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The effects of goal commitment on physical activity in adults

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Abstract
The purposes of this study were to examine: the effects of goals and goal commitment on increasing physical activity levels; and whether goal commitment moderates the relationship between goals and increases in physical activity levels. A total of 69 middle-aged (16 male and 53 female) adults were asked to wear a pedometer and to maintain their daily routine minimum five days for a baseline assessment of physical activity. Participants were then randomly assigned into three different goal groups: 10%, 20% and 40% increase step counts from baseline measurement. The participants wore a pedometer and were asked to reach assigned goal. Then the participants' goal commitment to the assigned goals was also measured. Results from a multiple regression analysis indicated that goal and goal commitment were significant predictors of increasing daily step counts. However, there was no significant interaction between goal commitment and goal on performance. With these findings, this study suggests that goal commitment is an independently important predictor for increasing physical activity in adults.

Keywords: Motivation, physical activity, goal-setting, pedometer, goal commitment

Introduction
The importance of regular participation in physical activity (PA) has been emphasized both in media and research, but most Americans still do not meet the recommended amount of PA (Carlson *et al*., 2010 [4]; Tucker *et al*., 2011) [27]. For example, Tucker and his colleagues (2011) found that less than 10% of U.S. adults achieved the Physical Activity Guidelines for Americans. Lack of PA participation is closely related with the increasing rate of obesity, which is a significant health concern (Nelson *et al*., 2007) [22]. Obesity is highly associated with health risks such as type 2 diabetes, coronary artery disease and stroke, etc. (Kopelman, 2007) [13]. Even though there are multiple efforts to promote PA, effectiveness of existing PA interventions are still limited (Godino *et al*., 2014). Based upon literature (Brug, Oenema, & Ferreira, 2005 [3]; King *et al*., 2002 [11]; Rhodes & Nigg, 2011) [24], PA interventions should be theory based in order them to be effective. Rhodes and Nigg (2011) [24] reported that employing theory-based interventions facilitates a better understanding of PA behaviors and helps to guide the development of effective interventions. However, many PA-related interventions do not adopt a theoretical framework, such as goal-setting theory. For example, many pedometer-based interventions often incorporate a goal-setting strategy to promote PA by providing 10,000 steps/day slogan or a specific increment step counts from baseline. But, rarely do they include a specific component of goal-setting theory such as missing the measurement of additional variables (Bravata *et al*., 2007) [2].

A theory of goal setting has been found as an effective motivational strategy in PA settings. Main premise of goal setting theory is that difficult and specific goals motivate individuals to increase performance than easy, vague, and do your best goal (Locke & Latham, 2002) [17]. While previous literature suggests that an improvement in personal performance relates to the specificity and difficulty of the goal being set, the effectiveness of difficult goals may not be solely explained by the level of specificity and difficulty of the goal (Locke & Latham, 2002) [17]. Research suggests that additional factors may goal-setting effects such as goal commitment (Hollenbeck & Klein, 1987 [10]; Kyllo & Landers, 1995 [14]; Locke, Latham & Erez, 1988 [16]; Locke & Latham, 2002 [17]; Locke & Latham, 2006) [18]. Goal commitment is defined as "the determination to try for a goal" (Hollenbeck & Klein, 1987, p. 212) [10]. Locke *et al*. (1988) [16] also stated "it is virtually axiomatic that if there is no commitment to goals,

then goal setting does not work" (p. 23). Goal commitment, especially is considered an important factor for the effectiveness of difficult goals. In other words, when the goals are difficult, high levels of goal commitment are necessary in order to put forth sufficient effort toward goal achievement (Donovan & Radosevich, 1998) [7].

The literature proposes goal commitment is considered important factor of the relationship between goal and performance, but many previous goal-setting studies in PA settings overlooked the importance of goal commitment by not measuring it (Hollenbeck & Klein, 1987; Locke, 1991) [10, 15]. For example, Hollenbeck and Klein (1987) [10] reported that goal commitment was rarely measured and the role of goal commitment in goal-setting research was not discussed. To date, whether goal commitment influence the relationship between goal setting and performance in PA setting has limited evidence. Much of the previous goal-setting research was focused on the effects of goal setting by comparing the performance results among different goal groups including no goal group rather than understanding the mechanisms of the goal-setting theory.

In addition, there are inconsistent results on the moderating effects of goal commitment to the relationship between goal and performance. For example, Seijts and Latham (2011) found supportive evidence for goal commitment as a moderator of the relationship between learning goal level and performance in undergraduate students. However, Dodd and Anderson (1996) [6] found that goal commitment did not moderate the relationship between a difficult goal and academic performance. With these inconsistent results and lack of attempts to measure goal commitment in previous goal-setting research, the role of goal commitment as a moderator of goal and goal commitment has not been fully discussed.

To identify the role of goal commitment in goal-setting effects in PA setting, the purposes of the current study were to examine the effects of goal commitment, goals, and moderating effects of the relationship between goal commitment and goals on PA level. The hypotheses of this study were: (a) goals and goal commitment independently influence an increase in daily step count; and (b) goal commitment moderates the relationship between goals and increase the number of daily steps so that higher goal commitment would be related to improvement of PA levels.

Methods

Participants

A total of sixty-nine participants (16 male and 53 female) were participated in the study. They were recruited from the resources the human subjects registry of the Center for Healthy Aging Research at university in the Northwest region of the United States. Participants were also recruited by postings around campus and some local business bulletin boards, and word of mouth. Inclusion criteria for participation included: (a) aged between 40 and 65 years; (b) ambulatory without assistance; and (c) willing to wear a pedometer for at least five days for baseline and at least six days for goal-setting week. To account for the small sample size, only participants that wore a pedometer at least five days for baseline and for at least 6 days for the goal-setting week were included. The demographic information of participants is described in Table 1. The study was approved by the Institutional Review Board. Written informed consent was obtained from all participants before the start of data collection.

Table 1: Participant characteristics (n = 69)

Characteristic	Male(n = 16)	Female(n = 53)	Total(n = 69)
Age (years)	54.13 ± 6.45	54.38 ± 6.15	54.31 ± 6.17
Height (cm)	179. 40 ± 6.32	162.62 ± 6.03	166.51 ± 9.35
Weight (kg)	87.55± 15.89	72.53 ± 17.50	76.01 ± 18.18
BMI (kg/m^2)	27.15 ± 4.52	27.40 ± 6.30	27.33 ± 5.90

Instruments

Pedometer The Omron HJ-720 ITC pedometer (Bannockburn, IL, USA) was used to measure PA in this study. This relatively new model is a piezoelectric pedometer (Tudor-Locke *et al*., 2011) and is more accurate than spring-levered pedometers especially for obese individuals and individuals with slow walking speeds (Pitchford & Yun, 2010; Tudor-Locke *et al*., 2011). The accuracy of several locations for pedometer placement has been found; the pedometer in this study was worn on the waistband in line with the middle of the thigh. The unit has a memory that can store activity data for up to 41 days. In order to maintain the accuracy of all pedometers, a shake-test was performed by the researcher and assistants as suggested by Vincent and Sidman (2003) [29]. Only pedometers with error rates of 5% or less were used in the study.

Goal commitment. Participants' level of goal commitment to the assigned goal was measured by questionnaires developed by Klein *et al*. (2001) [12]. The items are presented in Table 2. This measure has five items with a Likert scale (1 = "strongly agree" to 5 = "strongly disagree"). Higher scores indicate a greater commitment to the goal. A response of "strongly agree" to items 3 and 5 indicates a high commitment level whereas a response of "strongly disagree" indicates a low commitment level. Items 1, 2, and 4 are reverse-scored before statistical analysis. According to Klein *et al*. (2001) [12], factor loadings for this five-item measure ranged from 0.65 to 0.74. In the current study, the Cronbach alpha reliability coefficient for the five goal commitment items was 0.79.

Table 2: Goal commitment items Hollenbeck *et al*. (2001)

1.	It's hard to take this goal seriously. (R)
2.	Quite frankly, I don't care if I achieve this goal or not. (R)
3.	I am strongly committed to pursuing this goal.
4.	It wouldn't take much to make me abandon this goal. (R)
5.	I think this a good goal to shoot for.

Note: Items followed by (R) means that the item should be reverse-scored.

Procedure

Participants were required to have a total of three meetings. At the first meeting, participants' demographic information including height and weight was collected by a researcher and student assistants. Then the researcher instructed participants on how to wear the pedometer. Participants were asked to wear the pedometer from the time they woke up until they went to bed (except during water-related activities) for the next ten days beginning the day after the first meeting. Two types of visual reminders (key carabineer & door hanger) for wearing the pedometer were offered to all participants. Approximately ten days after the first meeting, the researcher met with the participants for a second time.

During the second meeting, the baseline step count of each participant was calculated as a mean of the daily step counts for a minimum of five days. According to Matevey, Rogers, and Dawson (2006) [21], individuals may change their activity levels when they wear a pedometer. However, they found that reactivity did not seem influence the validity of using pedometer for adults in free-living environment. In this study, step counts within the first three days measurement were not

included in the baseline calculation in order to control for reactivity. Participants were randomly assigned into selected goal groups with 10, 20, and 40% increases in their step counts over baseline and were then asked to reach his/her assigned goals. Since there is lack of attempts to examine the effects of various degrees of goal difficulty with using pedometer, different degrees of goal levels in the current study were established based on reviewing of goal-setting literature in PA settings. After the participants understood their assigned goal, their level of goal commitment to the assigned goal was assessed by paper and pencil survey. A minimum of seven days after the second visit, the participants had a last meeting with the researcher and pedometers were collected. To be included in the goal-setting week data, participants had to have at least six days and one weekend day of pedometer wear time.
Statistical analyses.
Descriptive statistics were determined for participant characteristics including age, sex, height, weight, BMI, and average step counts at baseline and at the goal-setting week for all groups. Body mass index (BMI) was calculated with the formula (weight/height²). To calculate the average daily steps at baseline and post goal setting, participants had to have had at least five days of pedometer data with at least one weekend, but no more than three weekend days to be included in the analyses.
To examine the moderating effects of the associated change in PA level, a multiple regression analysis was used. The dependent variable was change in step count from baseline to the goal-setting week. Independent variables (IVs) included in this analysis were goal, goal commitment, and the interaction between goal and goal commitment. All independent variables were assessed for multicollinearity using correlation coefficients of each pair of variables and the variance inflation factor (VIF). Multicollinearity occurs when the VIF is greater than 10 (Cohen *et al*., 2003) [5]. When one or more of the IVs is highly correlated with the other IVs, it can be problematic because multicollinearity increases the standard errors of the coefficients (Cohen *et al*., 2003) [5]. Through diagnosis of multicollinearity, a very high level of multicollinearity was present (*VIF* = 39.02 for goal, 46.59 for interaction between goal and goal commitment). In order to control for multicollinearity, each predictor (i.e., goal, goal commitment, and interaction) was centered by subtracting it from its mean. After the goal was centered, the multicollinearity issue was resolved (*VIF* = 1. 07 for goal, 1.07 for goal commitment, 1.14 for interaction between centered goal and goal commitment). All analyses were performed using the SPSS statistical program version 16.0 for Windows (SPSS, Inc., Chicago, IL, USA).

Results

The participants had on average 8,107 steps/day during the baseline period and had on average 10,536 steps during the goal-setting week. Across all groups, the average step goal was 9,948 steps/day. It is interesting to note that participants exceeded their assigned goal by about 589 steps. The average goal commitment score was 4.20 ± 0.63. Means in step counts are presented in Table 3.3.

Table 3: Average steps across all groups

	Steps
Baseline	8107.30 ± 3055.61
Goal groups	9947.94 ± 3717.03
Post test	10536.14 ± 4331.91
Change in steps	2394.65 ± 2186.44

Multiple regression analysis showed that the three predictor model was significant, (R^2= 0.48, F (3, 65) = 6.617, p<.01) and explained about 23% of the variance in the improvement of daily steps (R^2 = 0.23, Adj R^2 = 0.20). In addition, goal (β = 0.40, p<0.01) and goal commitment (β = 0.23, p<0.01) significantly predicted change in steps. In this study, the interaction term between goal and goal commitment was not a significant contributor to performance. This indicates that there was no moderating effect of goal commitment on the relationship between goal and performance. Coefficients for IVs are presented in Table 3.4.

Table 4: Coefficients for Independent Variables (IVs)

IVs	b	beta	t
Goal	0.24	0.40	3.58*
Goal commitment	793.11	0.23	2.04*
Interaction	-0.10	-0.12	-1.03

Note: *p<.05

Discussion

The purposes of the current study were to examine the effects of goal and goal commitment on PA. In addition, this study examined whether goal commitment was a moderator of the relationship between goal and performance. To achieve these purposes, it was expected that (a) goals and goal commitment influence performance, and (b) goal commitment would moderate the relationship between goals and performance. Study results partially supported these hypotheses.
As hypothesized, our findings show that PA level as measured by step counts were increased with goals and goal commitment. The results suggest that goals and goal commitment had direct independent effects on increasing daily step counts. This is consistent with existing research on goal setting effects. These findings can be interpreted in two ways. First, setting a goal is important factor for increasing performance. The literature also suggests that goals influence performance through directive, energizing, persistence, and development functions (Locke & Latham, 2002) [17]. Second, goal commitment can be considered as equally important a predictor as are goals for increasing performance. This finding is consistent with previous studies that showed that goal commitment plays a critical role in goal-setting effects (Hollenbeck & Klein, 1987). These two main findings in current study support previous studies in that goals and goal commitment can be important mediators in contributing to increased performance (Dodd & Anderson, 1996 [6]; Theodorakis, 1996) [26].
In contrast to some goal-setting literature (Erez & Zidon, 1984 [8]; Hollenbeck & Klein, 1987 [10]; Seijts & Latham, 2011) [24], this study did not find the role of goal commitment to be a moderator of performance. A number of explanations could account for the lack of interactive effects of goal commitment. First, the role of goal commitment as a moderator might be less important. For example, a review by Donovan and Radosevich (1998) [7] found that only 3% of the variance in performance was explained by the moderating effect of goal commitment on goal and performance. Then there might be another factor influence the goal and performance relationship. Second, findings in the current study may align with previous literature that states that goal commitment should be treated as a mediator instead of a moderator of performance. For instance, Theodorakis (1996) [26] and Dodd and Anderson (1996) [6] found that goal commitment had direct effects on tennis performance. Third, the contradictory finding in this study may have resulted from its small sample size and

convenience sample. Larger sample sizes would increase the significance level sufficiently to fully evaluate the moderating effect of goal commitment.

Strengths and Limitations of the study

The major strength of the current study, to our knowledge this study is the first attempt to identify the specific mechanisms of the theoretical framework of goal-setting in a pedometer-based PA intervention by measuring goal commitment. Much of previous pedometer-based intervention often used goal setting, but there was a lack of examining any moderating variables to goal-setting effects. Significance of the current study is that not only providing specific step count goals, but also examining the relationship between goal commitment and performance.

There are several limitations of the current study. First, this was a convenience sample of middle-aged adults in a university community at Northwestern state. Many of participants might have much interest and wanted to be more physically active. Results indicated that the levels of PA as measured by step counts in the current study were higher than middle-aged adults in previous literature (Bassett, Cureton, & Ainsworth, 2000). Authors believe why high levels of PA in the current study participants that they might have much interest increasing their PA level due to goal commitment results, (average 4.2 points out of 5 points) and anecdotal report that they wanted to be more physically active during the meetings with a researcher. Those may have led to potential selection bias. Second, the current study used pedometers for measuring level of PA instead of any other instruments, such as accelerometers and observation. However there are no methods universally to be accepted for measuring physical activity levels (McNamara, Hudson, & Taylor, 2010) [20]. Last, the current study has such a short-term intervention (one week-long) so the findings may not guarantee if it would bring the long-term effects.

Conclusion

Goals lead individuals to increase improve their performance. However, goals alone may not suffice to bring desired outcomes. In support of this, the current study was to examine the relationship between any additional moderating variable, goal commitment and goals on performance. Our results revealed that goal commitment is as important as goals. Thus, simply setting a goal may not result in better performance but individuals need to commit to the goals. This finding could be contribute to the development of future PA promotions using goal setting. Current study findings also recommend examining any additional factors, such as self-efficacy to the goal and performance relationship.

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