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Yuanyuan Song
University of Georgia, yuanyuan.song@uga.edu

Elena Karahanna
University of Georgia, ekarah@uga.edu

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Giving What a User Needs: Constructing Reference Groups in Fitness Technologies

Emergent Research Forum (ERF)

Yuanyuan (April) Song
University of Georgia
yuanyuan.song@uga.edu

Elena Karahanna
University of Georgia
ekarah@uga.edu

Abstract

Mobile fitness technologies are designed to support exercise behavior. A distinguishing aspect of these technologies is their social component. Though research has examined the social support effects of this social component, less attention has been given to its social comparison effects. A fundamental aspect of social comparison is the referent groups on which the comparison is based. The paper examines the relative effects on exercise behavior of social comparisons based on referent groups constructed using demographic similarity, goal similarity, and social closeness. We will test our proposed design through a randomized field experiment on a mobile fitness application.

Keywords

Social comparison, physical activity, reference groups, mobile fitness technology.

Introduction

Physical inactivity is the fourth leading risk factor for global mortality and a risk factor for many noncommunicable health issues, such as stroke and (World Health Organization 2008, 2010). Despite its importance, people struggle to maintain exercise behaviors. Fitness technologies, such as wearable devices and applications, aim to improve well-being by providing features that motivate users to exercise and stay physically active (James et al. 2019). An important aspect of these features provided by such technologies is a social component. Extant research on the social component emphasizes the influence of social support on physical activity (Sullivan and Lachman 2017; Zhou et al. 2016). However, another important affordance of the social component is social comparison (Yoganathan and Kajanan 2013).

Many fitness technologies allow users to follow other users and get informed of their physical activity (Zhou et al., 2016). Some fitness technologies also allow users to observe strangers' (people that users do not follow) physical activity (Fitbit 2017). Fitness technologies can also provide social comparison feedback based on features such as leaderboards, competitions, activity, reports, and profiles. (Rockmann and Gewald 2019; Wu et al. 2015). Hence, the social component in fitness technologies provides abundant social comparison opportunities. Such technology-enabled social comparison is significantly different from the social comparison in people's offline social networks, because the capabilities of technologies allow for more visible social comparison, allow for social comparison information presented differently, and allow to construct reference groups, defined as people to whom focal individuals are compared, more fluidly. The objective of our research is to compare the effect of social comparison based on different reference groups on physical activity, defined as the frequency (how many times a week) and duration (average duration of each physical activity) of an individual's physical activity.

Extant research has shown equivocal research findings on the influence of social comparison on physical activity. Although several studies show encouraging results (Arigo et al. 2015; Burke and Rains 2019; Diel and Hofmann 2019; Mulgrew et al. 2018; Peng et al. 2019; Rancourt et al. 2015; Wasilenko et al. 2007; Zhou et al. 2016), other studies also report ineffectiveness of social comparison (Diel and Hofmann 2019; Martin Ginis et al. 2008; Peng et al. 2019; Wasilenko et al. 2007). One possible reason for such equivocal findings is differences across studies in design features that enable social comparison. In fact, little is known about how to design fitness technologies that empower motivating and positive social comparison. One way

to leverage social comparison to motivate exercise is by constructing appropriate reference groups. Reference groups are important because people to whom focal individuals are tied in the social comparison can influence these focal individuals' self-regulation of behavior (Festinger 1954). Therefore, our research explores different ways to construct reference groups for social comparison to identify their relative influence on physical activity. We contribute to the growing literature on the effect of social comparison on physical activity by focusing the discussion on a more systematic examination of reference groups. Our research also has design implications for constructing motivating social comparisons given the ease with which reference groups can be constructed online.

Literature Review

Social comparison theory proposes that individuals have an innate tendency to compare themselves with others as a means of self-evaluation (Festinger 1954). Researchers have identified two major directions of social comparison: upward social comparison when individuals compare themselves to people better off and downward social comparison when people compare themselves to people worse off (Buunk et al. 1990). The difference between these two types of social comparison is the reference groups to whom focal individuals are compared. Reference groups are a central part to any social comparison process (Roels and Su 2014) and can influence focal individuals' self-regulation of behavior (Festinger 1954).

Research findings on the role of social comparison in exercise motivation and behavior are equivocal. Some studies suggest that social comparison has a positive effect on exercise (Arigo et al. 2015; Burke and Rains 2019; Diel and Hofmann 2019; Mulgrew et al. 2018; Peng et al. 2019; Rancourt et al. 2015; Wasilenko et al. 2007; Zhou et al. 2016) Others report the ineffectiveness of social comparison on exercise (Diel and Hofmann 2019; Martin Ginis et al. 2008; Peng et al. 2019; Wasilenko et al. 2007). A possible reason for the different findings may be that the social comparison reference groups were defined differently in each case. Specifically, the studies used five different ways of defining reference groups to enable social comparison: social comparison direction, social comparison extremity, social closeness, and proximity to standard. First, social comparison direction involves using upward and downward social comparison to define reference groups. Even so, different studies operationalized upward and downward social comparison differently. For example, Peng et al. (2019) manipulated upward, lateral, and downward social comparison as better, similar and worse body shape respectively. Diel and Hofmann (2019) defined upward and downward social comparison in terms of overall fitness score measured by questionnaires and Martin Ginis et al. (2008) used professional exercise video stimuli as upward social comparison. Second, Diel and Hofmann (2019) examined social comparison extremity in terms of small or big differences in fitness scores to define the reference groups. Social closeness is another moderator that is examined in the literature. Weight comparisons to friends (i.e. close social ties) amplify the effects of social comparison on exercise intention (Rancourt et al. 2015). Finally, proximity to standard (i.e., a meaningful threshold) is used to construct reference groups. For example, the level of 50th and 75th percentile of team performance (average number of steps) is used to define reference groups (Patel et al. 2016).

These studies illustrate the range with which one can define social reference groups. What is missing is a theoretical approach that can integrate across findings and guide the selection and comparison of social reference groups in a systematic manner. Garcia et al. (2013) provide one such framework. Specifically, they identify individual and situational factors that increase social comparison and can be leveraged to inform approaches to construct reference groups. Individual factors include individual differences, dimension relevance, similarity, and relationship closeness, and situational factors include incentive structures, proximity to a standard, number of competitors and social category fault lines (Garcia et al. 2013). Extant literature on social comparison has examined some individual differences (specifically, tendencies towards social comparison), relationship closeness, and proximity to a standard. Other factors that contribute to motivating social comparisons in exercise are largely understudied. Given the ease with which information based on different referents can be presented in fitness technologies, one fruitful research avenue is to examine what criteria to use to construct social referent groups that provide motivating social comparisons in the context of physical activity and their relative effects.

Our study extends the current literature by leveraging individual factors in Garcia et al.'s (2013) model, and more specifically, relationship closeness and similarity in terms of demographics and goals, as the basis for constructing social reference groups and by *comparing* their relative effects on physical activity. Although social closeness has been examined in Rancourt et al. (2015), it was measured by participants completing a

diary assessing the frequency and nature of weight-focused social comparisons (Rancourt et al. 2015). Such measurement is subject to recall bias (Shiffman et al. 2008) and self-report bias. We operationalize social closeness by constructing reference groups in mobile fitness technologies based on one's social network. This provides a different measure of social closeness which is more apt for our context.

Hypotheses Development

Social comparison theory suggests that people are more inclined to compare themselves with similar others (Festinger 1954). When people perceive that their reference groups are similar to themselves on related attributes, they are more likely to believe that they can, or have the potential, to perform similarly (Noon and Meier 2019), which motivates them to improve their performance. While there are multiple ways to assess similarity, we suggest that one common way is demographics (i.e. age and gender). We expect that reference groups with the same gender and similar age have a motivating effect on exercise.

Hypothesis 1: Social comparisons based on reference groups that have similar demographics with the focal user have a positive influence on the focal individual's physical activity.

The similarity of goals between reference groups and the focal user influences the focal user's physical activity in several ways. First, goal commitment is influenced by other people's goals (Hollenbeck and Klein 1987). Individuals' commitment to difficult goals is likely to be higher when people around them have similarly difficult goals (Hollenbeck and Klein 1987). Second, the level of goal commitment shown by others may also influence the individual's level of goal commitment (Hollenbeck and Klein 1987). If focal users get informed of other people's high commitment to similar goals, they will be more likely to commit to their goals. Therefore, we posit:

Hypothesis 2: Social comparisons based on reference groups that have similar goals with the focal user have a positive influence on the focal individual's physical activity.

Close relationships exist between people with frequent interactions and a high level of closeness (Hu et al. 2019). Close social ties (e.g., family and friends) mean more to people than weak ties (e.g., acquaintances and strangers). Thus, reference groups consisting of close social ties set up meaningful standards for individuals and thus motivate them to exercise. Further, studies show that social ties have an impact on individuals' health behaviors, such as obesity (Christakis and Fowler 2007), smoking (Christakis and Fowler 2008) and health behavior adoption (Centola 2011). Thus, we posit:

Hypothesis 3: Social comparisons based on reference groups that have close relationships with the focal user have a positive influence on the focal individual's physical activity.

Three different ways of constructing reference groups have been proposed (i.e., reference groups with similar demographics, with similar goals, and with close relationships to the focal individual). We expect that reference groups with similar goals are likely to have the strongest effect on physical activity. First, reference groups with similar goals have a motivating effect on physical activity, because people's commitment to goals is likely to be higher if they are surrounded by others with similar goals and get informed with others' commitment (Hollenbeck and Klein 1987). Second, we expect reference groups with similar goals have a stronger effect than those with similar demographics and close relationships. Compared to reference groups with similar demographics and close relationships, reference groups with similar goals are likely to vary less in terms of the physical ability to exercise, and they are more likely to be similar with focal individuals in terms of exercise ability. We expect such similarity leads to comparison and motivates exercise behavior. Further, having people with similar goals around gives focal individuals a sense of companionship, which would motivate them to exercise. Thus, we posit:

Hypothesis 4: Social comparisons based on reference groups with similar goals will have the strongest effect on an individual's physical activity *than social comparisons based on similar demographics or based on close relationships to the focal individual.*

Proposed Method

We will test our hypotheses through a randomized field experiment on a mobile fitness application. The fitness application will have a feature that enables users to be informed, in aggregate, of others' physical activity and where the individual stands in this comparison. Leveraging this feature, we will expose users

to social comparisons with reference groups. Our research sample will be randomly chosen from active users of the fitness application and will be randomly assigned to different groups. We will collect our baseline data on physical activity two weeks before our experiment is implemented. We will also collect data after the experiment design is implemented. Our experiment will last four weeks.

We will conduct two studies to test our hypotheses. Study 1 will have three conditions: reference groups constructed based on demographic similarity, goal similarity and social closeness. The app feature will prominently display the reference group with which the user's physical activity is compared to make users aware that they are in social comparisons. In the first group, users will be shown comparisons with a reference group of similar demographics (i.e. age and gender). Users in the second group will be shown comparisons with a reference group who has similar exercise goals in terms of exercise frequency and intensity. In the third group, users will be shown comparisons with their close social ties with whom focal users have most interactions, such as communications, likes, and comments. In all three cases, we will use *upward* social comparison with the level of difference between the individual and the referent group being held constant across conditions. That is, our manipulation is merely showing a different referent group and holding all else constant. In this manner, we are able to isolate whether perceiving a different referent group as the basis of social comparison is consequential to physical activity. To avoid suspicion, the amount of difference between the individual and the group's mean performance will be selected each day based on a normal distribution around the mean difference that we select as the basis of the upward comparison.

In Study 2, we will randomly assign a different set of users to the three treatment groups (i.e. demographic similarity, goal similarity, and social closeness). However, the social comparison information provided to the subjects will be based on the actual physical activity of these reference groups. In other words, the second study informs users of their actual position in social comparisons with their reference groups. In this manner, we assess whether the referent group used-which may also influence direction (upward or downward) and magnitude (small or large difference) of social comparison–impacts physical activity in a more realistic manner. The second study will inform how our proposed design works in real practice. We will analyze the data in both studies using ANOVA and Tukey's HSD test.

Expected Contribution

Our research contributes to research on social comparison and physical activity. We propose theory-based designs of reference groups in mobile fitness technologies to provide insights on approaches to motivate physical activity. We further compare these in terms of their relative influence on one's physical activity. Our findings are expected to inform the literature on social comparison in the context of exercise.

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