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The Role of Companionship, Esteem, and Informational Support In Explaining Physical Activity Among Young Women In an Online Social Network Intervention

David N. Cavallo, **Jane D. Brown**, **Deborah F. Tate**, **Robert F. DeVellis**, **Catherine Zimmer**, and **Alice S. Ammerman**
University of North Carolina at Chapel Hill

Abstract

The primary objective of the current study was to examine the relationship between social support and physical activity within the Theory of Planned Behavior (TPB) theoretical framework. This study used data from the Internet Support for Healthy Associations Promoting Exercise randomized controlled trial. A total of 134 female undergraduate students participated in the study, which included baseline and post measures of perceived social support for physical activity (esteem, informational, and companionship), TPB variables related to physical activity (perceived behavioral control, intention, and attitude), and physical activity behavior. Path analysis revealed a significant indirect relationship between change in companionship support and physical activity mediated by change in intention (.13, p<.01) and a significant direct relationship between change in esteem support and change in physical activity (.26, p=.03). The model explained 27% of the variance in physical activity and 59% of the variance in intention. Overall, change in social support exerted a small to medium amount of influence on change in physical activity in this modified TPB model when controlling for traditional model constructs. Encouraging companionship and esteem support should be considered as a strategy for increasing physical activity in this population.

Keywords

social support; physical activity; health behavior; behavior change; theory of planned behavior

Given the benefits associated with adequate physical activity and the fact that the majority of Americans do not meet recommended national guidelines, developing programs that increase physical activity is a public health priority ((CDC), 2007; Eaton et al., 2008;

Correspondence concerning this study should be addressed to David Cavallo, Center for Cancer Prevention and Control Research, University of California Los Angeles, 650 Charles Young Drive South, Room A2-125 CHS Box 956900, Los Angeles, CA 90095-6900. dncavallo@ucla.edu.
David N. Cavallo, Department of Nutrition, University of North Carolina at Chapel Hill; Jane D. Brown, School of Journalism and Mass Communication, University of North Carolina at Chapel Hill; Deborah F. Tate, Departments of Nutrition and Health Behavior, University of North Carolina at Chapel Hill; Catherine Zimmer, Odum Institute for Research in Social Science, University of North Carolina at Chapel Hill; Alice S. Ammerman, Department of Nutrition, University of North Carolina at Chapel Hill.
David Cavallo is now at the Center for Cancer Prevention and Control Research, University of California Los Angeles.

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Warburton et al., 2006). Based on a growing body of observational evidence that greater social support is associated with greater physical activity, many intervention studies have employed strategies to increase social support among participants (Glasgow et al., 2003; Gold et al., 2007; Harvey-Berino, Pintauro, Buzzell et al., 2002; Harvey-Berino et al., 2004; Harvey-Berino, Pintauro, & Gold, 2002; Harvey-Berino et al., 2010; Kahn et al., 2002; Kim et al., 2011; Kosma et al., 2005; McKay et al., 2002; McKay et al., 2001; Micco et al., 2007; Richardson et al., 2010; Sherwood & Jeffery, 2000; D. F. Tate et al., 2003; D. F. Tate et al., 2001; Deborah F. Tate et al., 2006; Trost et al., 2002; Van Der Horst et al., 2007). Although many of these studies have reported improvements in physical activity related outcomes and behaviors, it is impossible to determine the effects of different types of social support because social support is rarely measured and in cases where it is measured, a global measure of social support is used. A better understanding of the effects of different types of social support on physical activity could benefit the design of future social support interventions by allowing researchers to concentrate their efforts on the most salient behavioral determinants (Baranowski et al., 1998).

Social support is thought to improve health through indirect physiological effects (e.g. reduced stress) and direct effects such as improving health behaviors (e.g. increasing physical activity) (Uchino, 2006). Although there is a great deal of heterogeneity in the definition of social support, common types include informational, instrumental, emotional, and appraisal support. Instrumental support consists of the provision of tangible aid, such as financial assistance and transportation: emotional support consists of the provision of caring, love and sympathy; informational support is the exchange of relevant advice or information; and appraisal support is the provision of feedback important to making decisions (Berkman et al., 2000).

Many studies have examined the social support – physical activity relationship within established health behavior theories including the theory of planned behavior (TPB)(Ajzen, 1991). The TPB (Figure 1) has been widely used in studies to predict physical activity across a variety of populations. In the TPB, behavioral intention, which is an indication of a person's readiness to perform the behavior, is assumed to be the most important and proximal determinant of behavior. Perceived behavioral control, or one's belief in their control over performing the behavior, is included in the TPB to account for the fact that the performance of any behavior is to some degree non-volitional. Although a person may have the will to perform a behavior, both external factors (e.g., a lack of resources) and/or internal factors (e.g. a lack of skill or motivation) could inhibit their performance under different circumstances. In other words, intention may not be sufficient to perform the behavior. Perceived behavioral control is therefore theorized to have an effect on behavior through intention and directly when it is a reflection of actual control. The other constructs in the model, attitude and subjective norm, are thought to influence behavior only through intention. Attitude consists of the affective and instrumental beliefs individuals hold about the behavior and subjective norms are beliefs individuals have about what important others' think of their performing the behavior.

Results from meta-analyses and reviews have supported the TPB's overall ability to predict physical activity behavior (Blue, 1995; Downs & Hausenblas, 2005; Hagger et al., 2002).

These analyses have consistently found the strongest relationships between intention and physical activity, attitude and intention, and perceived behavioral control and intention. By contrast, reports of a direct relationship between perceived behavioral control and physical activity when controlling for intention has been inconsistent and the relationship has been consistently weaker than that for intention and physical activity. Subjective norms also have exhibited a weak or non-significant relationship with intention when controlling for perceived behavioral control

Because of subjective norm's performance in the TPB in the physical activity domain, some authors have suggested that this construct be dropped (Courneya & McAuley, 1995; Courneya et al., 2000; Ryan E. Rhodes & Nigg, 2011). In part to find a psychosocial construct that could augment or replace subjective norm, several studies have examined the relationship between social support, TPB constructs, and physical activity. In several of these studies, the role of social support was examined as an antecedent to perceived behavioral control and intention but more recent studies have used it to replace subjective norm as a direct predictor of intention and physical activity. Across these studies, support has been found for the prediction of perceived behavioral control, intention and several types of physical activity behavior by social support as well as a greater ability to predict physical activity than subjective norm (Courneya et al., 2000; Okun et al., 2003; R. E. Rhodes et al., 2002; Saunders et al., 2004). It has been theorized that social support is a better predictor of physical activity behavior within the TPB framework because physical activity is a complex behavior that requires significant internal and external resources. Whereas just knowing what significant others think of a behavior may be sufficient to encourage action for a behavior that requires few resources (e.g. voting), physical activity will be influenced by social support because it may provide actual assistance to perform the behavior in addition to influencing intentions.

These studies have partially elucidated the mechanisms whereby social support influences physical activity in the TPB, but have largely been cross sectional or used global measures of social support. In one study where social support types were included, informational and esteem support influenced physical activity via perceived behavioral control, whereas companionship support had a direct effect, indicating that examining distinct types of social support may provide a better understanding of its role in the TPB (Okun et al., 2003).

Using data collected as part of the Internet Support for Healthy Associations Promoting Exercise (INSHAPE) study -- a randomized controlled health promotion intervention trial designed to increase perceived social support for physical activity and physical activity among female undergraduate students using Facebook, a popular online social networking website, this study aims to extend previous work by replacing subjective norm with multiple measures of social support and examining the relationship between changes in these variables over a 12-week period in order to determine if different types of support have differential effects on physical activity directly and through intention. Given the significant resources needed to participate in physical activity, including knowledge of facilities and techniques and in some cases the participation and facilitation of others, we hypothesized that social support types that are more likely to involve direct assistance will more strongly influence physical activity directly rather than through intentions. Specifically, that

information and companionship support will have a stronger direct relationship with physical activity than esteem support.

Methods

Participants

The study sample for the INSHAPE trial consisted of 134 female undergraduate students at a large Southeastern public university. Female undergraduates were selected for this study based on their widespread use of online social networks and previous research that supports the greater influence of social support on physical activity for women than men (Kelsey et al., 1997; Lenhart, 2010; Molloy et al., 2010; Sallis et al., 1999). Participants were recruited through flyers, university listserv emails, Facebook and Twitter™ accounts affiliated with the university, and advertisements in the college newspaper. Interested participants completed an online screener to determine their eligibility. Participants were deemed eligible if they were currently enrolled female undergraduates at the University under the age of 25 years, reported less than 30 minutes of daily physical activity, and more than 30 minutes of daily use of Facebook. Participants were excluded if they answered yes to two or more questions on the SCOFF disordered eating questionnaire (Perry et al., 2002). To identify participants with contraindications to an unstructured exercise program, they were required to submit physician approval if they answered yes to one or more questions on the Physical Activity Readiness Questionnaire (Thomas et al., 1992). None of the 19 individuals who screened positive on the Physical Activity Readiness Questionnaire submitted physician clearance, so they were ineligible to participate. A full description of participant recruitment is included in Figure 2. All study participants provided informed consent.

Design

Study participants were randomized into two groups, online social network plus self-monitoring (n=67) and education control (n=67). Perceived social support for physical activity, perceived behavioral control, attitude, and intention were assessed at baseline (time 1) and ten weeks (time 2). Physical activity was assessed at baseline (time 1) and twelve weeks (time 3). These measures were staggered due to the need to establish an appropriate timeframe between prospective TPB variables and retrospective social support measures at time 2 and the retrospective physical activity measure at time 3. Participants received thirty dollars for completing all study measures. The Institutional Review Board at the participating university approved this study.

Description of the INSHAPE trial—The INSHAPE trial was designed to test the efficacy of using Facebook to increase perceived social support for physical activity and physical activity. The primary hypothesis of the original trial was that participants enrolled in a physical activity themed online social network combined with web-based education and self-monitoring would exhibit greater changes in perceived social support for physical activity and physical activity than those in an online education-only control group.

Intervention participants had access to the INSHAPE website, which included educational materials related to physical activity and a self-monitoring tool (Dishman et al., 2009). Self-

monitoring was included in the intervention group as an evidence-based behavior change strategy and to provide structure and give participants a basis for exchanging social support by discussing their experiences and progress in the program(Burke et al., 2011). Participants were invited to join a Facebook group accessible only to members, where they could post comments to a common area (e.g., the group wall); respond to others' posts; create and post to discussion boards; and post web links, photographs, and videos. Participants were encouraged through incentives, emails, and messages posted to the group to exchange social support by discussing their experience in the program. The moderator's role in the group included answering technical questions about the study or responding to physical activity related questions from participants posted on the group wall or received through email, but did not include direct social support to individual group members. Control group participants were provided access to a limited version of the INSHAPE website, which included only the educational materials described previously. A more detailed description of the intervention and control conditions for the trial is published elsewhere (Cavallo et al., 2012).

Measures

Perceived social support—Perceived social support for physical activity was measured using the positive subscales from Chogahara's Social Influence on Physical Activity questionnaire, adapted for a college-aged population. In the original validation study, confirmatory factor analysis of the scale supported three distinct positive social support dimensions; informational support, esteem support, and companionship support. Chogahara defined informational support as "knowledge assistance that suggests "'you should know'"; companionship support as "partnership assistance that suggests, "'we participate together'" "; and esteem support as "esteem information provision that suggests "'you are good.'" " These subscales exhibited good internal reliability (α=.84 to .90) and test-retest reliability (r=.75 to .88) (Chogahara, 1999). A few of the original scale items were not included based on a study that adapted the instrument for a college-aged population, which also reported good internal reliability (α=.85 to .89) for the modified subscales (Okun et al., 2003). The wording used to assess social support was modified to explicitly include online forms of communication. Specifically, participants were asked how often in the past six weeks they had experienced certain social interactions with friends (e.g., made plans for exercising) including "friends on Facebook or other members of groups you have joined on Facebook." Each subscale consisted of 4 items and 5 response levels ranging from "never" to "very often." Subscale scores were calculated by taking the mean of the individual items such that higher scores indicated greater perceived social support.

TPB variables—Several scale instruments developed and validated in previous studies examining the TPB in the physical activity domain were used to measure attitude, intention and perceived behavioral control (R. E. Rhodes & Courneya, 2003; R.E. Rhodes et al., 2006; R. Rhodes & Courneya, 2005). A 6 item, 7-point bipolar adjective scale was used to measure exercise attitude. Adjective choices were prefaced with the statement, "For me, exercising regularly over the next 2 weeks would be…" followed by three items each for affective attitude (enjoyable-unenjoyable, interesting-boring, relaxing-stressful) and instrumental attitude (useful-useless, wise-foolish, beneficial-harmful). These dimensions of

attitude have exhibited discriminant validity in previous studies (R. E. Rhodes & Courneya, 2003; R.E. Rhodes et al., 2006).

Intention was measured with two items. Participants were presented with the statements: " I intend to exercise regularly over the next 2 weeks" and " I plan to exercise regularly over the next 2 weeks" and asked to rate them on a 7-point scale (strongly disagree-strongly agree). Three items were used to measure perceived behavioral control: (1) "How much personal control do you feel you have over exercising regularly in the next 2 weeks?" (very little control-complete control); (2) "How confident are you over the next 2 weeks that you could exercise regularly if you wanted to do so?" (very unconfident-very confident); and (3) "How much I exercise regularly over the next 2 weeks is completely up to me." Responses were measured on a 7-point scale (strongly disagree-strongly agree).

Physical activity—Physical activity was measured using a version of the Paffenbarger activity questionnaire adapted for online use (Paffenbarger Jr et al., 1995). This measure asks participants to report the amount of time spent walking, climbing stairs, and recreational activities engaged in over the past week. Total kilocalories are estimated based on the intensity and amount of time spent for each activity. This scale has demonstrated adequate reliability and predictive validity in previous studies (Pereira et al., 1997).

Data Analysis

Differences at baseline between participants who did and did not complete post intervention measures were examined using non-parametric tests and independent t-tests. The path analysis model was estimated with full information maximum likelihood procedures to account for missing data at follow up. Confirmatory factor analyses were estimated using weighted least squares with robust standard errors and means for categorical data. Mplus, version 6.11, was used for both path and confirmatory factor analyses. All other data analysis was performed using the Statistical Package for the Social Sciences (SPSS, version 19). Based on previous analyses of baseline characteristics and differences in the change in mediating and outcome variables over time between groups that were statistically insignificant, we have combined study groups for the purpose of the current analysis.

Model fit—Model fit was assessed using several fit indices including the chi-square test statistic, the comparative fit index (CFI), and the root mean squared error of approximation (RMSEA). The chi-square test statistic was considered a reliable evaluation method based on the relatively small sample size used for this analysis. The CFI is an incremental fit index that compares the proposed model to a null model. The RMSEA is an absolute fit index and differs in that it assesses how well the model reproduces the sample data. Models were considered to have good fit if chi-square statistics were insignificant at the 0.05 level, if CFI values exceeded 0.95, and if RMSEA values were less than 0.06, based on standard cut off recommendations for relative fit indices (Hu & Bentler, 1999).

Model specification—Assessment of the overall model exploring the relationship between social support, TPB variables, and physical activity was performed in two steps. In the first step, confirmatory factor analysis was performed on modified measures used for

social support subtypes. For these models, factor loadings and model fit were estimated for each social support subtype with indicators based on their respective scales items. Each factor was scaled by setting the unstandardized regression coefficient of one indicator to 1. In the second step, path analysis was performed to explore the relationships between change in social support, TPB constructs, and physical activity. We calculated the change between time points for model variables using residualized change scores. We first obtained the predicted values of the post measurement using the pre values. The residualized change score was then calculated by subtracting the predicted value from the actual value. This method was used to account for differences at baseline and regression to the mean between observations (MacKinnon, 2007). A comprehensive structural equation model with latent variables was not used due to sample size and the resulting need for model parsimony. A preliminary model including the effect of group assignment found only a marginally significant relationship for one variable (perceived behavioral control) and so group was not included as a predictor in the final model. The path model (Figure 3) was based on previously described studies examining the validity of the TPB in predicting physical activity and modifications to the theory to include social support. The model was designed to assess the magnitude and statistical significance of the relationships between change in perceived social support, attitude, and perceived behavioral control and change in physical activity, mediated by change in intention. In addition, the direct relationships between change in perceived behavioral control and change in social support and changes in physical activity were assessed. Based on results from the complete path model, we performed secondary path analyses to clarify the relationship between model variables.

Results

Results include descriptive statistics for participant demographics and all study variables and the values and significance of parameter estimates and overall model fit and variance explained for path and confirmatory factor analyses.

Participants

Participants were predominately white (73%), non-Hispanic (92%), whose parents had attained college or higher-level education (79%). Participant attrition was 8% (n=11) at time 2 and 10% (n=14) at time 3. There were no significant differences between the baseline demographic characteristics of participants who completed all study measures versus those who did not.

Descriptive Statistics

Descriptive statistics are included in Table 1. All scale items exhibited good internal reliability at baseline (α = .82 – .94). Variables were screened for outliers and cases with scores greater than three standard deviations from the mean were examined for validity. Two cases were excluded from the path analysis due to extreme total physical activity values in excess of 12,000 kcals per week. Inter-correlations between social support measures are reported in table 2. Correlations between pre and post measures ranged from . 31 to .42 and there were high correlations between esteem support and companionship support at time 1 (.61, $p<.01$) and time 2 (.72, $p<.01$).

Confirmatory Factor Analysis

The three subscales for social support; information, esteem, and companionship were analyzed at baseline using confirmatory factor analysis. Models for information and companionship subscales indicated good fit with the exception of the RMSEA statistic for companionship. [Information: χ^2 (2, N=134)=1.26, P=.53, CFI = .1.00, RMSEA = .00, Companionship: χ^2 (2, N=134)=3.69, P=.16, CFI = .99, RMSEA = .08] The esteem subscale only met the CFI criteria for good fit, χ^2 (2, N=134)= 16.03, P=.00, CFI = .98, RMSEA = . 23. Based on modification indices, a second model for esteem support that correlated the errors between two indicators yielded an improved fit. [χ^2 (1, N=134)=.18, P=.68, CFI = 1.00, RMSEA = .00] Standardized factor loadings for each subscale are included in Table 3. All loadings were in excess of .80 with the exception of one indicator for esteem social support.

Path Analysis

Table 4 presents inter-correlations for residualized change scores included in the path model (model 1). Standardized parameter estimates for the model are included in Figure 3. Twelve cases from the sample were excluded from the path analysis due to missing values on predictor variables in addition to the two excluded for extreme kcal per week values. Overall fit for model 1 was good. [χ^2 (2, N=120)=.52, P=.77, CFI = 1.00, RMSEA = .00] The model explained 27% of the variance in the change in physical activity and 59% of the variance in the change in intention. (R^2 = .27, .59 respectively)

Significant predictors of change in physical activity intention included change in perceived behavioral control, attitude, and companionship social support. Significant predictors of change in physical activity included change in esteem social support and intention. There was also a significant negative relationship between change in perceived behavioral control and change in physical activity. No significant relationships between change in information support and change in physical activity or intention were found in the model. Significant, indirect effects on change in physical activity via change in intention were found for change in perceived behavioral control (.21, p<.00), instrumental attitude (.09, p=.02), and companionship support (.13, p<.01).

Because the difference in both magnitude and significance between the bivariate estimate and path coefficient between change in physical activity and perceived behavioral control suggested potential multicollinearity, we ran a second model (model 2) excluding social support variables. This model continued to exhibit the same relationship between physical activity and perceived behavioral control (−.29, p<.01), indicating that the correlation between perceived behavioral control and intention was most likely leading to a biased estimate. Based on this result, we ran a modified full model (model 3), excluding the path between physical activity and perceived behavioral control. The results from this model showed an attenuated but significant relationship between intention and physical activity (. 27, p<.01) and a non-significant, attenuated relationship between physical activity and esteem support (.20, p=.11). No change in the relationship between change in information support and physical activity was found (.01, p=.91). Based on the high correlation between esteem and companionship social support change (.68, p<.01), we also performed sensitivity

analyses to determine the independent relationship between each variable and change in physical activity and intention in two additional models. In the model including esteem but no companionship support (model 4), there was a significant direct (.23, p=.02) and indirect relationship via intention (.08, p<.02) between change in esteem support and physical activity. The model with companionship only (model 5) produced results similar to models 1 and 3, with change in companionship having a significant indirect relationship with change in physical activity via change in intention (.10, p<.01) but not a significant direct relationship (.16, p=.10). Models 3 and 5 failed to meet the chi-square criterion for good fit [Model 3: χ^2 (3, N=120)= 10.12, P=.02, CFI = .95, RMSEA = .14; Model 5: χ^2 (3, N=120)= 7.93, P=.05, CFI = .96, RMSEA = .12] and model 4 failed to meet both the chi-square and CFI criteria for good fit [χ^2 (3, N=120)=10.45, P=.02, CFI = .94, RMSEA = .14].

Discussion

The primary purpose of this study was to evaluate the influence of social support on physical activity directly and via intention in a modified TPB framework. We built upon previous research by assessing change and using multiple types of social support. Our proposed model found a significant direct relationship between esteem support and physical activity and an indirect relationship between companionship support and physical activity via intention. By using path analysis and CFA, we were able to assess the strength and significance of theoretically predicted pathways in the model, overall model fit, and the proportion of variation explained in intention and physical activity.

Esteem support was found to have a stronger direct relationship with physical activity than companionship support. This is consistent with a previous study that found esteem support but not companionship support to be significantly positively associated with strenuous and total exercise among a sample of college students (Okun et al., 2003). The relationship between social support and intention varied across models. With respect to esteem support, only in the model that excluded companionship support did we find a significant direct relationship with intention. We did find a consistent, significant relationship between change in companionship support and intention. This contrasts with Okun et al. (2003), who reported no significant relationships between any social support variables and intention in regression analysis. That analysis, however, also controlled for normative variables, which may have attenuated social support effects. The relationship between social support and intention does have prior support, however, in several other studies with varying measures of the social support construct, reinforcing the idea that social support influences physical activity behavior through greater intention (Courneya et al., 2000; R. E. Rhodes et al., 2002; Saunders et al., 2004). The direct and indirect effects of informational support on change in physical activity and intention were non-significant and had the smallest magnitude of all the social support types. This is consistent with previous findings examining informational support (Chogahara, 1999; Okun et al., 2003).

These results do not support our hypothesis regarding limited volitional control of physical activity behavior. In fact, our findings suggest that esteem support, rather than companionship support, might be more likely to reduce actual barriers to participation. A possible explanation for a mediated but not a direct effect of companionship support on

physical activity in the current study is that we explicitly included measurement of online forms of support. This measure may have recorded companionship support that is less acted upon. In other words, participants may have discussed joining each other for physical activity using Facebook but not followed through. This communication may have increased physical activity behavior intention but provided less direct assistance than the act of joining the person to workout. Our secondary model excluding companionship support did find both direct and indirect effects for esteem on physical activity and in this model, its relationship with intention was stronger than its relationship with physical activity, which is consistent with our original hypothesis. Among the social support types, informational support had the smallest effects in our model. It may be that this population already had adequate information about physical activity and change in informational support had very little effect. The results of this study support the relationship between intention and behavior predicted by the TPB. Change in intention was a moderate to strong predictor of change in physical activity in our models, which is consistent with cross sectional results from meta-analyses (Downs & Hausenblas, 2005; Hagger et al., 2002). The negative and significant direct relationship between change in perceived behavioral control and physical activity in our original model is not supported theoretically or empirically. We would expect this relationship to be either weak or positive contingent upon the level of volitional control of the activity. Based on our additional analyses, this likely resulted from a biased estimate due to the strong correlation between perceived behavioral control and intention. Change in perceived behavioral control was a strong significant predictor of change in intention in our model. This pattern is consistent with previous meta-analyses of the TPB examining the prediction of physical activity intention and several studies examining social support in a modified TPB framework (Courneya et al., 2000; Downs & Hausenblas, 2005; Hagger et al., 2002; Okun et al., 2003; R. E. Rhodes et al., 2002; Saunders et al., 2004).

In the current model, the perceived behavioral control-intention relationship was stronger than attitude-intention. The relative strength of these constructs in predicting intention has been debated and previous studies, including those examining social support within the TPB framework, have found mixed results (Courneya et al., 2000; Downs & Hausenblas, 2005; Okun et al., 2003; R. E. Rhodes et al., 2002; Saunders et al., 2004). In the current study, change in instrumental attitude had a greater effect on change in intention than change in affective attitude when controlling for social support and perceived behavioral control. This contrasts with a meta-analysis of the attitude construct of the TPB in the physical activity domain, where affective attitude greatly outperformed instrumental attitude in predicting exercise intention. (R. E. Rhodes et al., 2009) This difference may be attributed to our modifying the TPB, replacing social norms with social support. The social support construct has consistently outperformed social norms, possibly attenuating the overall effect of attitude in the current model. The relative strength of instrumental attitude may also be attributed to its weaker correlation with esteem support and perceived behavioral control than affective attitude in this sample.

Overall, our modified models of the TPB exhibited good fit by standard indices and change in social support exerted a small to medium amount of influence on change in physical activity in this modified TPB model when controlling for traditional model constructs. The current model explained similar amounts of the variance in intention and less of the variance

in physical activity than values reported by Rhodes et al. (2002). A direct comparison, however, is difficult given the differences between measures and variables used in the model and our assessment of change.

The study has several strengths including the use of multiple types of social support. We also improved upon previous designs examining TPB and social support by using change scores for predictor and outcomes variables, allowing for a stronger causal inference than cross sectional designs. In addition, the measure of perceived social support in this study explicitly included support experienced online through the use of online social networks, such as Facebook. Limitations of the current study include the use of a self-report measure of physical activity, which is subject to bias and considered less desirable than more objective measures. In addition, the sample size available for this analysis limited the complexity of the model, reduced the power to detect significant relationships, did not allow for the testing of multiple models on subsamples, and may have overestimated the fit of our model. Despite this, the model agreed largely with predictions derived from the TPB. The generalizability of this study is also limited demographically and because participants were enrolled in a study designed to increase their physical activity. It may be that a sample of less motivated individuals would not be influenced in the same ways and although no significant effects of the intervention were found, our results cannot be considered what happens naturally. Finally, we could only assess short-term change in physical activity based on predictor variables due to the brief interval between time 2 and time 3 measures.

Conclusion

This study suggests that companionship and esteem support are important among college-aged women who are motivated to be physically active. Therefore, strategies that link individuals with others to exchange these support types, including increased opportunities for communication and strategies that link individuals with others to exercise should be emphasized in physical activity interventions among this population.

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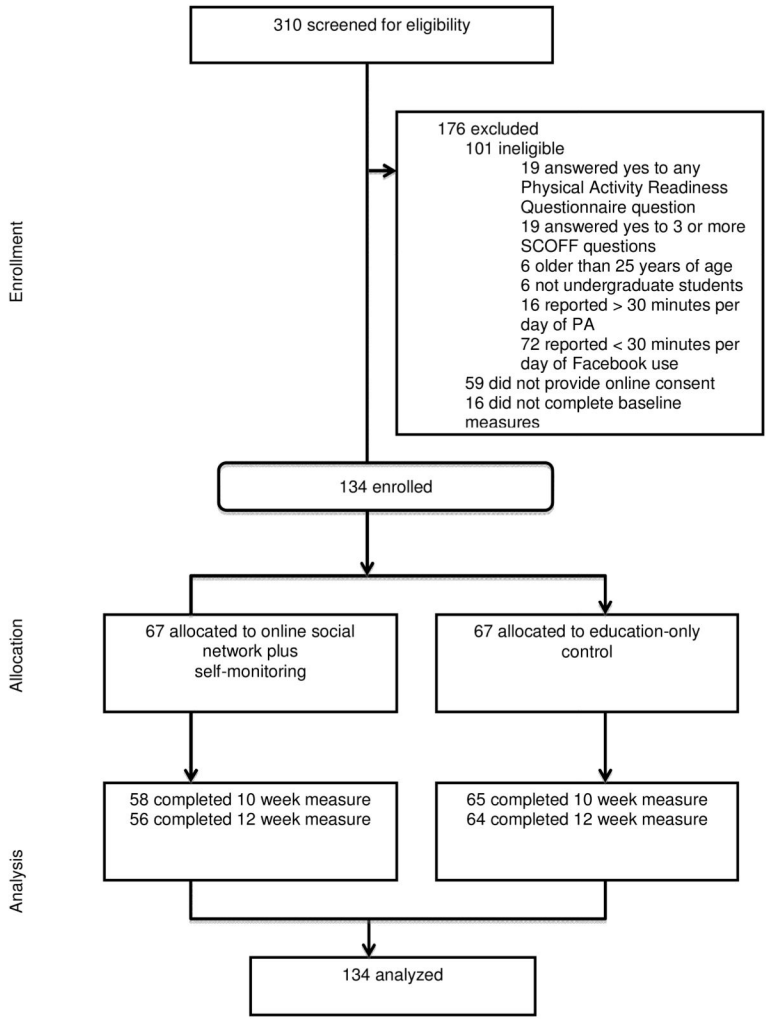

Figure 1.
CONSORT Diagram Showing Flow of Participants Through Trial

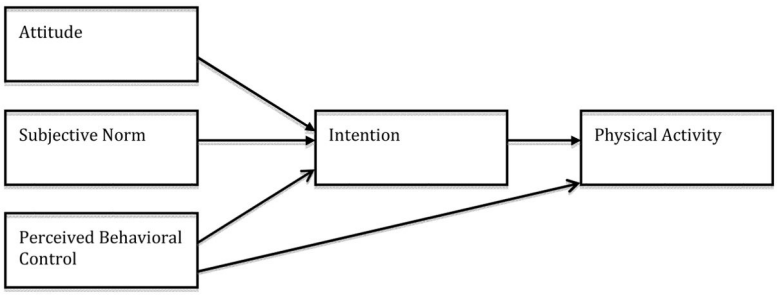

Figure 2.
The Theory of Planned Behavior (Ajzen, 1991)

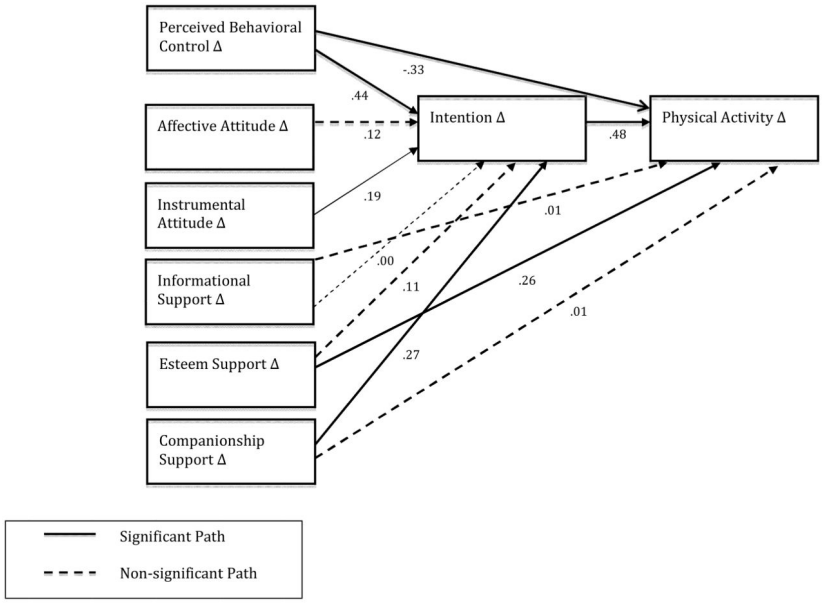

Figure 3.

Model of the Relationship Between Social Support and Theory of Planned Behavior Constructs

Table 1

Descriptive Statistics and Internal Reliability for Physical Activity, Social Support, and TPB Variables

Variable Name	N	Mean	Std. Deviation	α
Informational Support Time 1	120	1.77	.81	.89
Informational Support Time 2	120	1.90	.79	.84
Esteem Support Time 1	120	1.84	.77	.82
Esteem Support Time 2	120	2.23	.90	.89
Companionship Support Time 1	120	2.19	.94	.91
Companionship Support Time 2	120	2.51	1.05	.92
Intention Time 1	120	5.18	1.42	.85
Intention Time 2	120	5.09	1.55	.91
Physical Activity – Time 1	120	1676.48	1151.72	-
Physical Activity – Time 3	118	2318.16	1493.10	-
Affective Attitude Time 1	120	5.01	1.22	.87
Affective Attitude Time 2	120	5.06	1.43	.89
Instrumental Attitude Time 1	120	6.64	.61	.88
Instrumental Attitude Time 2	120	6.53	.87	.94
Perceived Behavioral Control Time 1	120	5.27	1.19	.82
Perceived Behavioral Control Time 2	120	5.18	1.34	.86

Table 2

Correlations Among Social Support Variables

Measure	1	2	3	4	5	6
1. Info Time 1	1.00					
2. Info Time 2	.36**	1.00				
3. Esteem Time 1	.45**	.28**	1.00			
4. Esteem Time 2	.28**	.57**	.31**	1.00		
5. Comp Time 1	.33**	.24**	.61**	.31**	1.00	
6. Comp Time 2	.27**	.47**	.28**	.72**	.42**	1.00

Note. Info = informational support, Esteem = esteem support, Comp = companionship support

** $p \leq .01$.

Table 3

Factor Loadings for Perceived Companionship, Esteem, and Informational Social Support Scales

Question Item **The questions asked were, "During the past 6 weeks, how often have your friends …"**	**Factor Loading**
Informational Support	
Informed you about the expected positive effects of exercise on your health?	.84
Explained to you why exercise is important to improve your health?	.98
Clarified for you how you may achieve your health goals through exercise?	.92
Explained to you about the amount or intensity of exercise necessary for improving your health?	.85
Esteem Support	
Affirmed that you have done well in your physical activity?	.82
Told you that you should be proud of your physical activity skills?	.90
Praised you for starting or sticking with your exercise program?	.53
Complimented your mastery of a physical activity skill?	.90
Companionship Support	
Made plans with you for exercising together?	.90
Teamed up with you to exercise together?	.99
Given you helpful reminders to exercise together with them?	.88
Changed their schedules so you could exercise together?	.85

Table 4

Correlations Among Path Model Variables

Measure	1	2	3	4	5	6	7	8
1. PA Δ	1.00							
2. Aff Attitude Δ	.08	1.00						
3. Inst Attitude Δ	.12	.40**	1.00					
4. Intent Δ	.41**	.38**	.39**	1.00				
5. PBC Δ	.09	.31**	.24**	.64**	1.00			
6. Info Δ	.21*	.20*	.16	.30**	.22*	1.00		
7. Esteem Δ	.39**	.18*	.14	.52**	.41**	.49**	1.00	
8. Comp Δ	.34**	.14	.14	.51**	.28**	.38**	.68**	1.00

Note. PA = physical activity, Aff = Affective, Inst = instrumental Intent = intention to exercise, PBC = perceived behavioral control, Info = informational support, Esteem = esteem support, Comp = companionship support

* $p \leq .05$.

** $p \leq .01$.