

The Relationship of Exercisers' Reasons for Using Physical Activity Trackers, Goal  
Orientations, Effort, and Enjoyment

By

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## Abstract

Many university employees spend significant time sitting at their desks during the workday, placing them at a high risk for chronic diseases that contribute to health care expenditures (Fountaine, Piacentini, & Liguori, 2014). Companies have developed wearable physical activity tracking technology (PATT) to help individuals heighten their awareness of, monitor, and increase their daily activity levels. Employing Achievement Goal Perspective Theory (AGPT), the purpose of this study was to examine whether university employees' goal orientations predicted their reasons for using PATT as well as exercise effort and enjoyment. University employees (203 females, 57 males;  $M_{\text{age}} = 42.35$  years) across the U.S. completed an anonymous online and paper survey that included the Goal Orientations in Exercise Measure (Petherick & Markland, 2008), Reasons for Using a Physical Activity Tracker Survey (Easton & Fry, 2017), and Enjoyment and Effort Subscales of the Intrinsic Motivation Inventory (McAuley et al., 1989). Four stepwise linear regression analyses were calculated to assess the extent that goal orientations (task and ego) predicted task-related reasons for using PATT; ego-related reasons for using PATT; exercise effort; and enjoyment. Task orientation significantly and positively predicted task-related reasons for using PATT, while ego orientation significantly and positively predicted ego-related reasons for using PATT. Further, both task and ego orientation scores significantly and positively predicted effort, and enjoyment scores. Results indicate PATT manufacturers may benefit from creating software that promotes exercisers' task-involvement, as task orientation is linked to more positive physical activity outcomes.

Keywords: goal orientation, physical activity tracker, achievement goal perspective theory, effort, enjoyment

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1 The Relationship of Exercisers' Reasons for Using Physical Activity Trackers, Goal  
2 Orientations, Effort, and Enjoyment

### 3 **Health and Exercise Trends**

4 The American College of Sports Medicine (ACSM) recommends adults engage in  
5 at least 150 minutes of moderate-intensity exercise per week and incorporate resistance  
6 training for each major muscle group two or three days each week. According to the  
7 Department of Health and Human Services (DHHS), only 20.9% of adults meet the  
8 physical activity guidelines for aerobic physical activity and muscle-strengthening  
9 activity. Further, the trend is for individuals to become less active across the lifespan  
10 (Clarke, Ward, Freeman, & Schiller, 2015). For example, between 2011 and 2014,  
11 physical inactivity in the United States increased by 25.4% among adults 50-64 years of  
12 age and 26.9% among adults 65-74 years of age (Watson et al., 2014).

13 The trend of physical inactivity levels are concerning because they are linked to  
14 prevalent chronic diseases and conditions associated with inactivity, such as heart  
15 disease, stroke, cancer, type 2 diabetes, obesity, and arthritis. These preventable health  
16 concerns are expensive (Jaspens, 2012), costing the United States (U.S.) economy \$576  
17 billion a year. In fact, lost productivity (i.e., employee absenteeism due to illness, poor  
18 job performance) accounts for \$227 billion of the total cost of poor health concerns, with  
19 \$232 billion contributing to medical treatment and pharmacy-related costs (Integrated  
20 Benefits Institute, 2012). According to the CDC (Van Duyn et al., 2007), the U.S. could  
21 save approximately \$5.6 billion in heart disease costs if 10 percent of adults participated  
22 in a walking program. This suggests that small improvements in physical activity levels

23 among adults could have significant effects on health care costs and lead to better overall  
24 health outcomes.

25 Inactivity among adults and the consequential rise of health care is concerning  
26 because costs deplete the U.S. of important human and financial resources, and exploring  
27 strategies to foster higher physical activity among adults is important. Such investigations  
28 may be particularly key with regard to adults employed in sedentary occupations (e.g.,  
29 office positions). Fountaine, Piacentini, & Liguori (2014) identified university employees  
30 (i.e., faculty, staff, and administration) as a large group that spends significant time sitting  
31 at their desks, placing them at a high risk for chronic health concerns. These researchers  
32 reported that university employees indicate they are seated for 75 percent of their  
33 workday and engage in low levels of leisure time physical activity. As such, exploring  
34 strategies that could help foster university employees' greater physical activity  
35 engagement, both within and outside the workday, is an important area of inquiry.

### 36 **Physical Activity Tracker Technology**

37 A number of companies have developed wearable physical activity tracking  
38 technology (PATT) to help individuals heighten their awareness of, monitor, and increase  
39 their daily activity levels. These devices also deliver individual feedback and progress on  
40 their physical activity levels (Polzien, Jakicic, Tate, & Otto, 2007). CCS Insight has  
41 predicted that in 2020, 411 million smart wearable devices, valued at \$34 billion, will be  
42 sold. Eighty-two percent of adults in U.S. population between the ages of 18-49 years  
43 reportedly own an app-enabled mobile phone and 15% of the population uses a physical  
44 activity tracker that is synced to their smartphone (Smith, 2015; The Nielsen Company,  
45 2014; Wilson, 2016). Clearly, the activity tracker technology is extremely accessible,

46 affordable, and has quickly become part of the U.S. culture. This technology provides  
47 quick access to individuals' personal health information including steps taken, calories  
48 burned, and heart rate, with the option of purchasing more advanced technology that  
49 monitors weight and sleep.

50 Hypothetically, use of PATT should be effective in helping individuals increase  
51 and even optimize their physical activity. For example, if the device alerts individuals to  
52 their sedentary behavior for a set period (e.g., one hour), limited number of steps in a  
53 certain period, progress towards their overall step goal for the day, and attainment of  
54 personal step goals across days, it would follow that a greater percentage of individuals  
55 would positively adapt their behavior. Though PATT has tremendous potential to help  
56 individuals adopt healthier lifestyles, research is limited and results are mixed in terms of  
57 beneficial outcomes for users.

58 With regard to specific studies, Jakicic, et al. (2016) conducted a two-year study  
59 that provided a comprehensive weight loss intervention to young adults. Individuals that  
60 were provided a web-based program to record their physical activity had greater percent  
61 weight loss than individuals who received PATT (i.e., 13 pounds compared to 7.7 pounds  
62 at 24 months), but no significant differences were observed for fat or lean mass, percent  
63 body fat, bone mineral content and density, or cardiorespiratory fitness between the two  
64 groups. Finkelstein et al. (2012) had adults (aged 21-65 years) wear PATT for 12 months  
65 and the researchers reported there was no improvement in health outcomes (e.g., heart  
66 rate, blood pressure) across the study. In addition, the participants had a decrease in their  
67 physical activity across the 12 months (e.g., steps decreased), and by the end of the study  
68 only 10 percent of participants were still wearing the PATT. Lastly, Pellegrini et al.

69 (2012) compared adults' weight loss across three intervention styles, including an in-  
70 person intervention, a PATT-based intervention, and a combination of in-person meetings  
71 and PATT. Although weight loss occurred across all three groups (e.g., waist and hip  
72 circumference reduced, percent body fat decreased), participants who received weight  
73 loss strategies (e.g., physical activity and nutrition) and utilized PATT experienced the  
74 greatest amount of weight loss across the six-month study. The findings from each of  
75 these studies suggest it is critical for researchers to gain a better understanding of how  
76 PATT can be used to promote adherence to physical activity and successful weight loss  
77 interventions.

78         There are many questions to be answered with regard to PATT. Currently, it is not  
79 known who (e.g., age, socioeconomic status, health status, current physical activity level,  
80 stage of behavior change) might benefit from wearing PATT, the specific benefits of  
81 utilizing PATT (positive health outcomes such as weight loss, increased physical activity  
82 levels), or whether additional support (e.g., in-person counseling; group interaction;  
83 online support) may be needed in combination with PATT to optimize the health benefits.

84         While it would appear that physical activity tracker technology could help  
85 individuals enhance their levels of physical activity, clearly more research is needed.  
86 Cowan et al. (2013) have called for manufacturers of physical activity tracker technology  
87 to collaborate with health and fitness professionals who are well grounded in health  
88 behavior and exercise psychology theory and research. Incorporating theory and research  
89 into the development of physical activity tracker technology would increase the  
90 likelihood that individuals might use physical activity tracker technology to achieve more  
91 effective health outcomes. It is interesting to consider that PATT manufacturers would

92 also benefit financially from designing technology rooted in a strong theoretical  
93 foundation, as individuals would likely invest in products, use them for longer periods,  
94 update their devices more often, and reap benefits from word of mouth referrals from  
95 customers with success stories.

### 96 **Achievement Goal Perspective Theory**

97         One theory that has been utilized in the exercise psychology literature, and that  
98 could be helpful to employ in the development of effective physical activity tracker  
99 technology is achievement goal perspective theory. John Nicholls (1984; 1989) spent  
100 twenty years developing the theory, because he was concerned at the lack of motivation  
101 he observed in students once they reach adolescence. Nicholls wanted to address the  
102 question of how to optimize motivation among all individuals, and he suggested that the  
103 key was in their personal definitions of success, which he referred to as their goal  
104 orientations. Specifically, Nicholls outlined two goal orientations: task and ego.  
105 Individuals who adopt a high task orientation define success based on their personal  
106 effort, skill mastery, and improvement. Alternatively, individuals who adopt a high ego  
107 orientation define success based on their normative standing in comparison to others.  
108 They feel most successful when they outperform others, win, and/or are ranked high  
109 among their peers (Nicholls, 1989).

110         Goal orientations are orthogonal so that individuals can be any combination of  
111 task and ego orientation (i.e., high and/or low in one or both). However, Nicholls  
112 predicted that a high task orientation was key to optimizing motivation over time.  
113 Regardless of individuals' perceptions of ability, Nicholls argued that individuals high in  
114 task orientation should give high effort, seek challenges, and persist in the face of

115 obstacles. With regard to ego orientation, the predictions are more complex and  
116 dependent on individuals' perceived ability. High ego orientation for individuals with  
117 high perceived ability should lead to similar adaptive responses (high effort, seek  
118 challenge, persist). However, a high ego orientation combined with low perceptions of  
119 ability would lead individuals to exert low effort, avoid challenge, and demonstrate low  
120 persistence (Nicholls, 1989).

121         It should be noted that individuals who report a high ego orientation,  
122 accompanied by a high task orientation, may be protected, as the high task orientation  
123 appears to be the critical key for sustaining motivation long-term. Individuals with a high  
124 ego and low task orientation are more vulnerable to less adaptive motivational responses,  
125 due to the focus on uncontrollable factors (e.g., performance of others).

126         Research has supported Nicholls' tenets in the physical activity domain (Duda,  
127 2001; Lochbaum et al., 2016), highlighting how task orientation is associated with  
128 adaptive achievement strategies, positive emotions, desirable behaviors, a mastery/task  
129 climate, intrinsic motivation, perceived competence, and trait self-esteem, while ego  
130 orientation is associated with less adaptive thoughts, emotions, and behaviors. In  
131 particular, task orientation has been consistently associated with individuals' effort and  
132 enjoyment in the physical domain (Lochbaum et al., 2016; Lochbaum & Gottardy, 2015).

133         Nicholls' AGPT is relevant when considered with respect to the reasons that  
134 individuals use physical activity trackers. Individuals high in task orientation would more  
135 likely use PATT to help them monitor their personal effort and improvement, whereas  
136 individuals with high ego orientation would be more inclined to employ PATT to gauge  
137 their performance in comparison to other users. Though research has not currently

138 addressed this specific question, Brown (2016) recently examined adults' pedometer  
139 steps across a walking intervention where they were encouraged to be either more task or  
140 ego-oriented. These university employees took significantly more steps when they  
141 received messages encouraging their focus to be on their personal effort and  
142 improvement versus outperforming others in their group. Although Brown (2016)  
143 assessed participants' perceptions of the motivational climate, the researcher suggested  
144 future research could benefit from assessing goal orientations to contribute to the  
145 complex understanding of motivation.

146         It follows that the reasons exercisers identify for using a PATT might be directly  
147 impacted by their goal orientations. For example, if individuals define success in exercise  
148 based on their personal effort and improvement, they would be more likely to indicate  
149 they use PATT for task-oriented reasons, such as monitoring their effort and  
150 improvement, and fostering social connections where they can support others in their  
151 pursuit of positive health behaviors. In contrast, it seems logical that individuals who  
152 define success based on their comparison to others (i.e., have a high ego orientation)  
153 would be more likely to wear PATT to receive information about their performance  
154 comparison to others.

155         Additionally, previous research has identified a positive and significant  
156 relationship between goal orientations and motivational responses. Findings from Duda et  
157 al. (1995) indicate task orientation was positively and significantly associated with effort  
158 and enjoyment among college students in physical activity classes. Ego orientation was  
159 not positively or significantly related to any dimensions of intrinsic motivation.

160 Thus, the first purpose of this study was to develop a measure to assess the task-  
161 and ego-related reasons university employees use PATT. The second purpose of the  
162 study was to examine how goal orientations predict PATT (i.e., task and ego) reasons,  
163 effort, and enjoyment. Task orientation was hypothesized to be positively linked to task-  
164 related reasons for using PATT, exercise effort and enjoyment. This study also explored  
165 whether ego orientation would predict ego-related reasons for using PATT, and whether  
166 ego orientation predicts exercise effort and enjoyment. It was hypothesized that ego  
167 orientation would be positively linked to ego-related reasons for using PATT and  
168 negatively correlated with task-related reasons for using PATT.

## 169 Method

### 170 Participants

171 Faculty and staff members (N=261; M = 42.14 years, SD = 11.83; 57 males: M =  
172 41.59 years, SD = 13.50; 203 females: M = 42.35 years, SD = 11.35; 1 “other”) aged  
173 from 23-74 years were invited to complete a hard copy/online version of a survey  
174 regarding the relationship between their goal orientations, reasons for wearing a physical  
175 activity tracker, exercise effort, and enjoyment. Participants were employees from a  
176 variety of schools (63 total; 45 universities, 11 colleges, and 7 community colleges). A  
177 majority of the sample population identified themselves as Caucasian/White (75%), while  
178 the remaining participants identified themselves as Asian (3.9%), Black/African  
179 American (3.9%), Hispanic (2.6%), Native American (1.0%), and Other (2.5%). The  
180 sample population included faculty, staff, and administrative employees.

181 On average, participants reported engaging in strenuous exercise (e.g., running,  
182 jogging) for more than fifteen minutes 2.64 times per week. They reported engaging in  
183 moderate exercise (e.g., fast walking, easy swimming) for more than fifteen minutes 3.81

184 times per week and mild exercise (e.g., yoga, easy walking) for more than fifteen minutes  
185 4.37 times per week. Participants indicated they averaged 12,108 steps per day and are  
186 sedentary for an average of 6.42 hours of the day. When participants compared  
187 themselves to other adults of the same age and sex, 12.7% of participants rated their  
188 physical fitness as “excellent,” 39.0% rated their physical fitness as “above average,”  
189 26.9% rated their physical fitness as “average,” 4.5% rated their physical fitness as  
190 “below average,” and .6% of participants rated their physical fitness as “poor.”

191 To qualify for participation in the study, participants had to use their PATT to  
192 monitor physical activity during waking hours and during bouts of physical activity. The  
193 device brands most frequently reported by the sample include FitBit (47.51%), Garmin  
194 (21.84%) and Apple (18.01%). While nearly half of participants (47.7%) reported owning  
195 their devices for more than one year, 18.2% of participants reported owning their device  
196 between 7-12 months, 11.4% of participants reported owning their devices between 4-6  
197 months, 7.1% of participants reported owning their device between 1-3 months, and 1.3%  
198 of participants reported owning their current device for less than 1 month. The majority  
199 of participants (59.1%) reported personally purchasing their PATT, while others received  
200 their PATT as a gift (22.4%), received their PATT from their employer (1.9%), won it in  
201 a raffle (.6%), or acquired it from an additional source (3.2%).

202 Participants reported using their PATT for a variety of activities, including  
203 walking (84.67%), running (60.15%), strength training (51.72%), biking (38.70%), and  
204 high intensity interval training (34.87%). Participants most commonly monitored their  
205 steps (84.29%), distance traveled (63.60%), active minutes (56.70%), heart rate  
206 (51.72%), and duration of exercise (50.57%). Participants reported how frequently they

207 look at their devices for information about their physical activity. Some participants  
208 indicated they look at their PATT at least once an hour (29.2%), while others look at their  
209 PATT at least once a day (47.7%), at least once a week (3.9%), at least once a month  
210 (.6%), or some other frequency (5.2%).

## 211 **Procedure**

212       Permission to administer both a digital and hard copy version of the survey was  
213 obtained by the Human Subjects Committee of the Institutional Review Board. The  
214 researchers recruited participants via an informational flyer sent to every department on  
215 the main campus and universities across the United States. Requests were also made via  
216 email and/or paper flyers. The advertisements included a link to the Qualtrics version of  
217 the survey. Participants who chose to complete the survey followed the link to view the  
218 informational statement. Passive consent for completing the survey was obtained from  
219 participants.

## 220 **Measures**

221 **Goal Orientation.** The Goal Orientation in Exercise Measure (Petherick & Markland,  
222 2008) was included to assess the participants' goal orientations, or personal definitions of  
223 success, in a physical activity context. Participants rated five task-related and five ego-  
224 related items (10 items total) on a 5-point scale, ranging from 1 (*strongly disagree*) to 5  
225 (*strongly agree*). Petherick and Markland (2008) reported acceptable internal consistency  
226 for the task ( $\alpha=.78$ ) and ego scales ( $\alpha=.88$ ). Sample items include, "I feel most successful  
227 when I can prove to others that I'm the best" (ego) and, "I feel most successful when I  
228 exercise at a level that reflects personal improvement" (task).

229 **Reasons for Using a Physical Activity Tracker Survey.** This measure was developed  
230 for the purposes of this study to assess participants' reasons, conceptualized as task and  
231 ego-involving, for wearing PATT. A total of 48 items were generated based on task  
232 orientation (effort, improvement, and cooperative behaviors) and ego orientation  
233 (normative comparison and focus on outcome). A panel of sport and exercise psychology  
234 professionals and graduate students reviewed the survey items to ensure the items  
235 reflected tenets of task and ego goal orientations. Items that were viewed as ambiguous or  
236 unclear were removed or restructured based on suggestions from the panel. Following the  
237 suggestions of the panel, the researchers modified the items and created a final 28-item  
238 version of the scale. The scale included 16 task-related reasons for using PATT items and  
239 12 ego-related reasons for using PATT items. Participants responded to the items using a  
240 5-point Likert scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). Sample  
241 items include, "A reason I wear my physical activity tracker is because I like to receive  
242 information that leads me to give greater effort" (task) and "A reason I wear my physical  
243 activity tracker is because I like to receive information that notifies me that I  
244 outperformed others in my social network" (ego).

245 **Neutral Reasons for Using a Physical Activity Tracker.** Additional items were  
246 developed to assess supplementary reasons participants wear PATT. In addition to the  
247 recommendations from a panel of sport and exercise psychology professionals and  
248 graduate students, undergraduate PATT users were interviewed to identify supplementary  
249 reasons for using PATT that did not directly reflect goal task ego orientations.  
250 Participants responded to 20 items using a 5-point Likert scale ranging from 1 (*strongly*  
251 *agree*) to 5 (*strongly disagree*). Sample items include, "A reason I wear my physical

252 activity tracker is because I like to share my results on social media” and “A reason I  
253 wear my physical activity tracker is because it is a fashionable piece of technology.”

254 **Exercise Effort.** Exercise effort was measured using the effort subscale of the Intrinsic  
255 Motivation Inventory (IMI; McAuley et al., 1989). Participants rated their exercise effort  
256 on the 4-items on a five-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly*  
257 *agree*). A sample item is “When using my physical activity tracker, I try hard while I  
258 exercise.” McAuley et al. (1989) determined the internal consistency of the subscale  
259 ( $\alpha=.84$ ) to be satisfactory.

260 **Exercise Enjoyment.** Exercise enjoyment was measured using the enjoyment subscale of  
261 the Intrinsic Motivation Inventory (IMI; McAuley et al., 1989). Participants rated their  
262 exercise enjoyment on the 5-items on a five-point scale, ranging from 1 (*strongly*  
263 *disagree*) to 5 (*strongly agree*). A sample item is “As a member of this fitness center I  
264 enjoy exercise very much.” McAuley et al. (1989) determined the internal consistency of  
265 the subscale ( $\alpha=.78$ ) to be satisfactory.

#### 266 **Data Analysis**

267 Mplus 7 and SPSS Version 22 were used for the statistical analyses. Two  
268 Exploratory Factor Analyses (EFA) were conducted to determine the factor validity of  
269 the items on the Reasons for Using PATT Scale for the total sample and for the females.  
270 Descriptive statistics (e.g., means, standard deviations, minimum, maximum and  
271 Cronbach’s alpha reliability coefficients) were calculated for each scale for the total  
272 sample and females. Pearson correlations were computed to examine the relationship  
273 between each goal orientation scale to task-related reasons for using PATT, ego-related  
274 reasons for using PATT, effort in exercise, and enjoyment (See Table 2b). Pearson  
275 correlations were also calculated to illustrate the relationship between goal orientations

276 (task, ego) and neutral reasons for using PATT (See Table 3b). Four separate stepwise  
277 regressions were conducted to examine the extent that goal orientations (task, ego)  
278 predicted a) task-related reasons for using PATT; b) ego-related reasons for using PATT;  
279 c) exercise effort; and d) enjoyment.

## 280 **Results**

281 Two separate EFAs were conducted with the total sample and the sample of  
282 female participants to examine the task and ego-related reasons for using PATT. There  
283 were not enough male participants in the study to conduct a separate EFA for males. The  
284 results of the total sample EFA revealed each of the 28 items had significant factor  
285 loadings. As recommended by Costello and Osborne (2005), items with loadings below  
286 .4 and/or items that loaded on both factors were considered weak items. Five items met  
287 the cutoff criteria, and were arranged by the size of the difference between their loadings  
288 on factor one and factor two of the model. Beginning with the item with the largest factor  
289 loading difference, these items were removed one at a time. The model was run until each  
290 of the five items was removed, at which time the model demonstrated acceptable fit.

291 The final model contained a total of 23 items, with 12 task-related reason items  
292 and 11 ego-related reason items for using PATT. The two-factor model fit indices  
293 indicated acceptable model fit with a comparative fit index (CFI; Hu & Bentler, 1998) of  
294 .90, Tucker-Lewis Index (TLI; Tucker & Lewis, 1973) of .88, root mean square error of  
295 approximation (RMSEA; Steiger & Lind, 1980) of .08, and standardized root mean  
296 square residual (SRMR; Hu & Bentler, 1998) of .05. The task-related reason items that  
297 were removed include the following: A reason I wear my physical activity tracker is  
298 because I like to . . . a) receive information that gives me feedback regarding my effort;

299 b) receive information that I can share with friends/family members so we can support  
300 each other in our health and fitness pursuits; c) receive information that I can share with  
301 friends/family members so we can hold each other accountable for our goals; and d)  
302 receive information that I can share with others so we can encourage one another to  
303 achieve our personal bests. The single ego-related item removed was, “I like to receive  
304 information that updates me that I have received more digital badges/awards/trophies  
305 than others.”

306         Using the initial 28-item model, a second EFA was conducted with female  
307 participants. The same process was followed for the total sample model to determine if  
308 all items should remain in the model. Items with loadings below .4 and/or items that  
309 loaded on both factors were considered weak items and were removed. The same five  
310 items that were removed in the total sample model did not meet the cutoff criteria and  
311 were considered weak in the female sample. An additional task-related reason item, “I  
312 like to receive information that helps me maintain my physical activity level” had a  
313 loading below .4. Thus, a total of six items did not meet the cutoff criteria. These items  
314 were arranged by the size of the difference between their loadings on factor one and  
315 factor two of the model. Beginning with the item with the largest factor loading  
316 difference, these items were removed one at a time. The model was run until each of the  
317 six items was removed and demonstrated acceptable fit. The two-factor model fit indices  
318 indicated acceptable model fit with a CFI of .93, Tucker-Lewis Index TFI of .91,  
319 RMSEA of .07, and SRMR of .04.

320         Cronbach’s alpha coefficients were calculated for each scale and for the total  
321 sample and females. The results revealed reliable values ranging from .73 to .94. Next,

322 descriptive statistics were calculated for the total sample, and separately for females and  
323 males (See Table 2a). Overall, participants reported higher task orientation and relatively  
324 low ego orientation, as well as moderate effort in and enjoyment of physical activity. In a  
325 similar vein, participants reported more task-related reasons than ego-related reasons for  
326 using PATT.

327 Descriptive statistics were also calculated for the neutral reasons for using PATT  
328 measure for the total sample, and separately for female and male participants (See Table  
329 3a). On average, participants rated items involving awareness of physical activity and  
330 reminders to be physically active higher than items involving sharing information with  
331 their doctor or on social media.

332 It was important to next consider potential gender differences across goal  
333 orientations (task, ego), task and ego-related reasons for using PATT, exercise effort, and  
334 enjoyment. Independent sample t-tests were calculated for each variable. Male  
335 participants reported significantly higher ego orientation than female participants,  $t(251)=$   
336  $2.21, p = .028$ , whereas female participants reported significantly higher task-related  
337 reasons for using PATT than males,  $t(247)= -2.25, p=.026$ . Results indicated there were  
338 no significant gender differences in task orientation  $t(249) = .079, p= .290$ , participants'  
339 ego-related reasons for using a physical activity tracker,  $t(245) = -1.07, p=.286$ , their  
340 exerted effort in exercise,  $t(255)=1.84, p=.07$ , and their enjoyment,  $t(254)=1.34, p =.180$ .

341 Next, bivariate pearson correlation coefficients were calculated for the entire  
342 sample to examine the relationship between goal orientation variables to the four  
343 outcome variables. Task orientation, as expected, was positively and significantly  
344 associated with ego orientation, task-related reasons for using PATT, exercise effort, and

345 exercise enjoyment. Ego goal orientation was positively and significantly associated with  
346 ego-related reasons for using PATT, exercise effort, and exercise enjoyment (See Table  
347 2b).

348 Pearson correlations were also calculated between goal orientations (task, ego)  
349 and neutral reasons for using PATT (See Table 3b). Overall, task orientation was  
350 positively correlated with PATT neutral items related to tracking and storing physical  
351 activity information. Alternatively, ego orientation was positively and significantly  
352 correlated with PATT neutral items associated with competitions and sharing results on  
353 social media. The separate female and male correlations indicated task orientation was  
354 positively and significantly correlated with PATT items addressing tracking multiple  
355 modes of PA patterns and using the device to quantify the intensity of physical activity,  
356 while ego orientation was positively and significantly correlated with brand support.

357 Finally, four stepwise linear regression analyses were calculated to assess the  
358 extent that goal orientations (task and ego) predict a) task-related reasons for using  
359 PATT; b) ego-related reasons for using PATT; c) exercise effort; and d) enjoyment. In  
360 each linear regression, the predictor variables (task orientation, ego orientation) were  
361 modeled and added (i.e., based on hypotheses) or removed one at a time in a stepwise  
362 manner in order to obtain the most robust model. These predictor variables were removed  
363 from each model based on their partial *F*-tests statistics.

364 The first linear regression examined the relationship between goal orientations  
365 and task-related reasons for using PATT. The positive and significant relationship  
366 between task orientation and task-related reasons for using PATT (based on the bivariate  
367 correlation) and theoretical support suggest task orientation should be modeled as the first

368 predictor variable and ego orientation added as the second predictor variable. As  
369 expected, the results revealed participants' task orientation was the only significant  
370 predictor (ego orientation did not contribute) of task-related reasons for using PATT [ $R^2 =$   
371  $.10$ ,  $F(1, 251) = 28.63$ ,  $p < .001$ , 95% CI (2.34, 3.28)] and accounted for 10% of the  
372 variance in task-related reasons for using PATT scores.

373         A second linear regression examined the role of goal orientations in predicting  
374 ego-related reasons for using PATT. Due to the positive and significant relationship  
375 between ego orientation and ego-related reasons for using PATT (based on the bivariate  
376 correlation) and theoretical support from AGPT, ego orientation was modeled as the first  
377 predictor variable and task orientation was added as the second predictor variable. As  
378 hypothesized, the results of the regression indicated ego orientation was the only  
379 significant predictor of ego-related reasons for using PATT [ $R^2 = .28$ ,  $F(1, 251) =$   
380  $96.08$ ,  $p < .001$ , 95% CI (.78, 1.19)] and accounted for 28% of the variance in ego-related  
381 reasons for using PATT.

382         A third linear regression examined the role of goal orientations in predicting  
383 effort. Theoretical support and linear correlation values led researchers to enter task  
384 orientation as the first predictor variable. The regression revealed both task orientation  
385  $t(243) = 7.01$ ,  $p < .001$  and ego orientation  $t(243) = 2.80$ ,  $p < .05$  scores significantly and  
386 positively predicted effort scores, accounting for 20.8% of the variance in effort [ $R^2 =$   
387  $.21$ ,  $F(1, 243) = 33.11$ ,  $p < .05$ , 95% CI (.50, 1.81)].  $R^2$  values indicated that task  
388 orientation made a greater contribution than ego orientation in predicting exercise effort  
389 scores Lastly, the fourth linear regression examined the role of goal orientation in  
390 predicting enjoyment. Theoretical support and linear correlation values led researchers to

391 enter task orientation as the first predictor variable. The regression revealed both task  
392 orientation  $t(242) = 5.94, p < .001$  and ego orientation  $t(242) = 2.61, p < .05$  scores  
393 significantly and positively predicted enjoyment scores and accounted for 16.2% of the  
394 variance in enjoyment ( $R^2 = .16, F(1, 243) = 24.61, p < .001, 95\% \text{ CI } (-.12, 1.50)$ ].  
395 Similar to effort, the  $R^2$  values indicated that task orientation made a greater contribution  
396 than ego orientation in predicting enjoyment scores (See Table 4).

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### Discussion

400 The purpose of the study was twofold: a) to develop a measure to assess the task-  
401 and ego-related reasons university employees use PATT and b) to examine how goal  
402 orientations predict PATT (i.e., task and ego) reasons, and two additional important  
403 motivational outcomes (effort and enjoyment). The EFA models for the total sample and  
404 the female sample provided support for the two-factor structure of the PATT measure.  
405 Results from regression analyses supported the hypotheses that task orientation predicts  
406 task-related reasons for using PATT and ego orientation would predict ego-related  
407 reasons for using PATT. Lastly, the results partially supported the hypothesis that task  
408 orientation predicts exercise effort and enjoyment.

409 To begin, the researchers developed a measure helpful for identifying the reasons  
410 individuals use PATT that reflected aspects of goal orientations. As the first of its kind,  
411 this measure was created based on the AGPT framework and the recommendations from  
412 experts in the field of health and exercise psychology. The final EFA model revealed a  
413 23-item measure including 12 task-related and 11 ego-related items, respectively, and  
414 provided strong initial support for the measure. For females, the final EFA model  
415 revealed a 22-item measure including 11 task-related and 11 ego-related items,

416 respectively, and also revealed adequate support for the model. Although the results of  
417 the EFA for the female sample indicated that the item “I wear my physical activity  
418 tracker because I like to receive information that helps me maintain my physical activity  
419 level” had a loading just below .4, it was determined this item should be kept for future  
420 work. Although the item does not appear to be a very strong item for females, the item  
421 was only tested once with a single sample of participants. Therefore, it is reasonable to  
422 test this item again with future samples.

423         This particular sample represents a unique population of university employees  
424 (i.e., faculty, staff, and administration). Though there was large variability in the sample  
425 (i.e., job responsibilities, age, and physical activity behaviors), there are multiple aspects  
426 of this population that make it ideal for collecting physical activity data and  
427 implementing strategies for physical activity engagement throughout the workday. For  
428 most university employees, their jobs entail only light activity (e.g., sitting at a desk,  
429 working on a computer). On average, participants reported they are sedentary for 6.42  
430 hours throughout their workday. This amount of time is similar to previous research  
431 involving university employees (Fountaine, Piacentini, & Liguori, 2014). Unfortunately,  
432 low activity jobs typically found at universities place participants at a high risk for  
433 chronic diseases, such as obesity, heart disease, and stroke, despite participation in  
434 regular leisure time physical activity (Owens et al., 2010).

435         University employees are an accessible population on a campus setting. They are  
436 organized in groups or departments and led by a department chair. Further, university  
437 employees are surrounded by technology and can instantly connect with other employees  
438 across campus (e.g., campus email, instant messaging, etc.). Thus, data from this

439 population can aid in the development of new practices to decrease the likelihood of  
440 chronic disease, and these may include the use of PATT.

441           It should be noted that research has illustrated that PATT devices alone cannot  
442 yield improvements in health outcomes. Results from Jakicic et al. (2016) indicated  
443 individuals that were provided a web-based program to record their physical activity  
444 experienced a greater percent weight loss than individuals who received PATT. Since no  
445 significant differences were found between the groups on fat or lean mass, percent body  
446 fat, bone mineral content and density, or cardiorespiratory fitness, researchers could not  
447 conclude that using PATT provided any additional benefit for improving health  
448 outcomes. In addition to not experiencing improved health outcomes, individuals may not  
449 maintain the use of PATT over time. According to Finkelstein et al. (2012), only 10% of  
450 participants were still wearing PATT following the completion of a 12-month study.  
451 These studies highlight the need for understanding the way individuals view and use  
452 PATT. In other words, PATT companies should be interested in how their products can  
453 be marketed as an accessory to behavior change, instead of the principal component of  
454 that change.

455           In the current study, the researchers initially aimed to acquire responses from an  
456 adequate number of males and females in order to examine gender differences in the  
457 reasons for using PATT. However, only 57 males participated in the study.  
458 Unfortunately, the number of male participants was not sufficient to examine gender  
459 differences across PATT reasons. Since consumer trends indicate adults between the ages  
460 of 35-54 years old represent 36 percent of fitness tracker owners in the United States and

461 54 percent of these PATT owners are women (Riley, 2015), it was assumed that an equal  
462 number of females and males could provide responses to the survey.

463 The second purpose of the study involved examining the relationships between  
464 goal orientations, reasons for using PATT, exercise effort, and enjoyment. Overall, the  
465 results are conceptually aligned with the tenets of Nicholls' (1989) AGPT framework.  
466 The regression analyses supported the hypothesized relationships between goal  
467 orientations and goal-related reasons for using PATT. Task orientation positively and  
468 significantly predicted task-related reasons for using PATT. If individuals use PATT for  
469 reasons that reflect effort, personal improvement, and skill mastery, it is likely that they  
470 will experience more control over their progress, put forth high effort, and focus on skill  
471 mastery during exercise (Roberts, 2012). Similarly, ego orientation positively and  
472 significantly predicted ego-related reasons for using PATT. Individuals who endorse ego  
473 orientation and utilize their PATT for ego-related reasons may feel less control over their  
474 experience (due to the performances of other users) and become distracted by awards,  
475 rankings, etc. These findings are supported by Nicholls' (1989) proposal that goal  
476 perspectives reflect individuals' larger worldviews. Thus, it is logical that individuals'  
477 views of success would carry over from exercise settings to the use of their PATT. It is  
478 essential for PATT companies to understand these relationships and the underlying  
479 motivational processes.

480 The regression analyses supported the hypothesized predictive relationships  
481 between goal orientations to exercise effort and enjoyment. Task orientation had a larger  
482 impact on exercise effort and enjoyment than ego orientation, suggesting task orientation  
483 makes a greater contribution to positive exercise outcomes.

484           A surprising finding within this study was the role of ego orientation in predicting  
485 exercise effort and enjoyment. PATT software may be reinforcing aspects of ego  
486 orientation (e.g., recognizing top-ranked performances among groups). This is  
487 problematic, as previous research has positively linked high ego orientation with  
488 tension/pressure and negatively linked ego orientation with enjoyment (Duda, 1992;  
489 Duda et al., 1995; Newton & Fry, 1998; Treasure & Roberts, 1994).

490           Further, while it is unclear why ego orientation was positively associated with  
491 exercise effort and enjoyment in this study, it may have something to do with the PATT  
492 achievement setting. As described above, PATT software may be encouraging PATT  
493 users to be ego-involved (to focus on their outcomes compared to others). Furthermore,  
494 perhaps the PATT achievement setting is unique and contributes to ego-involvement. For  
495 example, when using PATT, an individual may exercise alone and may not be in the  
496 same physical location as other exercisers. Thus, they may not witness aspects of other  
497 exercisers' performances, such as their level of skill or effort. Also, PATT users may  
498 only be able to view certain outcomes associated with other exercisers' performances  
499 (e.g., daily number of steps, total minutes of activity). These exercisers may be missing  
500 out on critical information related to the exercise experience. For example, one individual  
501 may acquire 5,000 steps on their PATT by completing a steep hike in challenging  
502 weather, whereas another exercisers may acquire 12,000 steps while casually commuting  
503 from school or work. It's possible, for example, that the individual with 5000 steps might  
504 feel he/she had a less successful day when comparing step counts with other exercisers  
505 who had higher counts. These features of the PATT achievement setting make it distinct  
506 from achievement settings in sport. In sport, individuals are a part of a team and receive

507 objective and subjective feedback from a coach and teammates. The team typically  
508 performs the same activity in an organized setting. Athletes on traditional teams work  
509 toward a common goal, experience team dynamics, and become task- or ego-involved as  
510 they process information about the competitive environment. These differences suggest  
511 the popularity of PATT among exercisers and pervasiveness in exercise settings have  
512 introduced a new type of achievement setting that is worthy of exploration. Lastly, the  
513 type and frequency of objective performance feedback may differ depending on the  
514 PATT model and/or software.

515         The results of the present study have clear implications for the PATT industry. In  
516 2016, the PATT market reached revenues of nearly 1.5 billion dollars and it is expected  
517 to become a five billion dollar industry by 2019 (Krebs, 2015). When considering the rise  
518 in health care costs coupled with the benefits of physical activity for preventing chronic  
519 diseases, it is possible that designing and marketing these popular devices could be done  
520 in such a way as to increase exercise effort, enjoyment, and health outcomes among  
521 users.

522         Additionally, PATT software companies may reach consumers from the moment  
523 they activate their PATT. Typically, new consumers begin using their new PATT by  
524 registering their device with the company's software and application platform. Upon  
525 device registration, individuals may complete an online survey that includes a measure of  
526 their goal orientation (e.g., the Goal Orientation in Exercise Measure; GOEM), specify  
527 their physical activity goals, and indicate notification preferences. These users may then  
528 receive a brief summary and description of their GOEM score, and information about  
529 how they can maximize the use of their PATT to enhance their task orientation and

530 support their goals (e.g., attaining high effort, personal improvement, and consistent  
531 physical activity levels). Lastly, PATT software companies can emphasize  
532 the assistance provided by their technical support staff, who are trained in health and  
533 exercise psychology theory.

534         One strategy PATT companies may use to market PATT to adult consumers  
535 includes emphasizing that the devices are capable of monitoring users' skill mastery,  
536 personal improvement, and effort. PATT software designers can  
537 design progress messages/activity notifications to reflect these capabilities, such as  
538 praising high effort when individuals achieve a personal best. In addition to increasing  
539 the likelihood that participants will experience more positive motivational responses  
540 (e.g., high exercise effort and enjoyment), support for this suggestion, as found in this  
541 study, has been reported in the literature. According to Rabin and Bock (2011),  
542 smartphone users prefer features such as progress-tracking, goal-setting, and problem-  
543 solving in their applications. By applying this strategy, PATT companies may help to  
544 optimize users' exercise experiences and meet the needs of their consumers.

545         The current study serves as a foundation for examining the use of physical  
546 activity trackers with an AGPT framework. The university employees in this study  
547 provided a diverse sample, although it may be advantageous to collect data from a  
548 specific group within the university setting (e.g., tenured professors, staff) in future  
549 research. Further, participants in the sample reported various levels of physical fitness  
550 and engagement in a multitude of physical activities. Results from future studies may be  
551 more revealing if data is collected from a more homogenous sample of exercisers within  
552 university settings.

553 Future research may also expand on the present study's method for understanding  
554 the relationships between goal orientations and reasons for using PATT to exercise  
555 outcomes. Potential studies may include providing participants with PATT and  
556 investigating how these devices can contribute to long-term behavior change. Once these  
557 devices are distributed, the researchers could offer training to office managers and/or  
558 department leaders for fostering a caring and task-involving climate in the workplace. By  
559 fostering a caring- and task-involving climate in a work setting, employers show their  
560 employees that they value their health (Huddleston et al., 2012). Consequently, the  
561 employees may feel like their work performance is not the only indicator of success in  
562 their position. A caring- and task-involving climate can contribute to a positive  
563 relationship between an employer and his/her employees, and yield more positive  
564 outcomes (e.g., improved work performance, decreased absences, etc.).

565 Similar to Brown (2016), researchers could design tailored messages to support  
566 either a caring/task-involving climate or an ego-involving climate. Given the positive  
567 outcomes (e.g., increased number of steps) participants experienced when the messages  
568 reflected a task-involving climate, it would follow that participants would experience  
569 positive results when receiving these messages through their PATT. PATT could be used  
570 in the workplace in combination with health incentives, department challenges, and  
571 fostering employee engagement in physical activity programs. Objective data could  
572 reveal improvements in employee health through multiple metrics (e.g., blood pressure,  
573 steps, time spent participating in physical activity). Following the intervention,  
574 researchers could conduct qualitative interviews to compliment the narrative of the data.

575           Although the findings of the study have important implications for physical  
576 activity research involving technology, it is necessary to acknowledge limitations of the  
577 study. For instance, responses from participants were collected at one time point and may  
578 not accurately represent individuals' perceptions of their PATT over weeks, months, or  
579 years. It may be more beneficial to check for patterns of behavior change versus behavior  
580 consistency. Further, participants self-reported their physical activity patterns and  
581 experiences using PATT. Since data was collected from a variety of staff and faculty  
582 members at colleges and universities, the positions and job responsibilities of these  
583 positions may differ depending on the school's research classification. For instance,  
584 faculty members at liberal arts colleges may spend more time completing their academic  
585 responsibilities than hourly staff members. Data may be more precise if the study was  
586 conducted in a controlled setting and or people were assigned to groups based on their  
587 specific types of physical activity. Additionally, self-report errors with regard to physical  
588 activity could be eliminated if data were collected by PATT and sent directly to the  
589 researcher.

590           Next, there was variability in the participants' use of PATT that was not  
591 controlled for during the study. Although the inclusion criteria stated participants must  
592 use PATT throughout the day and during bouts of physical activity, participants used  
593 different brands/models of PATT, which contained software that provided different goal-  
594 directed feedback. In other words, the feedback participants received on their devices  
595 may have been designed to emphasize their personal improvement (task) or how their  
596 performance compared to others in their age category (ego). Also, each of these devices  
597 was capable of measuring different combinations of metrics (i.e., calories burned, heart

598 rate) and contained a variety of features (i.e., GPS). In future studies, the researchers  
599 could collect more reliable data by issuing or requiring participants to use the same  
600 brand/model of PATT.

601 Finally, the researchers examined effort and enjoyment associated with physical  
602 activity. However, there are additional outcomes linked to long-term, positive  
603 experiences in physical activity settings that could be considered in future research. For  
604 example, exercise commitment was previously examined in an exercise setting (Brown &  
605 Fry, 2014). These findings would expand researchers' understanding of the role of PATT  
606 in users' exercise experiences. Additionally, the results would provide PATT software  
607 companies with the information they need to capture the interest and investment of  
608 consumers.

609 To conclude, the present research provides an initial assessment of the predictive  
610 roles of goal orientation (task, ego) to goal orientation-related reasons for using PATT  
611 and to exercise effort and enjoyment. The results reveal the benefits of adopting a high  
612 task orientation and utilizing PATT for reasons that reflect high effort, task mastery, and  
613 personal improvement for positive physical activity outcomes. Future studies may  
614 continue to explore the role of PATT in achievement settings.

615

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743 **Table 1a: EFA Factor Loadings for Total Sample**

Item	Factor 1	Factor 2
<i>Task-Related Reasons for Using PATT Items</i>		
Stem: A reason I wear my physical activity tracker is because I like to receive information that. . .		
1. . . . encourages me to try hard.	.04	.64*
2. . . . shows I have tried hard.	.06	.58*
3. . . . leads me to give greater effort to reach a new milestone/personal best.	-.02	.69*
4. . . . helps me monitor my personal improvement over time.	-.09	.54*
5. . . . shows a chart of my daily improvement in steps or activity level (light, moderate, vigorous).	.00	.50*
6. . . . challenges me to be physically active.	.02	.68*
7. . . . helps me maintain my physical activity level.	-.07	.53*
8. . . . helps me to see my personal improvement.	-.18*	.63*
9. . . . notifies me of my patterns of physical inactivity.	-.18*	.48*
10. . . . helps me strive to be my physical best.	.06	.69*
11. . . . spurs me to strive to reach my personal best.	.03	.79*
12. . . . updates me on how I am progressing toward my physical activity goals.	-.10	.62*
<i>Ego-Related Reasons for Using PATT Items</i>		
Stem: A reason I wear my physical activity tracker is because I like to receive information that. . .		
1. . . . notifies me that I outperformed others.	.81*	-.05
2. . . . informs me that I engaged in more physical activity than others I know.	.78*	-.14*
3. . . . I am outperforming (more active than) others in my physical activity group.	.86*	.01

4. . . . alerts me about where I rank on a leaderboard (or compared with others).	.78*	.06
5. . . . updates me that I have received more digital badges/awards/trophies than others.	.61*	.02
6. . . . I am competing well against others in my physical activity group who use the same device.	.82*	.02
7. . . . encourages me to be more active than others.	.73*	.07
8. . . . updates me on how I am progressing toward my goal of outperforming others.	.91*	-.07
9. . . . indicates to me that my physical activity level is greater and/or higher than others.	.86*	-.02
10. . . . I can share with friends/family members so we can call people out for not reaching our goals.	.56*	-.01
11. . . . updates me that I am successfully competing against others (e.g., complete more steps, perform with higher intensity).	.82*	.07

744 \*Indicates significant loading

745 **Table 1b: EFA Factor Loadings for Females**

Item	Factor 1	Factor 2
<i>Task-Related Reasons for Using PATT Items</i>		
Stem: A reason I wear my physical activity tracker is because I like to receive information that. . .		
1. . . . encourages me to try hard.	.01	.63*
2. . . . shows I have tried hard.	.06	.56*
3. . . . leads me to give greater effort to reach a new milestone/personal best.	-.11	.73*
4. . . . helps me monitor my personal improvement over time.	-.10	.50*
5. . . . shows a chart of my daily improvement in steps or activity level (light, moderate, vigorous).	.03	.49*
6. . . . challenges me to be physically active.	.04	.61*
7. . . . helps me to see my personal improvement.	-.17*	.62*
8. . . . notifies me of my patterns of physical inactivity.	-.19*	.48*
9. . . . helps me strive to be my physical best.	.06	.68*

- |   |      |      |
|---|------|------|
| 10. . . . spurs me to strive to reach my personal best.                         | .02  | .77* |
| 11. . . . updates me on how I am progressing toward my physical activity goals. | -.10 | .60* |

***Ego-Related Reasons for Using PATT Items***

Stem: A reason I wear my physical activity tracker is because I like to receive information that. . .

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|--|------|-------|
| 1. . . . notifies me that I outperformed others.   | .81* | -.05  |
| 2. . . . informs me that I engaged in more physical activity than others I know.   | .78* | -.14* |
| 3. . . . I am outperforming (more active than) others in my physical activity group.   | .86* | .01   |
| 4. . . . alerts me about where I rank on a leaderboard (or compared with others).  | .78* | .06   |
| 5. . . . updates me that I have received more digital badges/awards/trophies than others.  | .61* | .02   |
| 6. . . . I am competing well against others in my physical activity group who use the same device.                               | .82* | .02   |
| 7. . . . encourages me to be more active than others.  | .73* | .07   |
| 8. . . . updates me on how I am progressing toward my goal of outperforming others.  | .91* | -.07  |
| 9. . . . indicates to me that my physical activity level is greater and/or higher than others.                                   | .86* | -.02  |
| 10. . . . I can share with friends/family members so we can call people out for not reaching our goals.                          | .56* | -.01  |
| 11. . . . updates me that I am successfully competing against others (e.g., complete more steps, perform with higher intensity). | .82* | .07   |

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753 **Table 2a: Scale Correlations and Descriptive Statistics**

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	Total Sample					
	1	2	3	4	5	6 755
1. Task Orientation	1.00					
2. Ego Orientation	.19**	1.00				
3. Task-Related Reasons	.32**	-.01	1.00			
4. Ego-Related Reasons	.11	.53**	.21**	1.00		
5. Effort	.44**	.25**	.25**	.17**	1.00	
6. Enjoyment	.38**	.21**	.15*	.19**	.69**	1.00
Mean	4.23	1.95	4.06	1.91	3.75	3.46
SD	.63	.87	.55	.81	.79	.95
Min-Max	1.80-5.00	1.00-5.00	1.25-5.00	1.00-4.64	1.50-5.00	1.00-5.00
Alpha	.84	.89	.88	.94	.84	.91

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757 **Table 2b: Scale Correlations and Descriptive Statistics**

Males

	Females						Males					
	1	2	3	4	5	6	1	2	3	4	5	6
1. Task Orientation	1.00						1.00					
2. Ego Orientation	.13	1.00					.29*	1.00				
3. Task-Related Reasons	.36**	.12	1.00				.29*	-.19	1.00			
4. Ego-Related Reasons	.11	.60**	.20**	1.00			.08	.38**	.23	1.00		
5. Effort	.43**	.22**	.32**	.17*	1.00		.51**	.25	.19	.23	1.00	
6. Enjoyment	.42**	.17*	.17*	.19**	.69**	1.00	.27*	.31*	.16	.20	.66**	1.00
Mean	4.25	1.83	4.11	1.93	3.70	3.42	4.26	2.12	3.88	1.83	3.92	3.61
SD	.58	.82	.50	.85	.82	.97	.66	.98	.68	.64	.68	.85
Min-Max	1.80-5.00	1.00-5.00	1.92-5.00	1.00-4.64	1.50-5.00	1.00-5.00	2.20-5.00	1.00-5.00	1.25-5.00	1.00-3.36	2.00-5.00	1.80-5.00
Alpha	.81	.89	.86	.94	.86	.91	.87	.88	.91	.90	.73	.86

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**Table 3a: Neutral Items Scale Descriptive Statistics**

	Total Sample			Females			Males		
	Mean	SD	Min-Max	Mean	SD	Min-Max	Mean	SD	Min-Max
Awareness of Adequate Daily Movement	4.40	.80	1.00-5.00	4.45	.77	1.00-5.00	4.19	.92	1.00-5.00
Raises Awareness of PA Levels Over Time	4.26	.75	1.00-5.00	4.29	.72	1.00-5.00	4.16	.85	1.00-5.00
Reminder to be Physically Active	4.15	.91	1.00-5.00	4.20	.85	1.00-5.00	4.00	1.07	1.00-5.00
PATT Charts PA	3.99	1.05	1.00-5.00	4.00	.99	1.00-5.00	3.89	1.25	1.00-5.00
Reduce Sedentary Time	3.97	1.01	1.00-5.00	4.05	.92	1.00-5.00	3.68	1.16	1.00-5.00
Learn and Improve PA Patterns	3.86	.99	1.00-5.00	3.96	.94	1.00-5.00	3.53	1.05	1.00-5.00
24/7 Tracking	3.82	1.11	1.00-5.00	3.88	1.04	1.00-5.00	3.64	1.24	1.00-5.00
Track Various Aspects of Health	3.82	1.15	1.00-5.00	3.88	1.11	1.00-5.00	3.58	1.28	1.00-5.00
PA Intensity is Quantified	3.66	1.15	1.00-5.00	3.61	1.16	1.00-5.00	3.82	1.11	1.00-5.00
Increase Breaks for PA	3.52	1.18	1.00-5.00	3.58	1.16	1.00-5.00	3.26	1.20	1.00-5.00
Track Multiple Modes of PA	3.03	1.38	1.00-5.00	3.03	1.36	1.00-5.00	3.02	1.46	1.00-5.00
Fashion Trend	2.21	1.25	1.00-5.00	2.11	1.18	1.00-5.00	2.44	1.35	1.00-5.00
Job Incentive	2.14	1.34	1.00-5.00	2.07	1.29	1.00-5.00	2.46	1.51	1.00-5.00
Friend's Invitation to Participate in Challenge	2.13	1.23	1.00-5.00	2.10	1.21	1.00-5.00	2.25	1.30	1.00-5.00
Fitness Trend	2.09	1.14	1.00-5.00	2.14	1.14	1.00-5.00	2.00	1.15	1.00-5.00
Brand Support	1.88	1.10	1.00-5.00	1.76	1.10	1.00-5.00	2.26	1.33	1.00-5.00
Share Feedback with Doctor	1.75	.97	1.00-5.00	1.77	.96	1.00-5.00	1.67	.99	1.00-5.00
Monitor Medical Condition	1.61	.98	1.00-5.00	1.58	.94	1.00-5.00	1.74	1.14	1.00-5.00
Doctor Recommendation	1.48	.82	1.00-5.00	1.48	.78	1.00-5.00	1.47	.93	1.00-5.00
Share Results on Social Media	1.46	.79	1.00-5.00	1.45	.79	1.00-5.00	1.46	.79	1.00-5.00

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766 **Table 3b: Goal Orientations and Neutral Reasons Correlations**

	<b>Total</b>		<b>Females</b>		<b>Males</b>	
	<b>Task Orientation</b>	<b>Ego Orientation</b>	<b>Task Orientation</b>	<b>Ego Orientation</b>	<b>Task Orientation</b>	<b>Ego Orientation</b>
Awareness of Adequate Daily Movement	.06	-.08	-.03	-.23	.09	.01
Raises Awareness of PA Levels Over Time	.12	-.07	.04	-.21	.16*	.00
Reminder to be Physically Active	.05	-.16*	.02	-.028*	.10	-.08
PATT Charts PA	.20**	.01	.49**	.33*	.08	-.15
Reduce Sedentary Time	.04	-.22**	.10	-.32*	.04	-.14
Learn and Improve PA Patterns	.12	-.06	.17	-.09	.14	.00
24/7 Tracking	.16**	.00	.27*	.17	.12	-.03
Track Various Aspects of Health	.12	-.08	.38**	.02	.02	-.08
PAT Intensity is Quantified	.22**	.07	.29*	.14	.19*	.03
Increase Breaks for PA	.03	-.14*	.09	-.31*	.02	-.06
Track Multiple Modes of PA	.32**	.07	.40**	.19	.30**	.03
Job Incentive	.01	.20**	.07	.18	.00	.18**
Friend's Invitation to Participate in Challenge	.01	0.19**	.09	.20	-.01	.18*
Fitness Trend	.04	.18**	.06	.20	.06	.20**
Fashion Trend	.04	.16**	.23	.25	-.02	.14*
Brand Support	.03	-.25**	.13	.40**	-.02	.15*
Share Feedback with Doctor	-.02	.03	.04	.18	-.01	.02
Monitor Medical Condition	-.01	.00	.02	.01	.00	.00
Doctor Recommendation	-.02	.05	.06	.08	-.04	.08
Share Results on Social Media	-.01	.17**	.14	.28*	-.07	.13

\*p&lt;.05; \*\*p&lt;.001

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774**Table 4**

Stepwise Multiple Regression For Variables Predicting Reasons for Using PATT,  
Exercise Effort, and Enjoyment

Variable	<i>B</i>	<i>SE B</i>	$\beta$
Task-Related Reasons for Using PATT			
Step 1			
Task Orientation	.30	.06	0.32**
R <sup>2</sup> = .10 for Step 1 ( $p < .001$ ).			
Ego-Related Reasons for Using PATT			
Step 1			
Ego Orientation	.48	.05	0.53**
R <sup>2</sup> = .28 for Step 1 ( $p < .001$ ).			
Effort			
Step 1			
Task Orientation	.55	.08	0.41**
Step 2			
Ego Orientation	.15	.05	0.16*
R <sup>2</sup> = .21 for Step 1: $\Delta R^2 = .03$ for Step 2 ( $p < .05$ ).			
Enjoyment			
Step 1			
Task Orientation	.57	.10	0.35**
Step 2			
Ego Orientation	.18	.07	0.16*
R <sup>2</sup> = .41 for Step 1: $\Delta R^2 = .02$ ( $p < .05$ ).			

\* $p < .05$ , \*\* $p < .001$

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## **Appendices**

### **Extended Literature Review**

The purpose of this literature review is to (a) identify and discuss the current state of physical activity levels in the United States, (b) investigate the use of physical activity trackers in measuring health behaviors, (c) outline Achievement Goal Perspective Theory (AGPT), and (d) provide an overview of AGPT research outcomes that are associated with the exercise experience. This literature review will outline findings from the AGPT literature in exercise settings and provide support for the use of the framework to investigate the reasons individuals choose to wear physical activity trackers, and ultimately to predict outcomes associated with the exercise experience.

#### **Physical Activity Patterns Among Adults in the United States**

The American College of Sports Medicine (ACSM) recommends adults engage in at least 150 minutes of moderate-intensity exercise per week and incorporate resistance training for each major muscle group two or three days each week. According to the Centers for Disease Control (CDC), only 20.9% of adults meet the Physical Activity Guidelines for aerobic physical activity and muscle-strengthening activity. The report also indicated physical inactivity significantly decreases over the adult lifespan (Clarke et al., 2015). More specifically, between 2011-2014, inactivity among adults increased by 25.4 percent among adults 50-64 years of age and 26.9 percent among adults 65-74 years of age (Watson et al., 2016).

Although advancements in science and medicine have led to an increased lifespan of Americans, the life expectancy may plateau or decline if obesity rates are not improved (Olshansky et al., 2005). Havas et al. (2009) implores the medical field to identify obesity as a critical health issue. Peeters et al. (2003) analyzed mortality rates of

Framingham Heart Study participants, who were categorized by age and body mass index group (normal weight, overweight, or obese at baseline) within sex and smoking status strata. The results indicate life expectancies were reduced for individuals in the overweight and obese categories by 7.1 years and 5.8 years for non-smoking females and non-smoking males, respectively, when compared with individuals with a normal weight. As per the results, excess body weight can decrease life expectancy and increase early mortality.

These statistics are problematic given the confirmed benefits of physical activity, such as delaying, preventing, and managing the risk of chronic health conditions for adults over 50 years of age. Some of the most prevalent chronic diseases and conditions associated with inactivity (e.g., heart disease, stroke, cancer, type 2 diabetes, obesity, and arthritis) are the most expensive of all health concerns (Watson et al., 2016). However, they are often preventable health concerns. In addition to the health benefits for adults, healthy adults over the age of 50 may experience health benefits from engaging in physical activity. For example, routine exercise may reduce medication dependence, preserve independent lifestyles, prevent functional limitations, and improve the quality of life (McDermott & Mernitz, 2006; Nelson et al., 2007; Paterson, Jones, & Rice, 2007). Beginning an exercise regimen and adhering to a program can be an arduous task (Gaston, Cramp, & Prapavessis, 2012). According to Weiss et al. (2006), 56% of male adults and 64% of female adults with obesity are attempting to lose weight. Although some individuals reach their goal, only about 20% of adults with obesity maintain their desired weight following the first year (McGuire et al., 1999).

Considering the pattern of physical inactivity across adulthood, it is necessary to develop strategies to optimally motivate this population to make positive lifestyle changes and consistently incorporate exercise into their daily activities. One way physical activity is promoted to adults is through their health care providers. Primary care physicians may recommend incorporating physical activity into their lifestyles. For example, physicians may recommend exercise as medicine to avoid chronic health conditions and promote good health. Nurse practitioners may also provide advice, referrals, and follow-up in general practice. This practical method has been shown to increase exercise behaviors among patients and consequently reduce the economic strain caused by chronic diseases, morbidity, and mortality (Elley et al., 2004). These diseases can lead to hospitalization, which may cost over \$1,500 more for patients with sedentary behaviors than non-sedentary patients (Anderson et al., 2005).

In addition to health care providers, employers are also invested in adults' health. Businesses benefit from employees who engage in exercise due to their reduced absenteeism and health care expenditures. On average, poor health concerns costs the United States economy \$576 billion a year. Lost productivity (i.e., employee absenteeism due to illness, poor job performance) accounts for \$227 billion of the total cost of poor health concerns, with \$232 billion contributing to medical treatment and pharmacy-related costs (Integrated Benefits Institute, 2012). According to the CDC (Van Duyn et al., 2007), the United States could save approximately \$5.6 billion in heart disease costs if 10 percent of adults participated in a walking program.

Given the rising cost of health care and the health risks associated with physical inactivity, it is necessary to determine cost effective-strategies to bridge the gap between the fitness and healthcare industries.

### **Physical Activity Trackers**

The introduction of physical activity trackers has emerged as a way to track health behavior metrics on a daily basis and may potentially prevent and/or manage chronic diseases. These devices contribute to the Quantified Self movement, which refers to monitoring daily activity to improve health behaviors (Almalki, Gray, & Sanchez, 2015). Mobile apps and consumer devices track physical activity and track health information, such as diet, weight, sleep, walking and exercise. Today's advanced devices can be used to monitor aspects of specific activities, while other devices continuously track activity patterns throughout the day (Rooksby et al., 2014). In addition to various types of feedback, these devices may present interactive behavior change tools through mobile devices, computer software, social media platforms, or the device itself. The platforms may be used to store data for behavior trends (Lyons, Lewis, Mayrsohn, & Rowland, 2014; Cadmus-Bertram et al., 2015). These devices may be used to track goal progress over time (e.g., walking/running a designated distance) and to compare performances to other's within the user community. Each type of use may mediate increases in walking and physical activity (Lyons et al., 2014; Michie et al., 2011). Popular brands of physical activity trackers, such as Fitbit® and JawboneUP®, assess physical activity patterns, sleep quality, and caloric intake based on accelerometer measurements (e.g., steps) and applied algorithms (Chiauzzi, Rodarte, & Dasmahapatra, 2015).

According to the American College of Sports Medicine (ACSM), wearable technology, including activity trackers, smart watches, heart rate monitors and GPS tracking devices, is the top fitness trend of 2017 (Thompson, 2016). In 2013, 69% of U.S. adults tracked weight, diet, symptoms, or health routines (Fox & Duggan, 2013). In addition to the growing accessibility and technological advances of physical activity trackers, the number of smartphone applications that measure aspects of health continues to grow. Out of 875,683 total active applications, there are 23,490 applications in iTunes and 17,756 applications in Google Play categorized as Health and Fitness, (Chapple, 2012; AppBrain, 2012). Since more than half of the population in the United States owns a smartphone, it would be valuable to include health and physical activity applications as a form of monitoring daily activities.

According to Middelweerd, Mollee, van der Wal, Brug, & te Velde (2014), smartphone applications are helpful for tracking physical activity because they are easily accessible to the user, settings can be adjusted to the user's preferences (Griffiths, Lindenmeyer, & Thorogood, 2006), feedback is tailored to the user, and the devices have a large reach and interactive features. Health applications are popular among smartphone users. Fox (2010) reported approximately one in ten smartphone users have downloaded a health-related application.

PricewaterhouseCoopers surveyed 1,000 consumers of the Census National Representation regarding positive and negative aspects of wearable technology and how participants' values, attitudes, and behaviors influence technological advances. They reported that one in five participants owned a wearable device and one in ten of these participants used their devices each day ( Chiauzzi et al., 2015). Given the percentage of

Americans who own smartphones (77%), individuals are more equipped to measure their daily activity and sync their smartphones with their physical activity tracker (Pew Research Center, 2016; Smith, 2015). Although physical activity trackers are becoming more prevalent, users tend to abandon their devices over time. According to Ledger and McCaffrey (2014), over half of individuals who own a physical activity tracker no longer use their devices and approximately one third of individuals who purchase activity trackers terminate use within six months. The authors suggest developers of physical activity trackers devise a method to gain long-term investment by users. Developers of physical activity trackers have the task of developing devices that support individual's efforts toward their goals and in turn influence users' health and happiness.

Ledger and McCaffrey (2014) also interviewed twenty two participants between the age of 20 and 40 years about their use of physical activity trackers and accompanying smartphone applications, website applications, and Exergames. Participants were asked follow-up questions about what they liked and disliked about the devices. Participants tracked a range of activities, such as steps, physical exercise, food and drink, weight and size, and sleep patterns. The researchers identified the reasons for tracking physical activity were related to aspects of their life, such as weight management, ever-developing interests in sports and training, and relationships with family and friends. The researchers reported participants in the study did not decide to make behavior changes following the purchase of a physical activity tracker or an application. Rather, the physical activity tracker and/or application was used to measure short-term data as a means of progressing towards a long-term interest. Although physical activity trackers in this study were helpful in monitoring physical activity, they did not motivate physical activity.

Although advances in technology provide individuals with opportunities to track their physical activity behaviors, the devices are not responsible for altering beliefs about physical activity or physical activity behaviors, nor are they directly linked to the adoption of new behaviors. Furthermore, physical activity trackers are not usually designed to alter users' beliefs about increasing exercise (Kostkova, Coventry, Sullivan, & Lachman, 2017). The most effective way to facilitate behavior change or adopt new behaviors is through theory-driven interventions (Webb, Joseph, Yardley, & Michie, 2010) and behavioral support (Kostkova et al., 2017). The U.S. Department of Health and Human Services (1996) describe theory-based physical activity programs as critical for changing health behavioral patterns related to obesity.

### **Achievement Goal Perspective Theory**

There are a variety of theoretical frameworks in exercise to examine motivation, individuals' cognitive, affective, and behavioral motivational responses in achievement settings. Roberts and colleagues (2007) suggest the complex understanding of motivation is explained by the psychological constructs that influence and strengthen achievement behavior. One relevant social cognitive theory that is popular among contemporary theorists is Achievement Goal Perspective Theory (AGPT) (Nicholls, 1989). According to AGPT, individuals are driven by their desire to demonstrate ability and avoid exhibiting incompetence in achievement settings. Thus, Nicholls (1984) proposes that individuals may have diverse conceptions of ability and accompanying achievement behaviors. The manner in which individuals assess their ability and develop their personal definition of success influences their cognitions, behaviors, and affective responses in achievement settings (Duda, 2001; Nicholls, 1984, 1989).

Originally developed and employed to examine achievement motivation in educational settings, the theory has been used to examine individuals' perceptions of success and ability across numerous achievement settings, including physical education, sport, and exercise (Roberts & Treasure, 2012; Moore & Fry, 2014; Brown & Fry, 2014). Components of AGPT can be used to identify constructs that contribute to optimizing motivation for wearing physical activity trackers and outcomes associated with the exercise experience.

### **Perceptions of Ability/Cognitive Development**

Nicholls (1984; Nicholls & Miller, 1984) indicates children have an undifferentiated conception of ability, whereby they perceive their success is directly related to the level of effort they put forth toward completing a task. They are unable to accurately identify the separate contributions of effort and ability in achievement settings (Nicholls, 1978; Nicholls & Miller, 1984). Even after poor normative outcomes against more skilled opponents, children with a less differentiated conception of ability believe high effort in a next attempt will lead to outperforming the opponent, or performing as well as their opponent (Fry & Duda, 1997).

Children begin to develop accurate perceptions of their ability around the age of 12. More specifically, children at this age acquire a level of cognitive maturity whereby they can distinguish task difficulty, luck, and effort from ability. According to Nicholls, children who believe learning and personal improvement occur through effort are more likely to persist when faced with obstacles. Children who view their ability as an unchanging characteristic assess ability based on the ability of others (e.g., normative reference). When presented with obstacles, these children are less likely to put forth high

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effort to achieve personal improvement. Children identify their level of ability based on the amount of effort (e.g., high, low, or equivalent) required to outperform others in an achievement setting (Roberts, 2012). Thus, outperforming others is a demonstration of their level of competence. Children who view ability as an undifferentiated concept associate effort with learning. Therefore, these individuals are more likely to put forth high effort in an attempt to achieve task mastery (Nicholls, 1978, 1989). Children use their experiences in achievement settings (e.g., perceptions and beliefs) to form personal theories of achievement (Nicholls, 1989; Roberts, Treasure, & Balague, 1997; Roberts, 2001; Roberts, 2012).

Children younger than 12 years have difficulty accurately ranking their own physical, cognitive and social competencies among their peers. Harter (1982) reported a positive relationship between participants' perceptions of their athletic ability and their perceived popularity among their peers. Participants in elementary school tended to associate positive interpersonal skills and athletic excellence; however, this correlation became weaker as children entered middle school, suggesting that as children move across the elementary school years they become better able to distinguish outcomes from task difficulty, luck, and effort.

### **Goal Orientations**

A second component of achievement goal perspective theory is goal orientation, an individual's personal definition of success. (Nicholls, 1989) specifies that individuals adopt goal orientations that are associated with their conception of ability and represent their personal definition of success. Individuals' goal orientations may also influence their cognitive, affective, and behavioral responses in achievement contexts (Zhang,

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Xiang, Gu, & Rose, 2016). Nicholls (Nicholls, Patashnick, & Nolen, 1985; Nicholls, 1989) proposed individuals' goals are dispositional and representative of their beliefs about the purpose of the activities in the achievement setting. A goal orientation is directed toward a particular life domain, such as sport or academics (Spray et al, 2006). Individuals' goal orientations can guide beliefs about participation, affect, and experiences, while contributing to individuals' engagement in physical activity (Pintrich & Schunk, 2002).

Nicholls (1989) identified two distinct goal orientations, task orientation and ego orientation. Individuals with high task orientation define success as skill mastery, personal improvement, and effort (Duda, 2001). Individuals who are high in task orientation feel most successful when they improve upon past performances and put forth high effort. Individuals high in ego orientation feel most successful when they outperform others, win, and are ranked as the best among their peers (Nicholls, 1989). Individuals with high ego orientation define success as demonstrating superiority over others, even if the individual demonstrates low effort. Success is self-referenced for an individual high in task orientation, while success is normatively referenced for an individual with high ego orientation.

Individuals' goal orientations are orthogonal, or independent of one another. An individual may express any possible combination of goal orientation (e.g., high task/low ego, low task/high ego, low task/high ego, or low task/low ego) (Swain & Harwood, 1996). The multiple combinations of goal orientations are referred to as goal profiles, and influence whether an individual will be task or ego-involved in a given achievement setting. Nicholls (1984) indicates individuals' cognitive schemas may change as they

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interpret feedback about their achievement behaviors. However, goal orientations typically remain constant over time across achievement settings (Duda & Whitehead, 1998; Roberts, Treasure, & Balague, 1997).

Goal orientations are measured by assessing the situations in which an individual feels successful. Researchers (e.g., Roberts, Treasure, & Balague, 1997 and Nicholls et al., 1985) developed questionnaires to measure individuals' levels of task and ego orientation, or the predisposition of an individual to be task or ego-involved in an achievement setting (Roberts, 2012). Within the questionnaires, individuals are asked to indicate their agreement with statements about success that reflect principles of task orientation or ego orientation.

According to Duda and Hall (2001), task orientation is associated with adaptive motivational behaviors in sport and physical education. Individuals high in task orientation are more likely to put forth high effort, and persist through obstacles and difficult tasks. High task orientation has been linked to intrinsic motivation, positive affect, and attempt at greater challenges among individuals in physical activity and sport settings (Cumming & Hall, 2004; Ntoumanis & Biddle, 1999; Tank & White, 1996; White & Zellner, 1996).

Individuals with high ego orientation use normative references in the form of comparisons to judge their self-improvement. If they do not demonstrate superior performance or are not given attention for their ability, they are more likely to report feelings of incompetence, may not persist in the face of obstacles, and put forth less effort towards a task (Duda et al., 1995). Individuals with high ego orientation in exercise may judge their physical and general self-esteem based upon their perceptions of their

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physical strength, aerobic fitness level, and appearance (Fox & Corbin, 1989). Additional examples in exercise settings may include comparing oneself to more talented and skilled exercisers (e.g. self-improvement to spark learning and motivation), or comparing oneself to less accomplished and skilled exercisers (e.g., self-enhancement to protect or increase self-esteem) (Kilpatrick, Bartholomew, & Riemer, 2003). The adoption of a high task orientation in exercise may be detrimental for inexperienced individuals, as their progress is measured by normative comparisons and outcomes, such as performance and appearance over which they have little control.

### **Motivational Climate**

In addition to individuals' goal orientations, Nicholls (1984; 1989) indicates the perceived characteristics of an achievement setting contribute to their motivation.

Perceived characteristics of the motivational climate can influence achievement behaviors in a setting. The motivational climate refers to the observation of task and ego elements in an achievement setting, motivational goal structure, and additional contextual cues. Each of these features influence individuals to be task or ego-involved at any given point in time during the activity (Roberts, 2012).

Two dimensions of motivational climate have emerged in the research, including the task-involving climate and ego-involving climate (Ames, 1992). The motivational climate is characterized by how members perceive the manner in which effort and ability are valued, recognized, and rewarded (Ames, 1992; Newton, Duda, & Yin, 2000). In a task-involving climate, effort, personal improvement, cooperation, and task mastery are valued. Success is self-referenced and mistakes are viewed as part of the learning process. Roberts (2012) suggests the creation of a task-involving exercise setting is

crucial for optimizing motivation and increasing the likelihood of adaptive behaviors.

Nicholls' (1989) affirms that perceptions of a task-involving climate will most likely lead to optimal cognitive, affective, and behavioral motivational responses.

Alternatively, in an ego-involving climate, an individual perceives superior ability and outcomes are attributed to success. Furthermore, intragroup rivalry is encouraged among group members. An ego-involving climate uses normative comparisons to define success and punishes mistakes. Individuals' perceptions of the motivational climate may influence individuals' motivational outcomes and perceptions of success and failure in the achievement setting (Treasure & Roberts, 2001).

The perception of the motivational climate is measured using questionnaires, which measure individuals' perceptions of the strength of task and ego features of an achievement setting. Within the questionnaires, individuals are asked to indicate their agreement with statements about how achievement behaviors are recognized and success is defined in an achievement setting (Roberts, 2012).

Nicholls (1984, 1989) suggested that perceptions of a task-involving climate are more likely to be associated with positive outcomes, whereas perceptions of an ego-involving climate are more likely to result in negative outcomes. Outcomes associated with the perception of a task-involving climate in exercise settings include increased enjoyment, interest, competence, commitment to exercise and feeling valued as a member of a fitness center (Brown and Fry, 2014). Outcomes associated with the perception of an ego-involving climate in exercise settings include increased feelings of anxiety, depression, fearfulness, and low reported levels of interest/enjoyment, perceived competence, and effort/importance.

In summary, individuals' goal orientations influence the likelihood of practicing particular goal-related behaviors across achievement settings. Situational factors (perceptions of the motivational climate) may moderate the impact of individuals' goal orientations (Dweck & Leggett, 1988). If individuals do not perceive prominent features of a task-involving climate or an ego-involving climate, goal orientations will take precedence in determining achievement behaviors. In contrast, if individuals perceive prominent features of a task or ego-involving climate, their goal orientation may be superseded and the perception of the motivational climate will influence their cognitions, feelings, and actions (Roberts et al., 1997).

### **Caring Climate**

An additional climate that compliments a task-involving climate and is paramount to positive development is the caring climate (Newton et al., 2007). A caring climate is characterized by perceptions of warmth, support, kindness, and respect. Furthermore, the structure emphasizes interactions and interpersonal relationships between leaders and members. Members feel they are valued as part of the group and they play a significant role in the group's success.

Noddings (2005), who is credited for generating interest in encouraging a caring classroom environment for students, proposed educational settings as an important venue to nurture youth. She suggested schools prioritize the development of healthy students with a strong sense of character. The caring framework and relationships developed in these academic settings would provide students with positive experiences outside the classroom.

A caring climate in education settings is beneficial for students to develop

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physical, emotional, and psychological well-being (Solomon, Battistich, Watson, Schaps, & Lewis, 2000). Noddings (2006) adds that youth who perceive a caring climate may receive benefits such as improved happiness and psychological well-being. Fry et al. (2012) affirms members and leaders in a caring climate contribute to an environment that is non-judgmental, values the interests of its members, and promote fairness.

### **Research Supporting Cognitive Development**

Watkins and Montgomery (1989) provided support for how youngsters develop a mature cognitive understanding of ability across the elementary school years. The researchers interviewed 232 children in third, sixth, ninth, and twelfth grade, inquiring about their beliefs about athletic excellence. Compared to sixth grade participants, third grade participants were less likely to correctly separate excellent athletes from other athletes. Participants younger than 12 years believed athletes were successful because they put forth high effort, whereas those in ninth and twelfth grade were more likely to link physical, cognitive, and attitudinal skills to excellent athletes (e.g., identified different levels of motivation and determination in high performing athletes compared to other athletes). The results suggest that children's understanding of ability becomes more advanced as they age.

### **Research Supporting Goal Orientations**

Individuals' perceptions of success and beliefs about the world around them contribute to the development of their personal theories of achievement in academic, sport, and exercise settings. Solomon and Boone (1993) examined the effect of students' goal orientations on their cognitions and behaviors in physical education classes. During the initial week of the physical education course, participants were asked to choose from

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an assortment of tasks, ranging in difficulty. Throughout the semester, the instructors would assess participants on the selected tasks and determine their final grade. Overall, Boone and Solomon found that college students enrolled in a tennis class had a better experience if they approached the class with a strong task orientation rather than a strong ego orientation.

Participants' goal orientations influenced their experiences in the physical education classes. More specifically, participants with a high task orientation chose more difficult tasks, while participants with high ego orientation chose less difficult tasks for their course contracts. Across the semester, participants with a high task orientation reported lower levels of anxiety related to the physical education class, greater interest/attention, and more positive attitudes than participants with high levels of ego orientation (Solomon & Boone, 1993).

Nicholls (1989) indicates goal orientations can be measured across achievement settings. Cumming and Hall (2004) explored whether combinations of task and ego orientation correspond to perceptions of self-efficacy. Participants in various physical activity courses (aerobics, weight training, running, swimming) completed questionnaires about their involvement. The results illustrated individuals with high task orientation are associated with higher levels of self-efficacy than those with low task orientation, regardless of their corresponding level of ego orientation. Consistent with previous findings (e.g., Hodge & Petlichkoff, 2000; Pensgaard & Roberts, 2002), the adoption of a high task orientation is associated with adaptive behaviors, regardless of individuals' levels of ego orientation.

Van de Pol, Kavussanu, and Ring (2012) conducted a study involving adult male and female soccer players in the United Kingdom. Participants were asked to complete surveys regarding their goal orientations, perceived motivational climate, effort, enjoyment, and tension in training and competition. AGPT and current literature suggest task orientation is characterized by high effort and persistence to overcome obstacles. Soccer players in the study indicated higher ego orientation in competition than during training settings. The researchers proposed the normative characteristics of competition (e.g., social comparison) may inflate participants' ego orientation. Furthermore, athletes who indicated they have high ego orientation in training settings may be more likely to draw from aspects of an ego-involving climate as they develop their personal definition of success during competition.

### **Research Supporting Motivational Climates**

Brown and Fry (2014) explored the association between members' perceptions of staff behaviors, motivational climate, their own behaviors, commitment to future exercise, and life satisfaction in a group-fitness setting. Overall, participants at this national fitness franchise observed a highly caring and task-involving and low ego-involving climate. Further, participants reported high levels of exercise commitment and moderately high life satisfaction and perceived task-involving features in staff behaviors. More specifically, participants who perceived a higher caring, task-involving climate and lower ego-involving climate were more likely to report high commitment to exercise and staff members' task-involving, caring behaviors. Furthermore, they were more likely to

perceive task-involving, caring behaviors displayed by the staff. These findings signify the instrumental role staff members play in creating the motivational climate and how their actions and words affect whether individuals commit to the exercise setting.

College students at a university fitness center setting reported similar findings. Brown, Fry and Little (2013) surveyed university students to investigate their reported perceptions of the motivational climate at their university fitness center. The results suggested a relationship between the exercisers' perceptions of the motivational climate and mood. Specifically, the perception of an ego-involving climate was associated with negative emotions (e.g., depression, anxiety, fearful), while the perception of a task-involving climate was associated with positive emotions (e.g., vigor, well-being, calm). The findings indicate perceptions of the motivational climate influence an individual's positive feelings about life. These studies highlight the beneficial outcomes for exercisers who perceive a high task/caring motivational climate in a physical activity setting.

Individuals' responses to perceptions of the motivational climate in exercise settings have been consistent throughout the exercise psychology literature. Ntoumanis and Biddle (1999) provided a review of literature examining motivational climate in physical activity settings, reporting that perceptions of a task-involving motivational climate positively impact task goals, which in turn influence adherence. Perceptions of an ego-involving climate, on the other hand, impact ego goals, which negatively influence exercise adherence.

More recently, Harwood, Keegan, Smith, and Raine (2015) conducted a systematic review of achievement goal perspective theory literature between 1990-2014.

The researchers organized studies to classify intra-individual correlates affiliated with perceived motivational climates. Harwood et al. (2015) identified a perceived task/mastery climate was associated with perceived competence (overall and self-referenced), confidence/self-esteem, feelings of autonomy and relatedness, more intrinsic forms of motivational regulation, positive affect, attitudes and intentions, objective performance measures, adaptive practice/competitive strategies, pro-social moral functioning, and dispositional flow. A perceived task/mastery climate was negatively associated with negative affect, maladaptive practice/competitive strategies, and antisocial moral functioning.

The perception of an ego/performance climate was positively linked to normative competence evaluations, extrinsic motivation and amotivation, negative affect, negative thoughts/worries, maladaptive practice/competitive strategies, and antisocial moral functioning. Moreover, the perception of an ego/performance climate was negatively related to participants' feelings of autonomy, relatedness, and positive affect.

In summary, individuals' perceptions of the motivational climate play a major role in the motivational process in exercise settings (Harwood et al., 2015). The findings reported in these studies affirm the principles of AGPT, which recognizes the structure of an environment influences the likelihood of an individual becoming task or ego-involved in an achievement setting. Individuals perceive the degree to which task goals (e.g., effort, personal improvement, cooperation, and task mastery) or ego goals (e.g., superior ability, outcomes, and intragroup rivalry) (Nicholls, 1989; Ames, 1992; Newton, Duda, & Yin, 2000) are valued in an achievement setting and develop corresponding cognitions, affective responses, and behaviors. Across studies, individuals reported more positive

experiences and more adaptive behaviors when they perceive caring/task-involving climates in comparison to ego-involving climates.

### **Research Supporting Caring Climate**

Although there is support for the caring climate in sport settings, caring climates in exercise settings are relatively unplumbed. Similar to education settings, exercise settings can foster a motivational climate that values and welcomes members of all abilities and experience levels (Brown, Fry, & Little, 2013). Newton and colleagues (2007) assessed the extent to which the adolescents perceived the physical activity setting of summer camp to be interpersonally inviting, safe, supportive, while emphasizing value and respect for one another. Campers perceived significantly higher levels of caring climate, empathetic concern, future expected participation, and a lower perception of an ego-involving climate. The campers also reported their anticipated future involvement in the camp and the extent to which they valued the camp experience. These findings suggest perceptions of the motivational climate experience influence the exercise experience. The study's findings indicate youth can perceive aspects of the motivational climate, which can contribute to their developing view of exercise. In turn, these perceptions could influence their future relationship with exercise participation.

Adults who perceive a caring/task-involving climate report similar results. Brown, Volberding, Baghurst, & Sellers, (2017) invited faculty and staff members to share their perceptions of the motivational climate of a university fitness center. The participants represented a broad sample of exercisers, including groups of participants who never used the facility, participants who were former members, and participants who were current members. Overall, participants valued a caring/task-involving climate, regardless

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of their membership status. Qualitative interviews revealed participants in the current members group felt valued and welcomed in the fitness center, while former and never members reported feeling unwelcomed, ignored, or unsure how to use the equipment or fitness center offerings. The researchers concluded both groups of non-members would be more likely to join the fitness center if they observed a welcoming exercise setting where all members are valued and are shown respect. For example, the staff could call members by name, act approachable and visible, and provide equal treatment to all members. From a behavioral perspective, a personal trainer or a group fitness instructor can praise members' effort as members work towards their goal. They can provide a supportive and welcoming environment where mistakes are viewed as part of the learning process. The staff can act in a respectful way and model the behavior they expect from their members. The structure of a fitness center can display instructional signs, encouraging words, and a variety of equipment. This level of cognizance can help a fitness center become a place where members of all abilities feel valued.

### **Employing AGPT as a Framework to Investigate Individuals' Use of PATT**

As the role of technology becomes more ubiquitous in the lives of adults, it is worthwhile to investigate its role in the exercise experience. Physical activity trackers are designed to chronicle activities of daily living and monitor measurements (e.g., physical activity, food, weight, and sleep) to make users more aware of their daily activity, provide accessible feedback that spurs users to make progress toward their goals. Thus, individuals' goal orientations, or personal definitions of success, potentially influence their choice in health and fitness technology and in turn, contribute to outcome variables associated with individuals' exercise experiences. While there is a copious amount of

research examining the effectiveness of physical activity trackers and the link between the use of technology and increasing and maintaining physical activity (e.g., Cadmus-Bertram et al., 2015; Thompson et al., 2014), the present study will use AGPT to identify reasons for using physical activity trackers.

## **Predictor Variables**

### **Enjoyment**

Individuals' affective responses to exercise may improve as a result of participation in regular exercise (Guszkowska & Sionek, 2009; Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993; Kanning & Schlicht, 2010; Rokka, Mavridis, & Kouli, 2010). Behaviors that influence positive affect are more likely to be repeated, while behaviors that influence negative affect are less likely to be repeated in the future. Compared to individuals who feel high enjoyment, individuals who experience low enjoyment in an exercise setting may not experience increases in positive affective states (e.g., vigor, calmness) and/or decreases in negative affective states (e.g., anxiety, depression) (Raedeke, 2007). Therefore, individuals' perceptions of exercise can influence various facets of participation and ultimately, whether they choose to exercise (McAuley et al., 2007).

Kilpatrick et al. (2003) conducted a confirmatory factor analysis to validate the Task and Ego Orientation in Sport Questionnaire (Duda, 1989) in an exercise domain. Furthermore, it was the intention of the researchers to determine whether both task and ego goal orientations existed among individuals with a variety of exercise experiences. The researchers reported that exercisers are to some degree both task and ego oriented and found task orientation was associated with exercise enjoyment. These results suggest

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that an individuals' personal definition of success affects individuals' willingness to participate in exercise and their enjoyment of the activity.

Similarly, van de Pol, Kavussanu, and Ring (2012) studied the variability and differences of soccer players' goal orientations and perceptions of the motivational climate in two types of achievement settings (i.e., training and competition). The researchers were also interested in whether the type of achievement setting (i.e., training and competition) moderated the relationships between goal orientations, motivational climate, effort, enjoyment and tension. Participants reported higher levels of enjoyment/interest in competition compared to training settings. Participants' reported level of enjoyment was positively associated with the perception of a task-involving climate in training settings and competition. This finding is supported by previous research in academic settings. For example, results from Harackiewicz and colleagues' (2008) examination of students' goal orientations indicate students who report high interest levels are more likely to support a task-goal than students who report lower reported interest levels. In a similar vein, the findings in van de Pol et al. (2012) demonstrate athletes' interest/enjoyment of soccer during competition may influence their overall view of success in terms of improvement upon past performances.

### **Effort**

In addition to the strong relationship between goal orientation and enjoyment, there is a strong relationship with effort. Increased effort is an adaptive behavioral strategy commonly measured with perceptions of the motivational climate and the use of learning/practice and competitive strategies (Harwood et al., 2015). Additionally, increased effort is necessary to obtain the benefits associated with physical activity and

may moderate the reduced risk of health concerns when compared to exercise volume (Lee, Sesso, Oguma, & Paffenbarger, 2003; Wisloff et al., 2006).

Similarly, participants in van de Pol and colleagues' (2012) examination of soccer players found participants' perceptions of a task-involving climate in training were positively related to effort. Participants reported higher levels of effort and enjoyment when they perceived a task-involving climate in competition than in training settings. Effort was negatively associated with the perception of an ego-involving climate in training settings and during competition. The results demonstrate the impact the perception of the motivational climate in training settings and competition may have on athlete's view of success, intensity of effort, and enjoyment level (Van de Pol et al., 2008).

Additionally, participants reported higher levels of tension when they perceived an ego-involving climate in training settings. When athletes observe features of an ego-involving climate during training, such as the coach praising a few star players and punishing players' mistakes, they may feel tension. The results of the study have implications for the environment coaches and instructors create for athletes and exercisers.

### **Motivational Climate & Effort**

Van de Pol, Kavussanu, and Ring (2012) suggest high interest levels are more likely to support a task-goal than students who report lower interest levels. Participants' perception of a task-involving climate in training was positively related to effort. Although enjoyment was positively associated with the perception of a task-involving climate in training settings and competition, the relationship between the variables was

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stronger in training settings. Furthermore, participants reported higher levels of effort and enjoyment when they perceived a task-involving climate in competition than in training settings. Effort was negatively associated with the perception of an ego-involving climate in training settings and during competition. The results demonstrate the impact the perception of the motivational climate in training settings and competition may have on athlete's view of success, intensity of effort, and enjoyment level (van de Pol et al., 2012).

Brown and Fry (2013) explored the relationship between female college students' perceptions of the motivational climate in their physical education classes and their adaptive exercise responses (e.g., interest/enjoyment, perceived competence, effort/importance, and tension/pressure, commitment to exercise, and reasons for exercising). Participants who perceived a high caring and task-involving climate and a low ego-involving climate were more likely to report higher levels of intrinsic motivation (enjoyment, effort, improvement, and competence).

### **Motivational Climate and Enjoyment**

In addition to strong relationships between perceptions of the motivational climate and effort, there is also support for perceptions of the motivational climate and enjoyment in exercise. Huddleston, Fry, and Brown (2012) examined the association between employees' perceptions of the motivational climate to aspects of intrinsic motivation and employees' perception of employer's concern for their health behaviors. The researchers surveyed employees in various positions within a large corporation. Consistent with AGPT, a positive relationship emerged between perceptions of a task-involving climate in the workplace and intrinsic motivation. In particular, the findings suggest perceptions

of a task-involving climate were positively related to employees' interest/enjoyment, perceived competence, effort/importance, and feeling valued by their employer.

These results contribute to the growing body of exercise psychology literature and reinforce the benefits of creating a task-involving climate, such as influencing a positive exercise experience. By valuing high effort, personal improvement, cooperation, and skill mastery, instructors increase the likelihood of individuals choosing to exercise for reasons of interest/enjoyment. The relationship between perceptions of the motivational climate and mood states suggests the positive mood states (e.g. energy, vigor) may carry into their various responsibilities and roles outside of exercise settings. Furthermore, Seligman & Csikszentmihalyi (2000) suggest enjoyment drives personal growth and long-term happiness.

Huddleston and colleagues (2012) also discovered significant relationships associated with perceptions of an ego-involving climate in an exercise setting. Perceptions of an ego-involving climate were negatively associated with interest/enjoyment, perceived competence, and effort/importance. Therefore, if leaders highlight features of an ego-involving climate (e.g., encouraging rivalry and normative comparisons), individuals may not enjoy their exercise experience and fail to return to the fitness center.

Numerous studies have examined effort in sport settings. For instance, Jaakkola, Ntoumanis, and Liukkonen et al. (2016) examined the relationship between the perception of the motivational climate, achievement goals, perceived sport ability, and enjoyment among Finnish ice hockey players. Following the completion of self-report surveys, the results indicated players' perception of a motivational climate characterized

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by high effort, personal development, and skill improvement contribute to their enjoyment of junior ice hockey. More specifically, characteristics of a task-involving climate contributed to the development of task achievement goals, which predicted enjoyment levels of athletes in junior ice hockey. The results suggest the perception of the motivational climate can affect how an individual views success, which can contribute to athletes' enjoyment of sport. Given the role of motivational climate and goal orientations in sport, it is logical to expect similar results in exercise settings.

### **Self-Efficacy to Exercise**

Wang and Biddle (2001) propose examining additional factors that contribute to the multiple dimensions of motivation in exercise settings. Specifically, it would be beneficial to study goal orientations in combination with self-efficacy beliefs, as self-efficacy has been shown to be a significant factor for fostering enduring changes in exercise behaviors (McAuley & Blissmer, 2000; Neupert, Lachman, & Whitbourne, 2009). According to Bandura (1997), self-efficacy refers to the “belief in one’s capabilities to organize and execute courses of action required to produce given attainments” (p. 3). Self-efficacy beliefs are formed in childhood and develop across the lifespan. Individuals’ perceptions of self-efficacy affect their decision to engage in behaviors and activities and the likelihood of experiencing success. These perceptions also determine the use of coping behaviors in the face of challenges. Individuals with strong perceptions of self-efficacy are more likely to put forth more effort to persevere through obstacles than those with lower perceptions of self-efficacy (Bandura, 1977).

Similar to AGPT’s characterization of individuals with high task orientation, Bandura (1997) describes individuals with high levels of perceived self-efficacy as more

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apt to choose more challenging tasks, put forth greater effort, and persist longer when faced with obstacles, barriers, and aversive or stressful stimuli when compared to individuals with low perceived self-efficacy. There are various types of self-efficacy, such as learning efficacy, decision-making efficacy, coping efficacy, and self-regulatory efficacy (Weinberg & Gould, 2015). Two distinguishable types of self-efficacy studied in exercise settings are known as coping self-efficacy and task self-efficacy (Maddux, 1995). According to Bandura (1997), task self-efficacy applies to individuals' perceptions of their ability to correctly perform a task (e.g., perform a physical skill with proper mechanics). Coping self-efficacy, on the other hand, is concerned with individuals' confidence in their ability to complete a task correctly in the face of obstacles (e.g., when an individual is feeling fatigued). Individuals can develop self-efficacy through mastery experiences, in which they successfully perform a task and consequently develop confidence in their abilities. This confidence is enhanced when individuals overcome barriers to successfully perform tasks. If individuals do not perform a task successfully, they may develop lower levels of self-efficacy. Empirical research suggests high levels of perceived self-efficacy, a situation-specific self-confidence (Weinberg & Gould, 2015), are linked to frequent exercise and exercise program adherence (Bandura, 1995, 1997; McAuley & Jacobson, 1991; McAuley, Wraith, & Duncan, 1991; Rodgers & Gauvin, 1998).

Mitchell and colleagues (1994) propose individuals' self-efficacy beliefs prior to learning a new skill may be the strongest predictor of future performances. As skills become more developed, self-efficacy beliefs may increase. Past mastery performances, emotional states, or goals may also contribute to an increase in self-efficacy beliefs and

future cognitions (Bandura, 1977; 1986; Mitchell, Hopper, Daniels, George-Falvy, & James, 1994). McAuley, Courneya, and Lettunich (1991) measured sedentary adults' perceptions of self-efficacy following a brief graded exercise testing and a long-term (20-week) walking program. Overall, participants in the acute bout of exercise group demonstrated increased self-efficacy beliefs from baseline to post-graded exercise test. For participants in the long-term exercise group, self-efficacy beliefs for specific exercises (e.g., sit-up, walking/jogging) significantly increased from baseline to 20 weeks. McAuley et al. (1991) reported controllable aspects of the exercise environment, such as the length of the program and the support from the instructors, were particularly important for participants' efficacy beliefs.

Although there is evidence that aspects of the exercise environment contribute to self-efficacy beliefs, Kilpatrick, Bartholomew, and Reimer (2003) propose individuals' definitions of success may influence their confidence to exercise. The researchers aimed to determine how goal orientations affect self-efficacy beliefs. Participants' motivational profiles, or levels of task and ego orientation, were analyzed to determine whether there was a relationship between levels of coping and task self-efficacy. The researchers surveyed participants from a university community who participated in various exercise activities, such as aerobics, weight training, running, and swimming. Higher task orientation was associated with coping and task self-efficacy, whereas ego orientation was not associated with these outcome variables. The relationship between high task orientation and self-efficacy beliefs was unaffected by the level of ego orientation. Self-efficacy beliefs contribute to the growth of exercise adherence.

## **Barriers to Exercise**

Research has identified many perceived barriers to exercise that individuals have identified as reasons for refraining from developing an exercise regimen or dropping out of an exercise program. Given the majority of Americans do not meet physical activity recommendations, it is imperative to examine the reasons why individuals do not adhere to exercise regimens and develop strategies to promote participation and program maintenance. In order to expand upon the exercise experience research, it is vital to highlight studies that identify predictors of exercise adoption and maintenance.

McAuley (1992) examined the effect of self-efficacy cognitions of sedentary, middle-aged adults as they adopted and maintained exercise behavior. The program incorporated low-impact aerobic exercise three times per week across five months. The researchers measured two types of self-efficacy, including general self-efficacy, or an individual's confidence related to their physical ability, and exercise self-efficacy, which referred to participants' perceptions of their ability to complete the exercise program in the midst of barriers. Participants completed questionnaires related to general self-efficacy and exercise-specific self-efficacy midway and at the completion of the exercise program.

General self-efficacy significantly predicted participants' level of exercise intensity in the middle of the exercise program (3 months). Exercise self-efficacy predicted participants' rate of perceived exertion at the end of the study (5 months). Perceptions of exercise self-efficacy predicted participants' attendance at three months into the study. However, when compared to self-efficacy, participants' overall attendance more strongly predicted future behavior.

The results illustrate that sedentary adults' perceptions of self-efficacy significantly affect exercise participation. General self-efficacy and exercise self-efficacy, in particular, predicted individuals' attendance records and rate of perceived exertion throughout the exercise program. Furthermore, the results indicate the degree to which individuals' physical self-confidence and perception of their ability to overcome perceived barriers is more influential when adopting a new exercise regimen compared to maintaining the exercise regimen. Attendance, or previous experience, leads to further participation.

According to the study's findings, high self-efficacy is imperative for individuals beginning a new exercise regimen, as they are likely to experience setbacks, obstacles, and aversive stimuli that may prevent them from engaging in the exercise behavior (McAuley, 1992). Although self-efficacy contributed to the adoption of an exercise regimen among a symptomatic population (e.g., sedentary adults), there is not substantial research to suggest reports of self-efficacy can predict adherence within an asymptomatic population (McAuley & Jacobson, 1991)

Researchers aim to identify aspects of the exercise experience that may contribute to self-efficacy beliefs. For instance, Brown (2016) examined the effect of various types of encouragement given to participants in a walking program. Adults were randomly placed in walking groups that corresponded to three types of encouragement: task-involving/caring, ego-involving, or neutral. Surveys related to perceptions of the motivational climate, self-efficacy for exercise, and adherence were completed before, during, and following the walking program. Participants received emails about their daily step goal over the course of ten weeks. The results indicated that self-efficacy beliefs

about overcoming barriers to reach a daily walking goal increased for participants in all three types of encouragement groups. Thus, participation in a walking program contributed to an increased level of self-confidence to be physically active. Although the change was not significant across groups, the researchers suggest future research explore the role of participants' goal orientation in moderating the relationship between perceptions of the motivational climate and step totals.

In addition to health behaviors, physical activity trackers and their support platforms can also measure individuals' improvement and compare their performances to others. Individuals who use physical activity trackers may encounter normative comparisons with fellow users, such as rankings. Objective rewards instantly appear on a physical activity tracker when individuals reach their goals or surpass their previous performance (e.g., walk a greater number of steps than previous day). This type of external reward is similar to recognition an individual may receive from an instructor or a personal trainer in an exercise setting. Duda (1993) suggests the manner in which individuals define success and displays competence is related to their reasons for participation in achievement settings. Individuals who engage in exercise present characteristics of task and ego goal orientations (e.g., personal improvement and competition) similar to goal orientations presented in sport settings (Duda & Tappe, 1988; Gill, Williams, Dowd, Beaudoin, & Martin, 1996; Markland & Ingledew, 1997).

Cowan et al. (2013) analyzed 127 iPhone physical activity applications for the incorporation of theoretical constructs from prominent behavior change theories. The researchers concluded few applications support information gleaned from health behavior theories. Further, the data revealed positive correlations between the amount of

theoretical content used in a health application, the cost of the application, and the amount of exercise-related behaviors presented by the application. In order to improve the likelihood of behavior change, the researchers suggest health behavior change experts (i.e., public health professionals and certified health education specialists) work together with application developers to design programs for effective behavior change.

Cadmus-Bertram et al. (2015) suggests web-based technologies, including body-worn sensors and smartphone apps that measure activity through a smartphone's accelerometer, can help combat public health issues associated with obesity and inactivity. Additionally, the researchers indicate the use of a fitness tracker alone will not lead to effective behavior change. Rather, Cadmus-Bertram et al. (2015) and Shih et al. (2015) suggest the most effective method for achieving behavior change is to combine the use of the physical activity tracker feedback with a self-regulatory behavior (e.g., goal setting, review of previously set goals, frequent behavioral feedback).

Jakicic et al. (2016) compared a standard behavioral weight loss intervention to a technology-enhanced weight loss intervention to monitor weight change in overweight to obese adults. During the first stage of the longitudinal study, all participants were placed on a low-calorie diet, engaged in prescribed physical activity, and attended group counseling sessions. After six months, participants were randomly placed in either a standard intervention group to self-monitor their diet and physical activity, or an enhanced intervention group, which included wearing a physical activity tracker and logging diet and physical activity on a website. Over the course of two years, the researchers measured participants' weight loss, body composition, fitness, physical activity, and dietary intake. At six months, the participants in the standard intervention

group and enhanced intervention group did not display a significant difference in weight loss. While both groups of participants experienced significant changes in weight over the course of the study, participants in the enhanced intervention group lost less weight than the participants in the standard intervention group. The results of the study indicated the physical activity tracker did not provide an advantage to overweight or obese adults who engaged in standard weight loss behaviors. Furthermore, the results suggest there are unanswered questions regarding individuals' motivational behaviors toward weight loss goals.

In addition to unanswered research inquiries, there are noteworthy aspects of PATT that contribute to the exercise experience. More specifically, when individuals use PATT independently from other exercisers, their experience with PATT may be different than when participants are given instruction in a weight loss intervention. For instance, individuals may seek to compete against other exercisers without performing in the same physical setting. When PATT users exercise in different contexts, they may compare their PATT outcomes to the outcomes of their friends and fellow competitors. The different physical activity contexts may present specific challenges, such as temperature or elevation variations. The varying physical activity contexts also prevent individuals from observing the skill and effort levels put forth by other exercisers. Given these differences, individuals cannot accurately compare their PATT outcomes to the outcomes of their friends and fellow competitors.

Since individuals use different models with a variety of software platforms, the quality and extent of feedback may differ between PATT models/software. Additionally, the amount of objective performance feedback may differ depending on the

sophistication of the PATT model and/or software. This feedback may lead exercisers to focus on particular indicators of success, such as calories burned or active minutes. By viewing PATT outcomes as an indication of success, individuals may become less interested in the effort, skill mastery, and improvement they encounter across time. In doing so, these individuals may risk quantifying their exercise experience rather than participating in the activity because they inherently enjoy it. Given the unique aspects of PATT and the findings from the present study indicate, PATT companies can benefit from making improvements to their software.

### **Conclusion**

AGPT is commonly used to explore individuals' motivation in sport and exercise, and maybe an important framework for investigating individuals' reasons for using PATT. This particular dimension of physical activity monitoring remains unexplored using the AGPT framework. While technology is pervasive in the exercise settings, the current research suggests employing theory could be helpful to determine how physical activity trackers can benefit individuals for long-term use. Ideally, these devices would be designed to foster and support a caring/task-involving climate that would support a high task orientation among users.

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<b>Please indicate how much you agree with each item's description of success <u>with regard to exercise.</u></b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
<b>I feel most successful when. . .</b>					
1) . . . I exercise to the best of my ability.	1	2	3	4	5
2) . . . other exercisers don't do as well as me.	1	2	3	4	5
3) . . . I make progress.	1	2	3	4	5
4) . . . I achieve the exercise goal I set for myself.	1	2	3	4	5
5) . . . I can show other exercisers that I'm better than everyone else.	1	2	3	4	5
6) . . . I feel like I've improved.	1	2	3	4	5
7) . . . I prove to myself that I am the only one who can do a certain exercise task.	1	2	3	4	5
8) . . . I know that I am more capable than other exercisers.	1	2	3	4	5
9) . . . I exercise at a level that reflects personal improvement.	1	2	3	4	5
10) . . . I can prove to others that I'm the best.	1	2	3	4	5

## APPENDIX A: STUDY QUESTIONNAIRE

<b>The following items require you to think about the reasons why you wear a physical activity tracker (Garmin, Fitbit, JawBone, etc.) during periods of physical activity. People wear these devices for many reasons, and you're asked to indicate below the extent that you agree or disagree with each of the reasons.</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
<b>A reason I wear my physical activity tracker is because I like to receive information that...</b>					
1) . . . encourages me to try hard.	1	2	3	4	5
2) . . . notifies me that I outperformed others.	1	2	3	4	5
3) . . . shows I have tried hard.	1	2	3	4	5
4) . . . leads me to give greater effort to reach a new milestone/personal best.	1	2	3	4	5
5) . . . informs me that I engaged in more physical activity than others I know.	1	2	3	4	5
6) . . . gives me feedback regarding my effort.	1	2	3	4	5
7) . . . helps me monitor my personal improvement over time.	1	2	3	4	5

1

<b>A reason I wear my physical activity tracker is because I like to receive information that...</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
8) . . . shows a chart of my daily improvement in steps or activity level (light, moderate, vigorous).	1	2	3	4	5
9) . . . I am outperforming (more active than) others in my physical activity group.	1	2	3	4	5
10) . . . alerts me about where I rank on a leaderboard (or compared with others).	1	2	3	4	5
11) . . . challenges me to be physically active.	1	2	3	4	5
12) . . . helps me maintain my physical activity level.	1	2	3	4	5
13) . . . updates me that I have received more digital badges/awards/trophies than others.	1	2	3	4	5
14) . . . congratulates me on receiving personal badges/accomplishments.	1	2	3	4	5
15) . . . helps me to see my personal improvement.	1	2	3	4	5
16) . . . notifies me of my patterns of physical inactivity.	1	2	3	4	5
17) . . . I am competing well against others in my physical activity group who use the same device.	1	2	3	4	5
18) . . . helps me strive to be my physical best.	1	2	3	4	5
19) . . . encourages me to be more active than others.	1	2	3	4	5
20) . . . spurs me to strive to reach my personal best.	1	2	3	4	5
21) . . . updates me on how I am progressing toward my physical activity goals.	1	2	3	4	5
22) . . . updates me on how I am progressing toward my goal of outperforming others.	1	2	3	4	5
23) . . . indicates to me that my physical activity level is greater and/or higher than others.	1	2	3	4	5

<b>A reason I wear my physical activity tracker is because I like to receive information that. . .</b>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
24) . . . I can share with friends/family members so we can support each other in our health and fitness pursuits.	1	2	3	4	5
25) . . . I can share with friends/family members so we can hold each other accountable for our goals.	1	2	3	4	5
26) . . . I can share with friends/family members so we can call people out for not reaching our goals.	1	2	3	4	5
27) . . . updates me that I am successfully competing against others (e.g., complete more steps, perform with higher intensity).	1	2	3	4	5
28) . . . I can share with others so we can encourage one another to achieve our personal bests.	1	2	3	4	5

<b>The following statements are additional items that have you think about the other reasons you may use a physical activity tracker. A reason I wear my physical activity tracker is because. . .</b>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) . . . I get a health/wellness incentive through my work if I track my physical activity.	1	2	3	4	5
2) . . . my friends invited me to participate in a challenge.	1	2	3	4	5
3) . . . it helps me to be aware of whether I am getting adequate movement throughout the day.	1	2	3	4	5
4) . . . my doctor recommended I purchase a physical activity tracker.	1	2	3	4	5
5) . . . it provides feedback necessary for monitoring a medical condition.	1	2	3	4	5
6) . . . I want to take part in a fitness trend.	1	2	3	4	5
7) . . . it helps me reduce my sedentary (inactive) time.	1	2	3	4	5
8) . . . it helps me increase the number of breaks I take for physical activity.	1	2	3	4	5
9) . . . it helps me learn and improve my physical activity patterns throughout the day.	1	2	3	4	5
10) . . . it reminds me to be physically active each day.	1	2	3	4	5
11) . . . it raises my awareness of my physical activity levels over time.	1	2	3	4	5

<b>A reason I wear my physical activity tracker is because . . .</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
12) . . . I like to support technology produced by my favorite brand.	1	2	3	4	5
13) . . . I like to share my feedback with my doctor.	1	2	3	4	5
14) . . . I like to track multiple modes of physical activity (e.g., biking, running, swimming).	1	2	3	4	5
15) . . . it charts my physical activity so I do not need to log it myself.	1	2	3	4	5
16) . . . it quantifies the intensity of my physical activity.	1	2	3	4	5
17) . . . it tracks my activity 24 hours a day, 7 days a week.	1	2	3	4	5
18) . . . I like to share my results on social media.	1	2	3	4	5
19) . . . I like to track various aspects of my health (e.g., calories, heart rate, sleep data).	1	2	3	4	5
20) . . . it is a fashionable piece of technology.	1	2	3	4	5

Please use the space below to write reasons you wear your physical activity tracker that may not have been mentioned in the previous measures:

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1

During a typical **7-day period** (a week), how many times on average do you do the following kinds of exercise for **more than 15 minutes** during your free time? Write on each line the appropriate number.

	<b>Times per Week</b>
<b>STRENUOUS EXERCISE</b> <b>(HEART BEATS RAPIDLY)</b> (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)	_____
<b>MODERATE EXERCISE</b> <b>(NOT EXHAUSTING)</b> (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)	_____
<b>MILD EXERCISE</b> <b>(MINIMAL EFFORT)</b> (e.g., yoga, archery, fishing from river bank, bowling, horseshoeing, golf without using a cart, snow-mobiling, easy walking)	_____

<b>Read each statement and think about how much you believe the statement describes your thoughts and feelings regarding exercise.</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
1) I put a lot of effort into exercising.	1	2	3	4	5
2) I enjoy exercise very much.	1	2	3	4	5
3) It is important for me to do well when I exercise.	1	2	3	4	5
4) Exercising is fun.	1	2	3	4	5
5) I try hard while I exercise.	1	2	3	4	5
6) Exercising is interesting.	1	2	3	4	5
7) I do not try very hard while I exercise.	1	2	3	4	5
8) Exercise does not hold my attention.	1	2	3	4	5
9) While exercising, I think about how much I enjoy it.	1	2	3	4	5

Reasons for Using a Physical Activity Tracker – Part

2

**1) Please indicate your gender:**

Male

Female

Trans

Other: \_\_\_\_\_

**2) Please indicate your age in years: \_\_\_\_\_**

**3) Please indicate your race/ethnicity: (select all that apply)**

White/Caucasian

African American/Black

Asian/Pacific Islander

Native American

Hispanic/Latino

Other: \_\_\_\_\_

**4) What is your current occupation? (Circle all that apply)**

Part-time employee

Staff Member

Full-time employee

Lecturer

Faculty Member

Other: \_\_\_\_\_

**4b) Please identify the university or college where you are employed:**

\_\_\_\_\_

**5) Please indicate the type AND model of your physical activity tracker:**

Garmin (Model: \_\_\_\_\_)

Apple (Model: \_\_\_\_\_)

FitBit (Model: \_\_\_\_\_)

Lumo (Model: \_\_\_\_\_)

Jawbone (Model: \_\_\_\_\_)

Polar (Model: \_\_\_\_\_)

Nike FuelBand (Model: \_\_\_\_\_)

Misfit (Model: \_\_\_\_\_)

Samsung (Model: \_\_\_\_\_)

TomTom (Model: \_\_\_\_\_)

Other (Model: \_\_\_\_\_)

**6) How did you acquire your physical activity tracker?**

I purchased my physical activity tracker.

I was awarded my physical activity tracker following a fitness challenge.

My employer provided my physical activity tracker.

I received my physical activity tracker as a gift.

I won my physical activity tracker in a drawing, raffle, auction, etc.

Other: \_\_\_\_\_

**7) What type(s) of physical activities do you engage in while wearing a physical activity tracker? Select all that apply.**

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Basketball            | <input type="checkbox"/> High Intensity       | <input type="checkbox"/> Strength Training |
| <input type="checkbox"/> Biking/Cycling        | <input type="checkbox"/> Interval Training or | <input type="checkbox"/> Swimming (water   |
| <input type="checkbox"/> Bowling               | <input type="checkbox"/> Circuit Training     | <input type="checkbox"/> aerobics or       |
| <input type="checkbox"/> Boxing/Kickboxing     | <input type="checkbox"/> Hiking               | <input type="checkbox"/> swimming laps)    |
| <input type="checkbox"/> Crossfit              | <input type="checkbox"/> Hockey               | <input type="checkbox"/> Tennis            |
| <input type="checkbox"/> Dance (e.g., Ballet,  | <input type="checkbox"/> Martial Arts         | <input type="checkbox"/> Volleyball/Sand   |
| <input type="checkbox"/> Zumba, etc.)          | <input type="checkbox"/> Rowing               | <input type="checkbox"/> Volleyball        |
| <input type="checkbox"/> Fitness class (e.g.,  | <input type="checkbox"/> Racquetball          | <input type="checkbox"/> Walking           |
| <input type="checkbox"/> Pilates, Barre, etc.) | <input type="checkbox"/> Running/Jogging      | <input type="checkbox"/> Yoga              |
| <input type="checkbox"/> Golf                  | <input type="checkbox"/> Soccer               | <input type="checkbox"/> Other:_____       |

**8) Are you currently competing as an athlete or training for an event (e.g., training for a triathlon)?**

- Yes       No

**8b) If you answered “Yes,” what kind of event/competition are you training for?**

\_\_\_\_\_

**9) Which of the following metrics provided by your physical activity tracker are most meaningful to you? (Select all that apply)**

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Steps                   | <input type="checkbox"/> Flights of stairs    | <input type="checkbox"/> Sleep data         |
| <input type="checkbox"/> Distance travelled      | <input type="checkbox"/> climbed              | <input type="checkbox"/> Calories burned    |
| <input type="checkbox"/> (e.g., running,         | <input type="checkbox"/> Speed, pace, route   | <input type="checkbox"/> Calories consumed  |
| <input type="checkbox"/> walking, cycling, etc.) | <input type="checkbox"/> Duration of exercise | <input type="checkbox"/> Heart rate         |
| <input type="checkbox"/> GPS                     | <input type="checkbox"/> Active minutes       | <input type="checkbox"/> Breathing patterns |
| <input type="checkbox"/> Altitude changes        | <input type="checkbox"/> Reminders of         | <input type="checkbox"/> Other:_____        |
|  | <input type="checkbox"/> inactivity           |   |

**10) How many days per week do you wear your physical activity tracker? \_\_\_\_\_**

**11) Please indicate your average number of steps per day: \_\_\_\_\_**

**12) On average, how many hours do you spend sedentary during the day? (e.g., sitting at a desk/computer) \_\_\_\_\_**

**13) How often do you look at your device for information about your physical activity?**

- At least once an hour       At least once a day       At least once a week

Reasons for Using a Physical Activity Tracker – Part

2

At least once a month       Never       Other: \_\_\_\_\_

**14) How long have you owned your current physical activity tracker?**

Less than 1 month       1-3 Months       4-6 Months  
 7-12 Months       More than 1 year

**15) Do you sync your physical activity tracker activity with fellow competitors, friends, or family (e.g., connect with friends or family via your tracker’s software)?**

Yes       No

**16) How physically fit are you compared to others of your same age and sex? (Note: The Centers for Disease Control (CDC) defines physical fitness as the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and respond to emergencies.) Please circle your response.**

1	2	3	4	5
Poor	Below Average	Average	Above Average	Excellent

**17) Listed below are reasons for exercise. Please rank each reasons below on a scale of 1-3, where 1 = a very important reason, 2 = a moderately important reason, 3 = not an important reason.**

___ Weight control	___ Attractiveness
___ Fitness	___ Enjoyment
___ Mood	___ Muscle tone
___ Health	___ Other: _____

**18) How often do you participate in group or individual “challenges” presented by your physical activity tracker?**

Never       Rarely       Sometimes       Often       Very Often

**19) Please provide any additional comments you would like to share about your experience with your physical activity tracker:**

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## 1 APPENDIX B: IRB APPROVAL

2 October 6, 2017

3 Lauren Easton laureneaston@ku.edu

4 Dear Lauren Easton:

5 On 10/6/2017, the IRB reviewed the following submission:

6 **APPROVAL OF PROTOCOL**

Type of Review:	Initial Study
Title of Study:	The Relationship of Exercisers' Reasons for Using Physical Activity Trackers, Goal Orientations, Effort, and Enjoyment
Investigator:	Lauren Easton
IRB ID:	STUDY00141424
Funding:	None
Grant ID:	None
Documents Reviewed:	• 10.4 Welcome on Qualtrics.png, • 9.25 7PM Research Flyer.pdf, • 9.25 7PM Research Flyer.pdf • 9.25 IRB Study Protocol.docx, • 9.25 Diss KU Human Research Protocol.pdf, • 9.25 Email Sample.docx, • 9.25 Email Sample.docx, • Survey. 10.3.doc, • Survey. 9.26.doc

7 The IRB approved the study on 10/6/2017.

- 8
- 9
- 10
- 11
1. Notify HRPP about any new investigators not named in original application. Note that new investigators must take the online tutorial at [https://rgs.drupal.ku.edu/human\\_subjects\\_compliance\\_training](https://rgs.drupal.ku.edu/human_subjects_compliance_training).
  2. Any injury to a subject because of the research procedure must be reported immediately.
  3. When signed consent documents are required, the primary investigator must retain the signed consent

12 documents for at least three years past completion of the research activity.

13 Continuing review is not required for this project, however you are required to report any significant  
14 changes to the protocol prior to altering the project.

15 Please note university data security and handling requirements for your project:

16 <https://documents.ku.edu/policies/IT/DataClassificationandHandlingProceduresGuide.htm>17 You must use the final, watermarked version of the consent form, available under the "Documents" tab in  
18 eCompliance.

19 Sincerely,

20 Jocelyn Isley, MS, CIP

21 Interim IRB Administrator, KU Lawrence Campus