references the importance of a support team, it does imply any support being received by that individual.
2. "Are my peeps supporting me?"

- a. This text would receive a score of 2 on social values because it explicitly states ‘peep’s, referring to the individual’s friends.
 - b. The text would receive a score of 1 on social support because it does refer to social support, however the question mark included indicates that the individual is not sure of whether or not they are receiving support, rather it only implies that there might be possible support from friends, thus fitting into the category of 1- implied or possible support.
3. “Are people noticing?”
- a. This text would receive a score of 0 on social values, as it references people in general but not specifically any social values.
 - b. This text would receive a score of 0 on social support, as it does not indicate any level of perceived support.
4. “Do it for mom.”
- a. This text would receive a score of 2 on social values as it explicitly states a social tie.
 - b. This text would receive a score of 1 on social support because it implies that the mother supports the individual’s decision to stop smoking.
5. “If you get a craving just remember how proud your father and sister will be if you are successful.”
- a. This text would receive a score of 2 on social values as it explicitly states social values.

- b. This text would receive a score of 2 on social support as it references the social values as being proud of the individual, and thus signifying perceived social support.

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