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# Understanding text-based persuasion and support tactics of Concerned Significant Others

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The behavior of concerned significant others (CSOs) can have a measurable impact on the health and wellness of individuals attempting to meet behavioral and health goals, and research is needed to better understand the attributes of text-based CSO language when encouraging target significant others (TSOs) to achieve those goals. In an effort to inform the development of interventions for CSOs, this study examined the language content of brief text-based messages generated by CSOs to motivate TSOs to achieve a behavioral goal. CSOs generated brief text-based messages for TSOs for three scenarios: (1) to help TSOs achieve the goal, (2) in the event that the TSO is struggling to meet the goal, and (3) in the event that the TSO has given up on meeting the goal. Results indicate that there was a significant relationship between the tone and compassion of messages generated by CSOs, the CSOs' perceptions of TSO motivation, and their expectation of a grateful or annoyed reaction by the TSO to their feedback or support. Results underscore the importance of attending to patterns in language when CSOs communicate with TSOs about goal achievement or failure, and how certain variables in the CSOs' perceptions of their TSOs affect these characteristics.

2  
3 **Abstract**

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5 and wellness of individuals attempting to meet behavioral and health goals, and research is  
6 needed to better understand the attributes of text-based CSO language when encouraging target  
7 significant others (TSOs) to achieve those goals. In an effort to inform the development of  
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10 based messages for TSOs for three scenarios: (1) to help TSOs achieve the goal, (2) in the event  
11 that the TSO is struggling to meet the goal, and (3) in the event that the TSO has given up on  
12 meeting the goal. Results indicate that there was a significant relationship between the tone and  
13 compassion of messages generated by CSOs, the CSOs' perceptions of TSO motivation, and  
14 their expectation of a grateful or annoyed reaction by the TSO to their feedback or support.  
15 Results underscore the importance of attending to patterns in language when CSOs communicate  
16 with TSOs about goal achievement or failure, and how certain variables in the CSOs'  
17 perceptions of their TSOs affect these characteristics.

18 **Keywords**

19 Concerned Significant Others, behavior change, computer-based communication, language  
20 expectancy, supportive communication, technology  
21

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48 **Introduction**

49           The past few decades have witnessed an increased focus on how concerned significant  
50 others (CSOs) can impact the health and wellness of individuals attempting to meet health goals  
51 (Zimmerman & Connor, 1989, Franks, Campbell & Shiels, 1992, Hurdle, 2001, Gallant, 2013).  
52 Resources have been designed specifically for CSOs, ranging in scope from educational  
53 initiatives by the National Alliance on Mental Illness (NAMI) for any number of mental health  
54 issues to targeted support groups like Al Anon for CSOs of drinkers. In addition to these,  
55 behavioral interventions, such as Community Reinforcement Approach and Family Training  
56 (CRAFT), have been designed to optimize the way CSOs communicate with their target  
57 significant others (TSOs), with the goal of engaging TSOs in appropriate treatments (Meyers,  
58 Miller, Hill, & Tonigan, 1998). Particularly for CSOs with a substance abusing TSO, the  
59 CRAFT program has been shown to be quite successful in its treatment engagement aims  
60 (Roozen, de Waart & van der Kroft, 2010). In essence, the growing consensus among researchers  
61 and health care professionals is that TSOs require environments that are supportive of behavior  
62 change, and that effective communication between CSOs and TSOs is central to fostering  
63 meaningful change beyond the clinic.

64           The ways in which we communicate with the significant others in our lives are  
65 diversifying rapidly with the growing use of technology for social purposes, from emailing to  
66 posting on social media to text messaging via mobile phone. However, these media are also  
67 being harnessed to better understand human computer interactions and to promote health. In fact,  
68 research over the last 40 years reveals that individuals are more honest and forthcoming when  
69 communicating via a digital medium (Griest, Laughren, Gustafson, Stauss, Rowse & Chiles,  
70 1973; Lucas, Gratch, King & Morency, 2014), making the ways in which we communicate with  
71 our loved ones via technology an important area of study. Although there is a growing literature

72 on using ubiquitous technologies (e.g., mobile phones) to target problem behaviors (Free et al.,  
73 2013), little is known about how behavior change-oriented communication conducted via  
74 technology impacts that behavior. Some research has examined how the tone and structure of a  
75 message can have an impact on receptivity and engagement in a technology-mediated interaction  
76 about behavior change, revealing that polite and gain-framed content improves message  
77 receptivity (Bickmore, Mauer, Crespo, & Brown, 2007; Muench, van Stolk-Cooke, Morgenstern,  
78 Kuerbis, & Markle, 2014). These studies point to the importance of understanding technology-  
79 mediated communication styles between CSOs and TSOs in order to optimize positive  
80 communication strategies and outcomes. Examining social support and persuasive messaging  
81 tactics from the perspective of the CSO may shed further light on this subject.

## 82 *Social Support and CSOs*

83 For many decades, the role of social support in the enhancement of health and wellness  
84 has been a topic of interest to scientists and practitioners across many related disciplines,  
85 including medical, psychological and sociological lines of inquiry (Caplan, 1979, Cohen &  
86 Syme, 1985, Tracy & Whittaker, 1990, DiMatteo, 2004). Under the umbrella of social support, a  
87 large and comprehensive literature on supportive communication has emerged, spanning face-to-  
88 face and technology-mediated communication (Burlison & MacGeorge, 2002, Adams, Baumer  
89 & Gay, 2014). Some of the earliest work on social support offered definitions of this construct  
90 that tie it strongly to elements of compassion, such that the target of social support is made aware  
91 that (s)he belongs to a community and is loved, cared for and esteemed (Moss, 1973, Cobb,  
92 1976). However, much of the literature on technology-mediated supportive communication has  
93 not specifically examined communication enacted within pre-established familial, romantic or  
94 platonic relationships, instead focusing on communication enacted via online support groups and

95 communities tailored to the behavior or health issue of interest (Braithwaite, Waldron & Finn,  
96 1999, Adams, Baumer & Gay, 2014). This is striking, since one might argue that social support  
97 in our everyday lives comes predominantly from our CSOs, who offer us their support and  
98 feedback both when we request it and when we do not. What's more, few studies have sought to  
99 understand social support enacted by CSOs based on goal that they would like their TSOs to  
100 meet. In effect, little is known about how the CSO's agenda for their TSO may impact their  
101 supportive communication style. Understanding the language styles of CSOs in brief technology-  
102 mediated communication settings like short text-based messaging can reveal important  
103 information about the mechanisms and nuances of behavior change promotion within the context  
104 of these relationships. This can help us build interventions for CSOs attempting to persuade,  
105 motivate and/or support their loved ones to improve their lives.

#### 106 *Persuasive Communication*

107       Research on persuasion has historically focused on how various components of language  
108 (e.g., the degree to which a message is tailored to the individual) impact the persuasiveness of a  
109 message (Noar, Harrington, & Aldrich, 2009; Oinas-Kukkonen & Harjuma, 2009). Within the  
110 context of behavior change research and treatment, this has resulted in the development of a  
111 number of treatments with a list of motivational language do's and don'ts. Perhaps the most  
112 notable example of this phenomenon is the development and dissemination of Motivational  
113 Interviewing as a clinical technique to promote behavior change in individuals by targeting  
114 ambivalence and promoting change talk through reflective listening and persuasive techniques  
115 (Miller & Rollnick, 1991).

116       Beyond therapeutic interventions, social psychological research on person-to-person  
117 communication reveals that individuals often plan how they will communicate based on their

118 expectations of the individual attributes, interpersonal relationship and environmental context of  
119 the person with whom they intend to speak (J. K. Burgoon, 1993). These expectations can, in  
120 turn, impact the outcome of the communication. Such research suggests that language is a rules-  
121 based system in which people develop a pattern of anticipated norms with regard to language  
122 usage in any given situation (M. Burgoon & Miller, 1985). This language expectancy construct  
123 is particularly relevant to close relationships, in which individuals develop habitual self-  
124 reinforcing communication patterns. Therefore, understanding how the content of brief  
125 persuasive communication in different behavior change scenarios may relate to CSOs'  
126 expectations of their TSOs is an important step in developing communication tools for CSOs in  
127 the digital age.

#### 128 *The Current Study*

129         This study examined the language content and other characteristics of brief text-based  
130 messages generated by CSOs to motivate their TSOs to achieve a behavioral goal of the CSO's  
131 choosing. CSOs were asked to describe the goal they wanted their TSO to achieve, and to  
132 generate brief messages to their TSO for three behavior change scenarios: (1) to help them  
133 achieve the goal, (2) in the event that the TSO is struggling to meet the goal, and (3) in the event  
134 that the TSO has given up on meeting the goal altogether. Messages were then analyzed via  
135 linguistic analysis software and coded across a number of variables pertaining to language  
136 content and semantics. The aim of the study was to determine whether any global characteristics  
137 in behavior change messages existed based on the CSO-TSO relationship and the three scenarios  
138 (above) for which each message was generated, and how variables in the CSOs' perceptions of  
139 their TSOs, such as motivation and expectations of a specific CSO reaction, moderate message  
140 characteristics such as tone and compassion in an effort to inform the development of

141 interventions for CSOs and TSOs.

## 142 **Method**

### 143 *Recruitment*

144 This study was approved by the New York State Psychiatric Institute Institutional Review Board  
145 (NYSPI IRB: #6625) and was part of the pilot intervention development work for a mobile  
146 adaptive alcohol intervention. Participants were recruited online through Amazon.com, Inc.'s  
147 online labor market, Amazon Mechanical Turk (MTurk). MTurk is a communication platform  
148 through which *workers* can be contracted to perform tasks that require human intelligence (e.g.,  
149 consumer surveys or beta testing) in exchange for compensation by the *requesters* who publish  
150 the tasks. These tasks—called *human intelligence tasks* (HITs)—can range from one brief  
151 question to a 30-minute survey. Over the last few years, MTurk has been used for social sciences  
152 research with results similar to other sampling methods when certain validity checks were  
153 included in the design (Mason & Suri, 2012).

### 154 *Study Eligibility*

155 MTurk worker qualifications for this study included a HIT approval rate of 95% or greater out of  
156 at least 500 completed HITs. This ensured a sample of workers whose work on previous HITs  
157 had been consistently deemed acceptable by other requesters, as well as a sample who  
158 demonstrated an appropriate degree of computer and Internet literacy. The subject pool was  
159 further limited to participants who were located in the United States. Workers who met these  
160 qualifications could view our HIT, which was labeled with the following description: *This brief*  
161 *survey will ask you questions about helping friends and family improve their lives*, and published  
162 through our requester account, *Columbia University Research*. Eligible workers could follow a  
163 Web link to an external, Web-based survey hosted by Survey Monkey, which has been used as a



164 survey host in numerous research studies. Prior to completing the survey, participants completed  
165 a brief consent form for anonymous survey-based research, which also provided investigator and  
166 IRB contact information. In the consent form, participants were informed that the study's aim  
167 was to better understand peoples' personal goals and how people support other individuals who  
168 are attempting to change a behavior. Once participants completed the survey, they were provided  
169 with a survey code to enter into their MTurk account to await requester review and compensation  
170 in the amount of \$0.50.

171 For the purposes of maintaining anonymity, we could not link the survey to the  
172 participants' MTurk accounts, but included several a priori validity checks for anonymous  
173 survey research in both the survey and our MTurk requester account. These validity checks were  
174 included in accordance with the Checklist for Reporting Results of Internet E-Surveys  
175 (CHERRIES; Eysenbach, 2004). Our safeguards included blocking IP addresses once the survey  
176 was opened by a worker in order to bar them from retaking it, and omitting responses of users  
177 who did not type cogent responses to open-ended questions and/or gave conflicting answers to a  
178 duplicated message preference question.

179 Although we were unable to match an individual worker to his or her survey responses,  
180 we were able to view the total amount of time each worker spent on the HIT in MTurk. As our  
181 survey should take a minimum of 5 minutes to complete, we rejected the work of participants  
182 who spent fewer than 5 minutes completing it.

### 183 *Participants*

184 In total, 115 participants took the survey. Of those, 96 were included in the final sample: all 19  
185 of those who were excluded were excluded because they either did not complete the survey in its  
186 entirety or because the content they contributed was illegible or did not pertain to the questions

187 they were asked.

188 *Assessments*

189 The assessment contained approximately 16 items, which were presented in groups of  
190 approximately 6 items per screen (See Appendix A).

191 Participants were asked to identify their relationship to a loved one (e.g., parent, spouse,  
192 friend) who they believed should change a behavior in order to improve his or her life, and to  
193 identify the cognitive or behavioral goal they wanted their loved one to achieve. For the intents  
194 and purposes of this paper, we will refer to participants as Concerned Significant Others (CSOs)  
195 and to their loved ones as Target Significant Others (TSOs). We chose to leave the definition of  
196 the term “goal” open-ended, allowing the CSO to choose any goal that came to mind. These  
197 goals did not have to be health related. CSOs were told that the TSO’s target goal could be  
198 anything from exercising more to being more assertive to cutting down on drinking, and that  
199 there were no wrong goals (see Appendix A).

200 CSOs were then asked to generate the following: (1) a brief, text-based message to help  
201 the TSO meet the generated goal, (2) a brief, text-based message in the event that the TSO was  
202 not meeting the goal, and (3) a brief, text-based message in the event that the TSO had  
203 completely given up on meeting the goal. Once CSOs generated these three messages, they were  
204 provided with a series of process rulers that have been used in previous research (Sobell &  
205 Sobell, 1996) relating to the generated goal, including goal salience, severity of the possible  
206 consequences of failing to meet the goal, and goal efficacy. We assessed CSO perceptions of  
207 their relationship to their TSO and their perceptions of the TSO change process using five  
208 process rulers pertaining to (1) the CSO’s perception of the closeness of their relationship to the  
209 TSO, (2) perception of their TSO’s motivation to meet their goal, (3) belief that their TSO would

210 take their advice were they to offer it, (4) perception of the severity of consequences if their TSO  
211 were to fail to meet their goal, and (5) frustration with the TSO's current progress (or lack  
212 thereof) toward meeting their goal. CSOs were additionally asked a multiple choice question  
213 about the type of reaction that they would expect from their TSO were they to offer suggestions  
214 or support to meet the goal. Finally, CSOs were asked to provide basic demographic information  
215 including their age, gender, race and ethnicity.

### 216 *Basic Linguistic Analysis*

217 To assess basic linguistic features of content generated by CSOs, we conducted an  
218 exploratory linguistic analysis on all goals and messages generated using the 2007 version of the  
219 Linguistic Inquiry and Word Count (LIWC) software developed by Pennebaker, Francis &  
220 Booth (2001). This software categorizes words across a variety of language dimensions,  
221 including basic descriptors (e.g., total word count, average number of words per sentence)  
222 standard linguistic processes (e.g., number of pronouns, articles and verbs used), and  
223 psychological processes (e.g., social, affective, cognitive, perceptual and biological processes).

### 224 *Message Coding*

225 TSO goals were coded into three broad categories based on their subject matter: physical  
226 health and well-being, competence and mastery, and personal fulfillment. Goals within these  
227 categories were then subcoded into more specific groupings as follows. We have used these  
228 coding variables in previous research on the content of text-based messages for behavior change  
229 (Muench et al. 2014).

230 We developed a number of coding schemas to assess three semantic characteristics of  
231 particular interest in the context of the CSO-TSO relationship, including: (1) positive, negative,  
232 or neutral tone, (2) presence or absence of a compassionate tone, and (3) gain- or loss-framed

233 orientation of messages. Table 1 presents this coding schema, along with an example message  
234 for each coding variable.

235 We also coded all messages generated by CSO's based on a schema developed by  
236 Cutrona & Suhr (1994) to classify different types of supportive messages. Although variations  
237 on this schema and the definitions of its variables have emerged over time (Adams, Baumer &  
238 Gay, 2014), we used the original schema and definitions as follows: (1) *emotional support*,  
239 defined as an expression of care, concern and/or sympathy, (2) *esteem support*, defined as  
240 reassurance of worth, an expression of liking for or confidence in the TSO, (3) *network support*,  
241 defined as an expression of connection or belonging in a social community, (4) *informational*  
242 *support*, defined as information and/or advice, and (5) *tangible assistance*, defined as an offer of  
243 money, physical intervention or other material aid. We added an additional variable to this  
244 schema to categorize messages that were entirely unsupportive.

245 Two researchers independently coded all text messages using the taxonomy described  
246 above. Each was given a definition and example of a message for each category. Interrater  
247 agreement when messages from all three messaging scenarios were merged revealed 89.6%  
248 agreement on tone, 78.1% on compassion, and 83.7% on gain versus loss-framing, and 94% on  
249 social support type. In cases where there was disagreement between coders about the  
250 categorization of a message (e.g. 11.4% of tone messages), the message was discussed and  
251 subsequently placed either in a category based on agreement between both coders or marked as  
252 uncoded and excluded from analyses. Of the 288 messages provided by the participants, 5  
253 (1.7%) messages were left uncoded within the tone category, 4 (1.4%) were left uncoded within  
254 the compassion category, 4 (1.4%) were left uncoded in the gain- versus loss-framing category  
255 and 3 (1.1%) in the social support category due to rater disagreement about the proper

256 classification of the message.

### 257 *Data Analysis*

258 Since this was an exploratory study, we provide descriptive statistics for each rating. We  
259 conducted Z-tests to see if there were significant differences in the proportions of linguistic  
260 content , tone, compassion, or social supportiveness of messages based on the messaging  
261 scenario (e.g., in the event TSO is not meeting goal) for which they were written. Simple  
262 bivariate correlations, Chi-Square and ANOVAs were conducted to assess the relationship  
263 between the tone or compassion of a message and the CSO's expectation of a TSO reaction to  
264 support or feedback and the CSO's perceptions of the TSO relationship and change process (e.g.  
265 the TSO's motivation to meet their goal). Multiple linear and logistic regressions were performed  
266 to assess the unique variance for all significant associations.

## 267 **Results**

### 268 *Overview*

269 Demographics are presented in Table 2. The sample assessed was predominantly young, white,  
270 and male: 62 out of 96 participants (64.6%) were between the ages of 18 and 30, 83 out of 96  
271 (86.5%) were white, and 68 out of 96 (70.5%) were male. CSOs primarily identified family  
272 members as their TSO of choice, with 25 out of 96 participants (26.0%) choosing to target their  
273 spouse, 27 out of 96 (28.2%) choosing to target a parent, and another 20 out of 96 (20.8%)  
274 choosing to target a sibling. The vast majority of remaining participants – 20 out of 96 (20.8%) –  
275 chose to target a close friend.

276 CSOs generated a variety of goals for their TSOs. In total, 51 out of 96 participants  
277 (53.1%) generated goals related to their TSOs' physical health and/or wellbeing (e.g., "I would  
278 like him to lose weight"). Within this group, 25 out of 51 participants (49.0%) generated goals

279 for their TSOs pertaining explicitly to smoking, drinking, or other substance use cessation. 32  
280 out of 96 participants (33.3%) generated goals related to competence and mastery (e.g., “I want  
281 her to finisher her Ph.D. dissertation”). Finally, 13 out of 96 participants (13.5%) generated goals  
282 related to personal fulfillment (e.g., “I want her to be happy”).

### 283 *CSO Perceptions of TSO Motivation & Expectation of a Reaction*

284 As shown in Table 3, the most common reaction CSOs expected from their TSOs in response to  
285 CSO messages was one of gratitude, followed by one of annoyance or irritation. The least  
286 common reactions that CSOs expected were anxiety or panic, followed by hurt. Based on mean  
287 scores, most CSOs reported that their relationships with their TSOs were close ( $M = 7.65$ ,  $SD =$   
288  $2.11$ ). However, CSOs reported being generally frustrated with the efforts of their TSOs to meet  
289 their goal ( $M = 6.36$ ,  $SD = 2.59$ ) and low perceived motivation on the part of TSOs to meet the  
290 goal ( $M = 5.19$ ,  $SD = 2.49$ ), despite the CSOs’ fears of severe negative consequences of TSO  
291 inaction ( $M = 6.55$ ,  $SD = 2.39$ ).

### 292 *LIWC Analysis by Messaging Scenario*

293 The total word count for messages generated for each messaging scenario were as follows: 1356  
294 words generated for messages to help TSOs meet their goal, 1307 words generated in messages  
295 for the event in which the TSO was struggling to meet their goal, and 1390 words generated on  
296 messages for the event in which the TSO had given up on meeting their goal. The average  
297 number of words per sentence was 12.56 in the first scenario, 12.33 in the second scenario, and  
298 10.45 in the third scenario.

299 Linguistic Processes. Use of negations (e.g. no, not, don’t, never) increased significantly from  
300 the first to the third messaging scenario ( $Z=-3.82$ ,  $P<.001$ , two-tailed). Use of punctuation also  
301 increased significantly from the first to the third messaging scenario ( $Z=-2.73$ ,  $P<.01$ , two-

302 tailed).  
303 Psychological Processes. No significant differences in psychological processes existed across  
304 scenarios. However, within the affective process category, the number of words identified by the  
305 system as pertaining to positive emotion declined significantly from the first to the third  
306 messaging scenario ( $Z=2.05$ ,  $P<.05$ , two-tailed). No significant difference was found between  
307 the number of words identified by the system as pertaining to negative emotion between  
308 scenarios.

#### 309 *Message Content by Messaging Scenario*

310 None of the changes in the tone of messages between the three messaging scenarios were found  
311 to be significant (see Figure 1), though there is a trend for positive messages to decrease and  
312 negative messages to increase in the event that the TSO has given up their goal.

313         The presence or absence of compassionate content in messages stayed virtually constant  
314 between messaging scenarios, varying by no more than a single participant in each. Overall, 33  
315 out of 96 participants (35.1%) included compassionate content in their messages both to help  
316 their TSO meet their goal and in the event that the TSO was struggling to meet their goal. 34 out  
317 of 96 participants (35.4%) included compassionate content in the messages they generated in the  
318 event that the TSO had given up on trying to meet their goal. Cross-tabulations performed for  
319 compassionate responses in each of the three messaging scenarios yielded little between-scenario  
320 agreement, indicating that compassionate messages were not necessarily written by the same  
321 participants across scenarios.

322         While gain- or loss-framed messages never constituted the majority the messages in a  
323 grouping, there were changes in the number of gain- and loss-framed messages by messaging  
324 scenario. The number of participants who generated gain-framed messages remained stable in

325 the first two messaging scenarios, with 19 out of 96 participants (20.2%) generating gain-framed  
326 messages to help their TSO meet their goal and in the event that their TSO was struggling to  
327 meet their goal. This percentage dropped to 12 out of 96 participants (12.8%) in the third  
328 messaging scenario, in which the TSO had given up on trying to meet their goal. These changes  
329 were not significant. The number of participants generating loss-framed messages rose  
330 significantly from the first to the third messaging scenario ( $Z=-3.55, P>.001$ , two-tailed). 8 out  
331 of 96 participants (8.5%) generated loss-framed messages for their TSOs to help them meet their  
332 goal. This number nearly doubled to 15 out of 96 participants (16.1%) in the event that the TSO  
333 was struggling to meet their goal, and again to 27 out of 96 participants (28.7%) in the event that  
334 the TSO had given up on trying to meet their goal.

335 None of the changes in social support type were found to be significant across the three  
336 messaging scenarios (see Figure 3), with the exception of a significant spike in the number of  
337 messages coded as unsupportive between the second and third scenario ( $Z=-2.85, P<.01$ , two-  
338 tailed). We ran a crosstab to determine the relationship between compassion and the various  
339 categories within the social support coding schema (e.g., emotional, esteem, network and  
340 informational support). Across scenarios, emotional, esteem, and network support messages  
341 constituted 85 % of all compassionate messages. In the first messaging scenario, informational  
342 messages constituted 75% of all messages coded as not compassionate, but decreased to 53.2%  
343 of all non-compassionate messages by the third messaging scenario (see Figure 4).

#### 344 *Message Content Associations*

345 We looked for significant differences in message content based on both demographic variables  
346 and a number of questions we posed to CSOs about their relationships to their respective TSOs,  
347 their involvement or lack thereof in the TSOs' efforts to meet their goals, and their perceptions



348 of the TSOs' individual change processes.

349 A number of significant differences in message tone and compassion existed based on  
350 variables relating to the CSOs' perceptions of their TSOs. CSOs were significantly more likely  
351 to generate messages with a positive tone to help their TSOs meet their goals if they felt that  
352 their TSOs were highly motivated to achieve that goal, and conversely more likely to generate  
353 messages with a negative tone if they felt that their TSOs were unmotivated ( $F_{2,90}=4.14, P<.05$ ).  
354 This was also true when generating messages in the event that their TSO was struggling to meet  
355 their goal ( $F_{2,92}=6.17, P<.01$ ). This relationship was not significant when the CSOs generated  
356 messages in the event that the TSOs had given up on trying to meet their goals. Similarly, CSOs  
357 were significantly more likely to generate compassionate messages to help their TSOs meet their  
358 goals if they felt that their TSOs were highly motivated to achieve those goals, and less  
359 compassionate messages if they felt that their TSOs were unmotivated ( $F_{1,91}=5.64, P<.05$ ), and  
360 the same held true in the event that the TSO was struggling to meet their goal ( $F_{1,93}=6.15,$   
361  $P<.05$ ). As was the case with tone, this relationship ceased to be significant when the CSOs  
362 generated messages for the scenario in which the TSOs had given up on trying to meet their  
363 goals.

364 CSOs who reported that they would expect a grateful reaction from their TSO were they  
365 to offer suggestions or support were significantly more likely to generate messages with a  
366 positive tone to help their TSO meet their goal ( $F_{2,90}=11.61, P<.001$ ), in the event that the TSO  
367 was struggling to meet their goal ( $F_{2,92}=5.51, P<.01$ ), and in the event that the TSO had given up  
368 on trying to meet their goal ( $F_{2,92}=3.58, P<.05$ ). CSOs who reported an expectation of a grateful  
369 reaction to their suggestions or support were also significantly more likely to generate messages  
370 with a compassionate tone in all three respective messaging scenarios ( $F_{1,91}=8.85, P<.01; F_{1,$

371  $F_{3,93}=15.91, P<.001$ ;  $F_{1,94}=5.29, P<.05$ ). CSOs who reported that they would expect an annoyed  
372 reaction from their TSO to CSO suggestions or support were significantly more likely to  
373 generate messages with a negative tone to help their TSO meet their goal ( $F_{2,90}=3.90, P<.05$ ) and  
374 in the event that the TSO was struggling to meet their goal ( $F_{2,92}=6.21, p<.01$ ). This relationship  
375 ceased to be significant in the event that the TSO had given up on trying to meet their goal.  
376 CSOs who reported an expectation of an annoyed reaction to their suggestions or support were  
377 also more likely to generate non-compassionate messages to help their TSO meet their goal ( $F_{1,91}$   
378  $=9.04, P<.01$ ) and in the event that the TSO was struggling to meet their goal ( $F_{1,93}=9.20,$   
379  $P<.01$ ). As with tone, this relationship ceased to be significant in the event that the TSO had  
380 given up on trying to meet their goal.

381         There was a significant relationship between tone and compassion when combined for  
382 all messaging scenarios ( $r=.527, P<.001$ ). Multiple linear regression for the first messaging  
383 scenario (to help the TSO meet their goal) revealed that tone, rather than compassion, remained  
384 significantly positively associated with TSO motivation ( $t=1.99, P<.05$ ) when both variables  
385 were entered as predictors. Similarly, binary logistic regression revealed that only tone remained  
386 significantly associated with the expectation of a grateful reaction ( $Wald=11.70, P<.001$ ).  
387 Neither predictor remained significantly associated with the expectation of an annoyed reaction,  
388 but the overall model remained significant.

389         Despite variations between subjects in their relationship to their TSO (e.g., spouse,  
390 parent, friend), the type of goal they identified for their TSO (e.g., physical health and wellbeing  
391 vs. competence and mastery), their perception of the severity of consequences the TSO would  
392 experience were they to fail to meet their goal, and their degree of frustration with the TSO over  
393 his or her target goal or behavior, no significant differences in the tone, compassion, or gain- and

394 loss-framing of messages were found based on these variables.

## 395 **Discussion**

396 To our knowledge, this study is the first to qualitatively examine the content of text-based  
397 messages generated by CSOs based on the CSO's desire for their TSO to meet a specific goal in  
398 a range of behavior change scenarios. It is also the first study to examine the relationship  
399 between these messages and CSOs' perceptions of their TSOs and the CSO-TSO relationship.

400 Results of this study indicate that the messages generated by CSOs are significantly more likely  
401 to be positive or ambiguous in tone than they are to be negative. Messages are significantly more  
402 likely to be compassionate than they are to be lacking in compassionate content, regardless of the  
403 specific CSO-TSO relationship or the scenario for which each message was generated.

404 Additionally, the presence of compassionate content in CSO-generated messages was positively  
405 associated with three specific subtypes of social support: emotional support, esteem support and  
406 network support.

407 Results further suggest that CSOs' perceptions of TSO motivation and CSOs' expectations of  
408 certain positive or negative reactions to suggestions or support are better predictors of the tone  
409 and compassion of CSO messages than variables such as CSO frustration or perceived severity  
410 of the consequences of the TSO failing to meet the goal. This has important implications for  
411 training CSOs on how their expectations of a reaction may drive a negative feedback loop  
412 beyond the TSO's actual behavior. Finally, results indicate that while CSOs are more likely to  
413 generate messages without gain- or loss-framed content, the number of CSOs who generate loss-  
414 framed messages increases as the TSOs struggle to meet or give up on their goals.

## 415 *LIWC Analysis*

416 The results of a basic linguistic analysis yielded few differences, even when findings were

417 statistically significant between scenarios. However, two findings were interesting. First,  
418 sentences were shorter and CSOs used more punctuation in their messages for the third scenario.  
419 This could suggest that CSO messages become more emphatic as the behavior change scenario  
420 becomes more dire, particularly given that punctuation is often used to convey emotion.

421 While there were no changes in social and instructive or informational content across  
422 scenarios, there was a significant linear decline in the number of positive emotion words that  
423 CSOs chose to include in messages from the first to the third scenario, possibly reflecting loss of  
424 hope as the TSO gives up on their goals. Interestingly, there was no complimentary increase in  
425 the employment of negative emotion words CSOs chose to use. It is possible that, much like  
426 compassion, which remained stable across scenarios, this reflects CSO sensitivity toward the  
427 TSO in the face of behavior change struggles, even when coupled with a decrease in positivity.

#### 428 *Motivation*

429 One of the principle findings of this study was that messages were significantly more likely to be  
430 positive in tone if the CSO perceived their TSO to be highly motivated to meet their goal, and  
431 negative if the CSO perceived their TSO to be unmotivated to meet their goal. These findings  
432 suggest that CSOs may be more inclined to be encouraging and affirmative of their TSO when  
433 they feel that the TSO is making a concerted effort to change, and more critical or dismissive  
434 when they feel that the TSO is not trying hard enough. Although this is, to our knowledge, the  
435 first time the persuasive language choices of CSOs have been linked to TSO motivation, these  
436 findings resonate with the literature on social reciprocity and its effect on caregiving (Horowitz  
437 & Shindelman, 1983). It may also be that CSOs are aware that more motivated individuals are  
438 more likely to meet their goals, leading CSOs to be more optimistic about their TSOs' chances of  
439 succeeding, and therefore more positive in their language choices within motivational messages.

440 The fact that the relationship between CSOs' perceptions of TSO motivation and the tone of  
441 CSO messages vanishes in the third messaging scenario is perhaps unsurprising, due to the fact  
442 that a scenario in which TSOs have given up on meeting their goals is by nature one in which  
443 TSO motivation is no longer a factor.

444 Similarly, messages in the first two messaging scenarios were significantly more likely to  
445 include compassionate content if the CSO perceived the TSO to be highly motivated to meet  
446 their goal. This is, arguably, the more difficult relationship to explain due to the fact that more  
447 motivated individuals may have less of a need for expressions of care or concern from their  
448 CSOs than those who are less motivated to change. However, these findings may suggest that  
449 CSOs are more disposed to be sympathetic to people who they perceive to be trying hard to meet  
450 their goal, and that this manifests as compassion within messages. Again, the fact that this  
451 relationship does not appear to be significant for the third messaging scenario is likely to be a  
452 result of the fact that motivation does not factor into this category of messages.

#### 453 *Expected Reactions to CSO Feedback*

454 The tone of messages was also found to vary significantly based on two expected TSO  
455 reactions to CSO suggestions or support. CSOs who expected their TSOs to be grateful for  
456 feedback were significantly more likely to write positive and compassionate messages,  
457 regardless of the messaging scenario. Conversely, CSOs who expected their TSOs to be  
458 annoyed upon receiving feedback were significantly more likely to write negative,  
459 uncompassionate messages for the first two messaging scenarios.

460 These findings were of particular interest to investigators, given that so many variables  
461 that were expected to influence the tone and compassion of messages (e.g., the perceived  
462 closeness of the CSO-TSO relationship or the CSOs' reported frustration with their TSOs'

463 progress toward goal attainment) were not found to be significant predictors. The relationships  
464 that were found between the CSO's expectations of their TSO and the message content they  
465 generated have important implications. Namely, the CSO's expectation of a positive and  
466 affirming reaction to support was related to the generation of positive, compassionate message  
467 content. By contrast, the expectation of a negative, irritated reaction to support was related to the  
468 generation of negative, uncompassionate message content. As language expectancy theory  
469 predicts, these findings suggest that CSOs' expectations of a positive or negative reaction to  
470 support has an impact on how they choose to communicate with their TSO – even in non-face-to-  
471 face interactions. What's more, they suggest that CSOs' expectations of gratitude or annoyance  
472 from their TSOs have more weight in influencing the tone and compassion of their messages  
473 than factors such as how well the TSO is doing in trying to meet their goal, how severe the  
474 consequences would be if the TSO were to fail, or how frustrated the CSO is with the TSO's  
475 progress.

#### 476 *Supportive Communication Type*

477         With the addition of a category for unsupportive messages, all messages were  
478 successfully categorized based on the social support coding schema developed by Cutrona &  
479 Suhr (1994). Although the most common type of supportive communication across scenarios  
480 was informational support, an equivalent number of messages fell into the emotional, esteem, or  
481 network support categories for each scenario, all of which include expressions of connectedness,  
482 love, care and liking. Very few tangible assistance messages were generated, which was to be  
483 expected given that we asked CSOs to generate brief text-based messages that were intended to  
484 be a form of stand-alone support. Unsurprisingly, the number of explicitly unsupportive  
485 messages spiked in the scenario in which CSOs had given up on their goals completely, although

486 even in this third scenario the number of unsupportive messages was relatively low. This may be  
487 tied to the relationship that appears to exist between negative tone in messages and CSO  
488 perceptions of low TSO motivation. Namely, CSOs may be more likely to withdraw support  
489 completely if they feel that their TSO is making no effort to meet their goal.

#### 490 *Gain- and Loss-Framing*

491 Gain- and loss-framed messages, which stressed the potential positive outcomes of goal  
492 achievement and the potential negative consequences of goal failure, respectively, constituted a  
493 significant portion of the messages in all messaging scenarios. Most notably, there was a  
494 significant increase in the number of loss-framed messages generated by CSOs from the first to  
495 the third messaging scenario. As the scenarios became more indicative of TSOs' failure to meet  
496 their goals, CSOs became more disposed to stress the potential negative consequences of these  
497 failures within their motivational messages. This corresponds with the decrease in positive affect  
498 words from the first to the third messaging scenario as identified in the LIWC analysis. Although  
499 this increase in loss-framed messages by scenario is not unexpected, future research should  
500 examine whether this is a desirable trend in communication between CSOs and TSOs about  
501 behavior change. Recent research indicates that recipients of motivational messages generally  
502 prefer to receive gain-framed over loss-framed content but may prefer loss-framed messages  
503 when motivation is lower (Muench et al., 2014; Muench, Weiss, Kuerbis, & Morgenstern, 2013).  
504 This tendency may generalize to all communication patterns – even those generated by CSOs.

#### 505 *Limitations*

506 While the scope of this line of research was exploratory, there were a number of limitations.  
507 Most notably, the representativeness of this CSO sample was limited by the age of participants  
508 and because nearly three quarters of the participants were male. Some important and common

509 CSO-TSO relationships, including CSO parent—TSO child relationships, could not be assessed  
510 based on the demographic characteristics of the sample, limiting the generalizability of the  
511 findings to the spectrum of CSO-TSO relationships. Furthermore, we did not restrict the  
512 availability of the survey only to CSOs of TSOs who might be the target of a true health  
513 intervention, but allowed CSOs to generate a wide range of goals, many of which were not  
514 explicitly health related. It is possible that this broader group of CSOs may generate different  
515 message content than a CSO sample with specific health or mental health-related goals for their  
516 TSOs. However, it bears repeating that we found no differences in tone or compassion based on  
517 goal type.

518 Another limitation is that we did not ask CSOs to generate brief text-based messages in a  
519 naturalistic context (e.g., via text message on a mobile phone or in an online one-on-one chat  
520 setting), but rather in an online survey setting in which there was no risk of the TSO receiving  
521 the messages they generated. It is possible that asking CSOs to generate messages via mobile  
522 text message or web chat, or in a setting in which their TSO could see the message, would yield  
523 different results. Nevertheless, our results correspond with much of the existing literature on  
524 CSOs, behavior change and language expectancy, indicating that further research on CSO-  
525 generated messages may be helpful to our understanding of CSOs' persuasive tactics.

526 While message coding was standardized, results of our analyses of tone, compassion and  
527 gain- and loss-framing should be interpreted with reservation as these coding categories were  
528 operationalized by researchers rather than using an external standard. In addition, understanding  
529 the nuances of the coding categories is important. For example, a message that contained only a  
530 direction or instruction (e.g., "Stop smoking now.") was not coded as compassionate, due to the  
531 fact that such a message does not explicitly convey a tone of care or concern. However although



532 the message was therefore coded as uncompassionate, it should not necessarily be interpreted as  
533 anonymous with compassion (e.g., cruel or indifferent). Future research should aim to refine  
534 these coding schemas to improve our understanding of subtle variations in message content.

535         Despite these limitations, we believe that the findings of this study hold promise in  
536 opening a line of research about how CSOs use language to motivate TSOs and how to improve  
537 communication between these populations to improve treatments that target the CSO-TSO  
538 relationship.

### 539 *Conclusions and Future Research*

540         When taken together, these findings underscore the importance of attending to patterns in the  
541 language choices of CSOs when addressing their TSOs about goal achievement or failure, and  
542 how certain variables in the CSOs' perceptions of their TSOs and their interpersonal dynamics  
543 moderate these characteristics. As we work toward a goal of fostering healthier relationships  
544 that promote change in people's daily lives beyond the clinic, our recommendation for future  
545 research is to prioritize elucidating the underlying communication dynamics between CSOs and  
546 TSOs, especially in text-based communication. These efforts may improve our ability to target  
547 counterproductive or ineffective communication patterns while providing tools and resources  
548 that enhance productive and supportive communication between these two populations.

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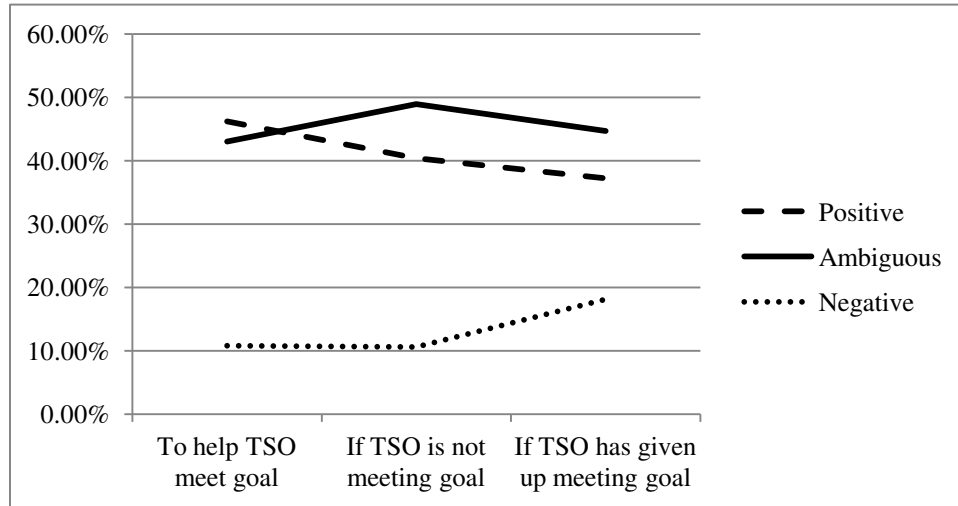
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**Figure 1**(on next page)

Tone by Messaging Scenario

Figure 1. Tone by Messaging Scenario



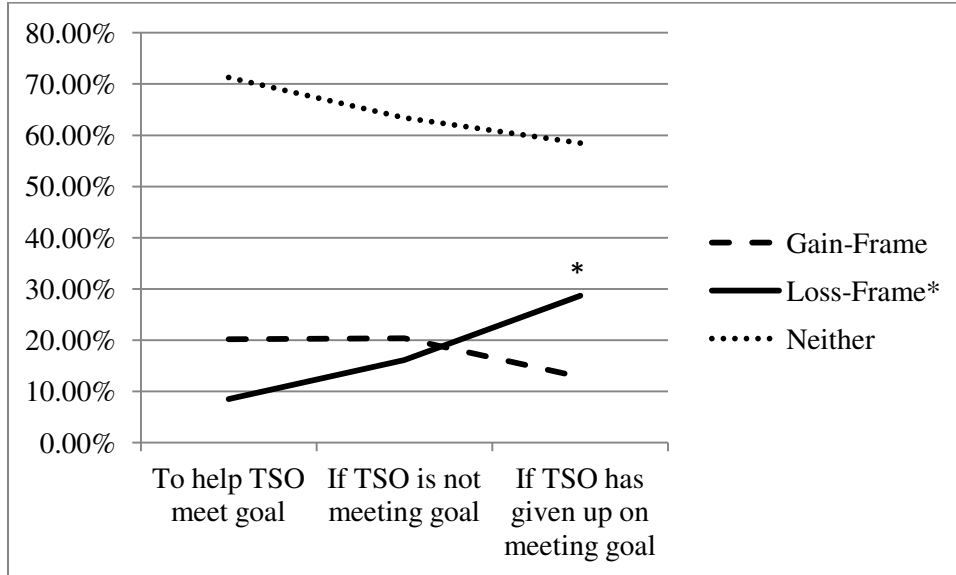
**Figure 2** (on next page)

Gain- and Loss-Framing by Messaging Scenario

\* Significant



Figure 2. Gain- and Loss-Framing by Messaging Scenario



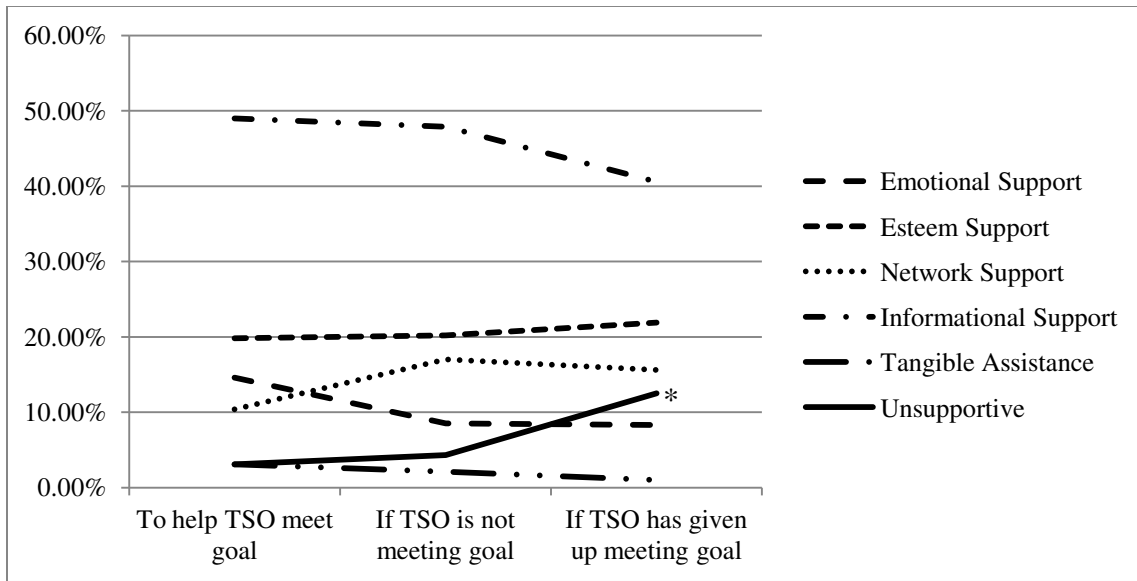
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**Figure 3** (on next page)

Social Support Type by Messaging Scenario

\* Significant

Figure 3. Social Support Type by Messaging Scenario

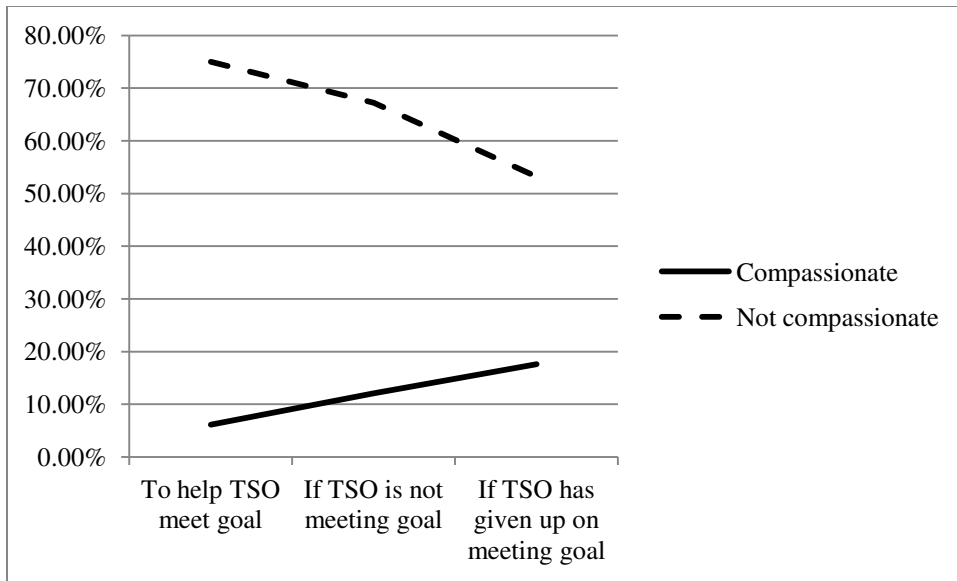


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**Figure 4**(on next page)

Compassionate vs. Not Compassionate Messages Coded as Informational Support

Figure 4. Compassionate vs. Not Compassionate Messages Coded as Informational Support



**Table 1** (on next page)

CSO Message Coding

1 Table 1. CSO Message Coding

<b>Coding Category</b>	<b>Coding Variable</b>	<b>Example Message</b>
Tone	Positive <i>Message is affirmative, encouraging, or favorable towards the TSO and goal achievement.</i>	“Hey Dad, it looks like you've lost some weight, keep at it!”
	Negative <i>Message is pessimistic, critical, or dismissive of the TSO and his/her behavior change attempts.</i>	“So long and good luck. Don't come crawling back.”
	Ambiguous <i>Message can be read as either positive or negative in tone, depending on the specific context/relationship of CSO and TSO; message in itself doesn't strongly confirm either positive or negative tone.</i>	“Call your children more often.”
Compassion	Compassionate <i>Message conveys a tone of care and concern for the TSO, or encourages the TSO to be self-compassionate.</i>	“I care a lot about you and I know you can do this!”
	Not compassionate <i>Message contains no indication of CSO's care or concern for the TSO.</i>	“You smoke too much. You should stop.”
Gain vs. Loss Orientation	Gain-framed <i>Message emphasizes the positive results of goal achievement.</i>	“The harder you try, the more money you'll have!”
	Loss-framed <i>Message emphasizes the negative consequences of goal failure.</i>	“It's your life, I know, but your weight is literally killing you.”
	Neither <i>Message refers to neither positives of goal achievement nor consequences of goal failure.</i>	“Don't get discouraged.”

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**Table 2** (on next page)

Demographics



1 Table 2. Demographics

<b>Variable</b>		<b>n (%)</b>
Age (years)	18-30	62 (64.6)
	31-40	21 (21.9)
	41-older	13 (13.5)
Gender (%female)		28 (29.5)
Race	Black	3 (3.1)
	White	83 (86.5)
	Asian	7 (7.3)
	Other	3 (3.1)
Ethnicity	Hispanic	4 (4.2)
Relationship to TSO	Spouse/Partner	25 (26.0)
	Parent	27 (28.2)
	Sibling	20 (20.8)
	Close Friend	20 (20.8)
	Other	4 (4.1)
TSO Goal Type	Physical Health & Wellbeing	51 (53.1)
	Competence & Mastery	32 (33.3)
	Personal Fulfillment	13 (13.5)

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### **Table 3**(on next page)

TSO-CSO Relationship & Goal Achievement Rulers (n=96)

<sup>a</sup> 1 = estranged, 10 = extremely close

<sup>b</sup> 1 = not at all motivated, 10 = extremely motivated

<sup>c</sup> 1 = TSO will do the opposite of CSOs suggestion, 10 = TSO will strive to take advice

<sup>d</sup> 1 = not at all severe, 10 = extremely severe

<sup>e</sup> 1 = not at all frustrated, 10 = extremely frustrated

1 Table 3. TSO-CSO Relationship & Goal Achievement Rulers (n=96)

Variable		Percent	Mean (SD)
Expected reaction to CSO suggestions or support	Gratitude	52.1	
	Annoyance	34.4	
	Excitement	21.9	
	Embarrassment	20.8	
	Detachment	15.6	
	Anger	14.6	
	Hurt	12.5	
	Anxiety	7.3	
TSO-CSO Closeness <sup>a</sup>			7.65 (2.11)
TSO Motivation <sup>b</sup>			5.19 (2.49)
Will TSO take CSO Advice <sup>c</sup>			5.62 (2.25)
Consequence Severity of Goal Failure <sup>d</sup>			6.55 (2.39)
CSO Frustration <sup>e</sup>			6.36 (2.59)

2 <sup>a</sup> 1 = estranged, 10 = extremely close

3 <sup>b</sup> 1 = not at all motivated, 10 = extremely motivated

4 <sup>c</sup> 1 = TSO will do the opposite of CSOs suggestion, 10 = TSO will strive to take advice

5 <sup>d</sup> 1 = not at all severe, 10 = extremely severe

6 <sup>e</sup> 1 = not at all frustrated, 10 = extremely frustrated

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