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The Road to Recovery: Predicting Improvement in Physical Therapy Programs

Noemie Bechu
Union College - Schenectady, NY

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By

Noemie Bechu

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ABSTRACT

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The three variables of autonomous motivation, self-efficacy, and autonomy support have positively predicted improvement in and adherence to various health rehabilitation programs. There have also been positive correlations between these variables, such that those with high autonomous motivation also have high self-efficacy. In the current study, we examined if these relationships would be replicated in the physical therapy context. Participants were adult community members recruited from their physical therapy practice through flyers. Participants were asked to complete a first survey regarding their autonomous motivation, self-efficacy, and current health status, and a second survey four weeks later asking about their current health status and the perceived autonomy support from the physical therapist. Our findings were not consistent with past research, such that none of the variables were positively correlated with each other nor were they positively correlated with perceived improvement in patients. This lack of correlations may have been due to the variety of injuries included in the sample as well as the short time-span used to measure improvement. Future research should focus on measuring all three independent variables at multiple time points and examining other potential predictors such as autonomy support from friends and family.

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Injuries that place patients in physical therapy can often require months and even years of stretches and exercises to bring the body back to its normally functioning level. However, physical therapists estimate that while 64% of their patients comply with short-term exercise prescribed, only 23% persevere with long-term exercises (Sluljs, Kok, & Van der Zee, 1993). This means that more than three quarters of the rehabilitation population will mostly likely not return to their baseline functioning. Although only estimates from physical therapists, several studies regarding injured athletes found that only 35% to 45% of patients actually follow prescribed exercise regimes (Sluljs et al., 1993). These compliance results are discouraging, as time spent in physical therapy is a direct predictor of actual improvement in the functional status of patients (Roach et al., 1998). As expected considering these low compliance rates, self-perceived improvement in physical therapy programs is also strikingly low. One study conducted with patients suffering from sciatica found that only 24% of the patients undergoing physical therapy reported meaningful clinical improvement (Jewell & Riddle, 2005). Such work highlights the importance of furthering the research around rehabilitation programs and determining the factors that may predict improvement among patients.

Compliance to rehabilitation- and therefore improvement- is likely determined by a variety of factors. On the whole, compliance to rehabilitation requires a person to engage in strong self-regulation of behavior to conform to the goals and exercises assigned by the therapist, and thus self-regulatory factors are likely to be of significance in the process. Understanding how these variables are related to rehabilitation compliance is one necessary step to better tailor physical therapy programs so that improvement is maximized in the shortest period of time. For this reason, this thesis investigated three factors from two applicable theories of self-regulation:

Bandura's (1989) social cognitive theory and Deci and Ryan's (2000a, 2000b) self-determination theory. Specifically, the unique predictive validity of and interaction between self-efficacy, autonomy support, and autonomous motivation were evaluated.

Self-Efficacy

Self-efficacy refers to an individual's belief in his/her capacity to accomplish a certain act (Bandura, 1989). It is most frequently defined for specific situations, such that one's self-efficacy to exercise may be different from one's self-efficacy to diet (McAuley & Blissmer, 2000). Bandura's (1977) posits that self-efficacy is crucial to both the initiation and perseverance of a behavior. His model argues that people's will to perform a certain behavior is based on efficacy expectations, or their beliefs in their ability to engage in that behavior. Furthermore, people also believe their behavior will lead to a certain outcome, which is referred to as an outcome expectation. However, if an individual does not have high efficacy expectations, that person will doubt his/her ability to succeed, which consequently changes both the behavior and outcome expectation. For these reasons, self-efficacy is believed to be an important determinant in initiating behavior.

Bandura's (1989) social cognitive theory also states that those with higher self-efficacy will set higher goals for themselves and have a stronger commitment to these goals. This commitment and perseverance in accomplishing these goals occurs because those with high self-efficacy maintain behaviors even in the advent of difficulties. High self-efficacy does not minimize the self-doubts the individual will experience in the face of failure, but it minimizes the period of recovery from these thoughts. These individuals can visualize their success rather than create scenarios of failure, resulting in this stronger perseverance that characterizes high self-efficacy beliefs. Thus, compared to those with low self-efficacy, individuals with high self-

efficacy are more likely to initiate and commit to a behavior, even in the face of challenges, to achieve their goals.

According to Bandura (1977) there are four different ways to enhance self-efficacy. It can occur through performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal. The more self-efficacy is improved, the less likely unpredictable obstacles will prevent both behaviors and outcomes. Contrastingly, in the face of unprecedented challenges, individuals with already low self-efficacy will discontinue their wanted behavior, changing the outcome, as well as decreasing the probability that this individual will try and engage in this behavior at a future time.

Self-efficacy has been examined in a number of different contexts, with its effects remaining relatively constant and promising throughout the research. In the context of work performance and academic success, individuals with higher self-efficacy demonstrated better work-related performance, and high self-efficacy in students predicted better grades, persistence, and a higher range of perceived career options (Stajkovic & Luthans, 1998; Lent, Brown, & Larkin, 1986). When analyzed in differing rehabilitation settings, the effects of self-efficacy have illustrated similar positive influences.

For example, in patients with pulmonary disease, self-efficacy significantly predicted improved physical activity, quality of life, and total health status, emphasizing the impact this variable can have various health domains (Bentsen, Wentzel-Laren, Henriksen, Rokne, & Wahl, 2010). In patients suffering from heart disease, self-efficacy significantly predicted intentions to exercise (Slovinec D'angelo, Reid, & Pelletier, 2007). Even more convincing, self-efficacy actually predicted exercise behavior at a six-month follow-up in patients with coronary heart disease, depicting the importance of self-efficacy in both the initiation and perseverance of a

behavior (Slovinec D'angelo, Pelletier, Reid, & Huta, 2014). These results provide initial support for the positive influence of self-efficacy on perceived improvement in physical therapy patients. This is because rehabilitation in physical therapy, as well as better outcomes observed by the patient, requires commitment to and belief in the ability to complete prescribed exercises (Jette & Jette, 1996).

Autonomous Motivation

For this research, motivation was operationalized following the self-determination theory (Ryan & Deci, 2000b). This theory posits that an individual's motivation to act is based off of three innate psychological needs: competence, the ability to master an activity; relatedness, feeling understood by others; and autonomy, feeling responsible for one's own behaviors and outcomes. The more an outcome satisfies these three needs, the more motivated the individual will be to engage in a behavior to fulfill these needs.

This theory also characterizes motivation in six different ways, such that different motivations can have varying levels of success (Deci & Ryan, 2008). The hierarchy of the self-determination theory begins with amotivation, which is simply lacking the intention to act because the person doesn't feel competent or has no desire to perform the activity. The next four forms of motivation all fall under extrinsic motivation, which is defined as engaging in behaviors for instrumental reasons such as to avoid punishment or guilt. The first type of extrinsic motivation is external regulation, which is the least effective type of motivation, after amotivation. People who are externally motivated engage in behaviors to receive a reward or avoid punishment. Second, introjected regulation refers to partaking in behaviors without fully accepting them as one's own, which is usually done to avoid guilt. Third, identified regulation occurs when an individual values the goal and when the actions needed to complete this goal are

seen as important to the individual for personal reasons. The fourth form, integrated regulation, is when an individual fully integrates the behavior into one's own values and needs, such that is becomes part of their self-concept. Intrinsic motivation represents the last of the subscales defining motivation and is the most powerful in convincing individuals to engage in a behavior. This motivation is completely inherent in the individual, such that one's behavior is a result of one's individual interest and curiosity in performing this behavior. Individuals with intrinsic motivation partake in behaviors for the pleasure it brings them, as well the satisfaction they feel through the accomplishment of these behaviors that leads to the desired outcome. Thus, the six forms of motivation represent a continuum from amotivation to intrinsic motivation with those having more intrinsic forms of motivation showing more personal integration of the behavior into their sense of self.

Initially, intrinsic motivation was defined as the most successful motivation, but recently studies have depicted that both identified regulation and integrated regulation are also crucial to motivation. All three types of motivation reflect the most self-determined or autonomous motivations, in which people are more likely to show perseverance in their behaviors (Deci & Ryan, 2008). For this reason, this thesis will focus on autonomous motivation, which includes the individual's intrinsic, identified, and integrated regulation.

The effects of autonomous motivation in rehabilitation programs have been researched extensively. In the context of weight loss programs, autonomous motivation was a significant predictor of both attendance and weight loss during the program (Williams, Grow, Freedman, Ryan, & Deci, 1996). Even more promising, autonomous motivation also predicted maintenance of the program at a 23-month follow up, depicting the lasting effects of this variable on improvement. In patients with diabetes, autonomous motivation was a significant predictor of

reduced glucose levels, highlighting its ability to predict health improvement (Williams, Freedman & Deci, 1998). Similar results were also found for patients with coronary heart disease and their exercise behavior (Slovinec D'angelo et al., 2014). Autonomous motivation may also be a significant predictor of improvement in physical therapy programs, as an important aspect of these programs is the exercise prescribed to continue working the muscle or ligament that has been impaired. This variable deserves research specifically in the context of physical therapy, as lack of motivation was often mentioned by patients who were non-compliant in their physical therapy programs (Sluljs et al., 1993).

Autonomy Support

The last variable that will be examined for this research is autonomy support. It is defined by the support others provide to the individual, especially by encouraging personal initiative and reaffirming competency in a given situation (Gagne, 2003). Autonomy supportive climates engage individuals in the goal setting process by involving them in the actual creation of goals as well as the steps needed to accomplish these goals. This setting also encourages independence by providing choices for the individual, while still acting as a support system by providing verbal encouragement (Williams, Gagne, Ryan, & Deci, 2002). Autonomy support has frequently been studied in conjecture with the self-determination theory, as having high autonomy support yields intrinsic motivations, as it helps to satisfy the need for competence, relatedness, and autonomy (Ryan & Deci, 2000).

Autonomy support was chosen as an important variable regarding improvement, as compliance in physical therapy programs was significantly related to the positive feedback that the patients received from their physical therapists (Sluljs et al., 1993). Additionally, correlations between autonomy supportive health care climates and positive physical health ranged from .08

to .39 (Ng et al., 2012). As one weight-loss study noted, autonomy supported individuals had more weight loss progress compared to directive supported individuals (Gorin, Powers, Koestner, & Wing, 2014). Autonomy support in patients with diabetes has been studied extensively, with autonomy support predicting both glucose levels at a 12-month follow-up (Williams et al., 1998) and physical activity of patients with type 2 diabetes (Koponen, Simonsen, & Suominen, 2017). In addition, autonomy support predicted clinic-based adherence in physical therapy patients (Levy, Polman, & Borkoles, 2008). These studies are related to my thesis, as physical activity and adherence are paramount to perceived health improvement in physical therapy.

Autonomy support refers to a support system that emphasizes the importance of an individual pursuing his or her goals by validating feelings compared to directive support, which is described by a support system that exercises with the individual and provides rewards and punishment for progress and loss. Ideally, physical therapists fall under the autonomy supportive role, engaging patients in the goal setting process while also tailoring their prescribed exercises to the needs and functional status of the patient. Because of this, it was also predicted that autonomy support would be significantly correlated with perceived health improvement in physical therapy patients.

Relationships between Self-Efficacy, Autonomous Motivation, and Autonomy Support

As depicted, the body of literature on self-efficacy, autonomous motivation, and autonomy support suggest that these characteristics may relate to perceived improvement in physical therapy settings. The relationships between these variables has also been investigated, finding that all three variables are positively correlated (Koponen et al., 2017). Research specifically on the interplay between autonomous motivation and autonomy support has shown

that the predicting ability of autonomy support alone becomes insignificant when tested with autonomous motivation (Russel & Bray, 2010; Williams et al., 1998). Identical results were found in patients with diabetes and their levels of physical activity, such that the effect of autonomy support on physical activity disappeared when autonomous motivation of the individual was controlled for (Koponen et al., 2017). Although a mediation analysis was not performed by Williams et al. (1996), they found that autonomy support significantly predicted autonomous motivation to continue in the program. These relationships depict that although autonomy support does predict positive health outcomes in various health settings, this effect is most likely mediated by autonomous motivation. This research is in line with the self-determination theory, which states that an autonomy supportive climate enhances the three needs of competence, relatedness, and autonomy (Deci & Ryan, 2000b). Consequently, the more these needs are satisfied, the more autonomous motivation the individual will garner. This relationship was shown in a study by Amorose and Anderson-Butcher (2006) which depicted the predicting effect of autonomy support from the coach on each of the three needs in high school and college athletes: competence, relatedness, and autonomy. Thus, although autonomy support predicts positive health outcomes, its predicting ability becomes insignificant when assessed with autonomous motivation, as autonomy support has been repeatedly found to increase levels of autonomous motivation.

The other relationship of interest for this research was that between self-efficacy and autonomous motivation, as the purpose of this research was to determine which variable was the best predictor of perceived improvement in physical therapy programs. Slovinec D'angelo et al. (2007) investigated this relationship in individuals interested in initiating an exercise program, finding that only the effect of self-determined motivation (a construct that evaluates both

autonomous and controlled motivation together) on exercise intentions and exercise planning remained significant when both self-efficacy and autonomous motivation were included in the model. Furthermore, in predicting physical activity in patients with diabetes, when both self-efficacy and autonomous motivation were included in the prediction model, only the effect of autonomous motivation remained significant (Sweet et al., 2009). In a similar study design, Koponen et al. (2017) also reiterated this relationship, with results illustrating that self-care competence did not mediate the relationship between autonomous motivation and physical activity, depicting the independent predicting ability of autonomous motivation. Competence and self-efficacy are similar constructs that have frequently been used interchangeably throughout research. Both are measured using scales that include "I feel confident in my ability to…" (Bandura, 1997; Sweet, Fortier, Strachan & Blanchard, 2012; Koponen et al., 2017). Because of this relationship between these two constructs, it is not surprising that self-efficacy would also influence autonomous motivation, as a prominent component of the self-determination theory states that satisfying the need for competence promotes more autonomous motivation. This relationship was reiterated in Bandura's (1989) social cognitive theory that states an individual's self-efficacy will dictate his/her level of motivation. This past research depicts the independent predicting ability of autonomous motivation in various health contexts, even when examined with either self-efficacy or autonomy support. Thus, similar correlations were expected in the context of physical therapy.

Based on this past research, there were two hypotheses of interest in this study. First, all three variables of autonomy support, self-efficacy, and autonomous motivation would be positively correlated. Second, following both Bandura's (1989) social cognitive theory and self-determination theory of Deci and Ryan (2000a), it was hypothesized that although all three

variables would be positively correlated with perceived improvement, when all three variables were examined concurrently, only autonomous motivation would remain significant. Thus, autonomous motivation was hypothesized to explain the most unique variance, acting as the best predictor of perceived health improvement in physical therapy programs.

Method

Participants

All participants of this study must have been currently undergoing physical therapy. Flyers, seen in Appendix A, that provided a brief outline of the study, including purpose, requirements of participants, and compensation were hung in various physical therapy practices. Participants were recruited from a total of six physical therapy practices. A sign-up sheet accompanied the flyer on which patients provided their emails, which was then used to send them the online surveys. Forty-six participants completed both surveys, but four of these participants were omitted from the data as their ID numbers did not match between the first and second survey. Seven participants completed survey one, but not survey two so their data was also excluded. The final sample consisted of 42 participants (14 men, 27 women, one did not answer). The average age of participants was 49.48 (*SD* =16.15). Regarding ethnicity, 88.1% of participants were Non Hispanic or Latino, 7.1% were Hispanic or Latino, and 4.8% preferred not to answer the question. Regarding race, 85.7% were White, 9.5% were African American 2.4% were Asian, and 2.4% identified as “other”.

Procedure

Patients provided their emails to sign up for the study. A survey link through Zarca Interactive was sent to them via this email; however, this email address was not associated with the collected data in any records. The first page of the first online survey provided patients with a

brief description of the study while also reiterating the anonymity and confidentiality of the study. If patients agreed to participate, they were asked to click a box indicating they had read the above information and voluntarily agreed to enroll in the study. They were then directed to the actual survey, which included measures of autonomous motivation, self-efficacy, and patient health status. Four weeks later, a second survey was sent that included the same measure of the patient's health status, as well as a measure of autonomy support and demographic questions.

Measures

Self-efficacy. The Revised Self-Efficacy for Rehabilitation Scale (Waldrop, Lightsey, Ethington, Woemmel, & Coke, 2001) measured a patient's self-efficacy for achieving his/her goals in the rehabilitation program. Originally 12 items, the scale was reduced to seven items, as the first five items dealt specifically with physical therapy involving the legs. Responses were on an 11-point Likert scale from 0 (*I cannot do*) to 10 (*Certain I can do*). Scores were summed and divided by the total number of items, with higher scores indicating higher self-efficacy. Past work demonstrated a Chronbach's alpha is .94 for the full scale (Stevens, van den Akker-Sheek, & van Horn, 2004).

Autonomous motivation. The Client Motivation for Therapy Scale (Pelletier, Tuson, & Haddad, 1997) examined the different constructs of motivation posited by the self-determination theory. These six subscales are intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation, with each having internal consistencies of .92, .91, .82,. .75, .70, and .91 respectively (Pelletier et al., 1997). Each question allowed participants to respond on a 7-point Likert scale ranging from 1 (*not true at all*) to 7 (*totally true*). Scores on each subscale were determined by computing the sum to each question.

To examine autonomous motivation for participants, the average of the intrinsic motivation, integrated regulation, and identified regulation was calculated.

Autonomy support. The Health Care Climate Questionnaire (Williams et al., 1996) assessed the level of autonomy support found in the health care setting. It was originally designed for patients of physicians, so for the purpose of this study, "physician" was changed to "physical therapist", as this was how previous studies changed the questionnaire to tailor their research (e.g., Levy et al., 2008). The questionnaire asked respondents to rate their interactions with the physical therapist on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*). The total score for each participant was calculated by the addition of all responses (with question 14 being reverse-coded); higher scores indicated better perceived autonomy support. Chronbach's alpha for this measure has been found at .80 (Williams et al., 1996).

Health status. Originally composed of eight multi-item scales, the Revised RAND 36-item Short Form Health Survey (Ware & Sherbourne, 1992) was reduced to four sub-scales. These sub-scales were titled physical functioning, role limitations due to physical health problems, bodily pain, and general health perceptions, with the addition of one question that assessed reported health transition. Past work has found the reliability of each scale to be .93, .84, .82, and .78 respectively (McHorney, Ware, Rachel Lu, & Sherbourne, 1994). These scales were used to examine perceived improvements in patients. An average of the computed scores in each scale was taken, and a final score referred to as the physical component summary was calculated by averaging out all the means of each subscale. Perceived improvement in participants was computed with a difference score for the health status scores between survey one and survey two.

Demographic questionnaire. This brief demographic questionnaire, seen in Appendix B, asked patients about their biological sex, gender identity, height, weight, religious affiliation, age, race, ethnicity and if English was their native language. Pertaining to the study, this questionnaire also asked patients at which practice they were currently undergoing physical therapy, as well as the injury that placed them in physical therapy and the seriousness of the injury and the pain experienced because of it. Additionally, participants were asked to report the amount of weeks they had been undergoing physical therapy, the amount of physical therapy sessions attended, and the amount of physical therapy sessions missed.

Results

Participant Data

Participant characteristics for physical therapy involvement and injury perceptions are presented in Table 1. Although time spent in physical therapy varied between individuals, participants reported being in physical therapy for an average of five months with an average of two appointments per week. They also reported doing an average of around four hours of prescribed exercises each week. During their time in physical therapy, participants reported missing an average of one to two appointments. Regarding the nature of injury, participants reported feeling that, on average, they saw their injury as somewhat serious, with very few reporting that their injury was very serious. In addition, patients reported experiencing some pain as a result of their injury. Sample size differed between sample characteristics, as some participants failed to indicate the hours per week they did the exercises prescribed by their physical therapist as well as the physical therapy sessions they had missed. Thus, the sample size for each calculated descriptive statistics is also reported in Table 1.

Additionally, the types and frequencies of injuries reported by patients are provided in Table 2. Most (n = 9) reported experiencing more than one injury or reported an "other" injury (n = 9) such as multiple sclerosis or dizziness. Following this, leg injuries, such as an ACL tear were reported by eight patients, and trauma and postoperative (n = 7) and neck/shoulder (n = 7) were the next most frequently occurring in the sample.

Correlations

The descriptive statistics, including means, standard deviations, and Cronbach's alpha, for all variables are presented in Table 3. Although the mean of perceived improvement was small (M = 6.69, SD = 11.94), health status did differ as a function of time, t (41) = -3.63, p = .001, d = -0.56, such that participants reported higher health scores at Time Two, four weeks after the first survey was sent at Time One.

The distribution of scores for self-efficacy and autonomy support were both negatively skewed, violating the assumption of normality of Pearsons r's correlations. Therefore, Spearman's rho correlation coefficients were calculated between the four variables of autonomous motivation, self-efficacy, autonomy support, and perceived improvement. All correlations were non-significant (see Table 4). Although four of the correlations were negative, the coefficients were so small that the direction of the relationship still remains inconclusive.

Lastly, Spearman's rho correlations were again examined between variables for men and women separately. Although men and women did not significantly differ in the mean values for these four variables, the pattern of relationships between the variables differed in men and women. The correlations for men, although non-significant, were positive, and were representative of the correlations we expected to see. Table 5 presents the correlations when males and females were assessed separately.

Discussion

The current study was designed to assess the role of autonomous motivation, self-efficacy, and autonomy support in predicting perceived improvement in physical therapy programs. However, both initial hypotheses were not supported. First, there were no significant correlations between the three independent variables of autonomous motivation, self-efficacy, and autonomy support, although past research has repeatedly illustrated the positive relationships between these three variables (Williams, McGregor, Zeldman, Freedman & Deci, 2004). Secondly, none of the independent variables were significantly correlated with perceived improvement, making it impossible to determine if one predictor was better than the others. There was a significant improvement in overall health status though, indicating the benefits that physical therapy does have on patients suffering from various injuries. This is in line with past research that has also shown the positive effects of physical therapy on health outcomes (Tosa, Albu & Papa, 2016).

The failure of this study to support our first hypothesis brings into question why the expected correlations were not replicated. One possible reason for this lack of correlations may be the different time points at which the variables were assessed. Previous research by Williams et al. (2002) has shown that baseline measures of autonomy support and autonomous motivation were not significantly correlated. This may be due to the fact that autonomy support has been found to significantly increase levels of autonomous motivation (Williams et al., 1998; Saebu, Sorenson & Halvari, 2013), which may further explain why autonomous motivation at Time One was not correlated to autonomy support at Time Two in this study. Because autonomous motivation was only assessed at the start of physical therapy, the effect of autonomy support on autonomous motivation may not have been explored sufficiently. In contrast with my thesis, past

research did show positive correlations between autonomous motivation at baseline and autonomy support several weeks later (Williams et al., 2002), highlighting the need for future research to further explain these discrepancies.

A similar explanation could also be provided for autonomy support and self-efficacy, as autonomy support is believed to improve levels of self-efficacy (Bandura, 1977). Again, because self-efficacy was only measured at baseline, the impact of autonomy support on self-efficacy was not explored, which may explain this lack of correlation. This relationship deserves further research due to findings that in patients with disabilities and in patients undergoing a physical activity maintenance program, autonomy support was not positively related to an increase in self-efficacy (Fortier, Sweet, O'Sullivan & Williams, 2007; Saebu et al., 2013).

The second hypothesis of my thesis regarded which variable would be the best predictor of improvement in physical therapy programs. Although autonomous motivation was hypothesized to be the best predictor, this hypothesis was not supported, as autonomous motivation was not significantly correlated with perceived improvement. Additionally, neither autonomy support nor self-efficacy was positively correlated with perceived improvement. These findings contradict results from past research, which has shown significant correlations between all three of these variables and a positive health outcome (e.g., Levy et al., 2008; Sweet et al., 2009; Slovinec D'angelo et al., 2007). One possible explanation for this failed replication may be the scale used to measure health status, and consequently, perceived improvement. Because the participants had such a wide variety of reported injuries that placed them in physical therapy, the general health scale used may not have captured the expected improvements after a four-week time span, especially because such improvement can differ drastically depending on the injury. Recommendations by Brewer (1999) encourage studies to include a homogenous sample of

injuries, as the demands of injuries can vary greatly, influencing the perceived improvement.

Another explanation for the lack of correlations may be the ceiling effects observed for both autonomy support and self-efficacy. Specifically, in the sample for my thesis, the means for both variables were near the high end of the scale, indicating high perceptions of autonomy support and physical therapy self-efficacy. Perhaps, individuals with lower autonomy support and/or self-efficacy need to be sampled to see the relationship with perceived improvement. In addition, when measuring autonomy support specifically, past research has had sessions audio-taped, with trained observers rating the autonomy support provided by the health care practitioner (Williams et al., 2002). Such method can provide more accurate and potentially more varied representations of the climate produced by the practitioner, compared to patient self-report. Future research should explore both patients with lower perceived autonomy support as well as the effect of measurement on such findings.

One interesting finding that was not expected was the gender discrepancy that appeared in our correlations. When the data was separated into males and females, the correlations in males between autonomy support, self-efficacy, autonomous motivation, and perceived improvement were all positively correlated, although not significant. This lack of significance however may be explained by the small sample size. Only 14 males participated in the study. Contrastingly, the correlations for the females were mostly negative. Past research suggests these discrepancies may not be related to a gender difference in autonomous motivation, as a recent meta-analysis indicated that there were no significant gender differences on any of the five subscales of motivation (integrated motivation was not on the measure used; Guerin, Bales, Sweet & Fortier, 2012).

However, differences may be attributed to gender discrepancies in levels of self-efficacy. In a sample of women post-hospitalization for cardiac complications, the relationship between their self-efficacy and physical activity became significantly weaker from two to 12 months (Blanchard et al., 2007). Although women reported increasing levels of self-efficacy, they did not report increased physical activity. This trend may also explain the lack of correlation between self-efficacy and perceived improvement in women in our study.

Finally, past studies have also depicted a gender differences in levels of physical activity reported between males and females, such that males report more physical activity and adherence to a cardiac rehabilitation program than females (Blanchard, Rodgers, Courneva, Daub & Knapik, 2002; Blanchard et al., 2007). However, in our study, females actually reported more perceived improvement than males, highlighting the need for future research to examine why these gender differences appeared in the physical therapy context.

Limitations

A significant limitation of this research was the differing amounts of time spent in physical therapy that was reported by participants. Initially, this thesis intended to recruit participants who were just beginning physical therapy so perceived improvement would be a measure of improvement made in the first four weeks of physical therapy. Instead, participants reported being in physical therapy anywhere from one week to one year. Although there was no significant correlation between time in therapy and the four variables of the thesis, it is possible that these differing time frames could have significantly affected a third variable that related to perceived improvement scores as well as self-efficacy and autonomous motivation. Moreover it is likely that improvement in the first four weeks of physical therapy may vary drastically from

the improvements occurring in a time span of four weeks in the later months of physical therapy, though this may be injury-dependent

Although using participants with differing injuries can increase the generalizability of results, it may have obfuscated the correlations we expected to see in this thesis. For example, a few of our participants reported being in physical therapy for multiple sclerosis (MS), a degenerative muscular disease that has no cure. In one past study that examined the effects of a 6-month intervention of either yoga or aerobic exercise for patients with MS, there was no significant improvement on either the physical functioning, physical health impact, or bodily pain scales of the 36-item short form health survey (Oken et al., 2004). Because these expected improvements were not found after a 6-month intervention, it is likely that they would also not be depicted after a 4-week time span. This highlights the different time commitments varying injuries can have, as well as the different improvements that should be expected, illustrating the need for future studies to focus on one specific injury in their study designs.

The last limitation regarding this research was the small sample size. Because an adult community sample was needed for this study, the amount of participants recruited was limited. Additionally, the sample consisted of mostly older adults, who have been shown to have significantly less clinic- and home-based adherence in physical therapy compared to younger adults (Levy et al., 2008).

Future Research

Among the other recommendations made throughout the discussion, it is crucial that these variables continue to be studied in the physical therapy context, as our study did illustrate the positive correlations we expected in males. To add to this study design however, future research should measure the three independent variables of autonomous motivation, self-

efficacy, and autonomy support at various time points through physical therapy, as previous studies have done (e.g., Williams et al., 1998; Williams et al., 2002; Fortier et al., 2007). By measuring these variables, predictive models can be examined that assess the relationships between the variables. Specifically in the physical therapy context, it is still unclear if autonomy support increases autonomous motivation and self-efficacy, as has been shown in other various rehabilitation programs.

Additionally, measuring these variables at different time points can help identify which variable-autonomous motivation, self-efficacy, or both-has a mediating role on health outcomes, as a consensus on this has yet to be reached. Although past research does provide support for autonomous motivation as the mediator (Sweet et al., 2009), other literature illustrates the ability of autonomous motivation to actually enhance feelings of self-efficacy (Slovinec D'angelo et al., 2014). This relationship has been supported with patients and exercise intentions (Slovinec D'angelo et al., 2007) and diabetic patients and glucose levels (Williams et al., 2004). Future research is needed to uncover how these variables relate to one another and if it may actually depend on the context of the rehabilitation.

Finally, because no significant correlations were found in this research, it is important to consider other variables that may be having a significant effect on perceived improvement, other than the three previously tested. For example, because autonomy support failed to predict home-based adherence in physical therapy patients (Levy et al., 2008), it would be beneficial to examine the social support from others such as a parent, friend, or significant other. In patients infected with HIV, social support was significantly positively correlated with both adherence to antiretroviral therapy and physical functioning (Luszcynska, Sarkar, & Knoll, 2007). Because many physical therapy exercises must be completed at home, social support from others may

have a greater effect in perceived improvement compared to the autonomy support of the physical therapist. Additionally, perceptions of physical therapy may influence perceived improvement, as the perception that chest physiotherapy did not help was a predictor of actual adherence to CP in cystic fibrosis patients (Myers & Horn, 2006). Similar results could be found in the physical therapy context, especially if the individual has already been in physical therapy for the same or different injury.

Conclusion

The results of this study fail to illustrate the positive health outcomes associated with autonomous motivation, self-efficacy and autonomy support in the physical therapy context. However, research regarding these variables in physical therapy should continue to be examined, as limitations of the study may have been responsible for the lack of correlations. Additionally, it is worth considering other variables that may be better predictors of improvement, such as social support or perceptions of physical therapy. Many will enter physical therapy at some point in their lives, and although physical therapy has proven to be effective in producing improvement, a large proportion of people still fail to adhere to physical therapy programs and prescriptions. This means that these individuals are unlikely to achieve pain reduction and substantial returns to pre-injury ability. Thus, it is imperative for basic research to determine what factors differentiate those who make these gains and those who do not.

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Table 1

Sample characteristics regarding physical therapy

Variable	N	Min	Max	*M*	*SD*
Weeks in physical therapy	42	1	256	21.21	44.99
PT appointments per week	42	0	10	2.02	1.60
PT sessions missed	41	0	6	1.48	1.73
Hours per week you do the exercises prescribed by your PT	39	1	32.50	4.27	5.16
Seriousness of injury	42	1	4	2.55	.97
Pain from injury	42	1	4	2.29	.77

Table 2

Types and Percentage of Injuries reported by participants

Injury	Percentage
Leg	19.0
Trauma or post-operative	16.7
Neck/shoulder	16.7
Back	4.8
More than one	21.4
other	21.4

Table 3

Descriptive Statistics for Autonomous Motivation, Self-Efficacy, Autonomy Support, and Perceived Improvement

Variable	*M*	*SD*	Cronbach's α
Autonomous Motivation	21.1	4.19	.87
Self-Efficacy	7.69	1.88	.89
Autonomy Support	6.19	1.13	.97
Health Status Time 1	55.60	22.65	.92
Health Status Time 2	62.28	23.58	.93

Table 4

Spearman's Rho Analysis for the predictors of perceived improvement

	Autonomous Motivation	Self-Efficacy	Autonomy Support	Perceived Improvement
Autonomous Motivation	-	-.006	-.051	-.091
Self-Efficacy	-	-	.021	.083
Autonomy Support	-	-	-	-.062
Perceived Improvement	-	-	-	-

Note. All correlations were non- significant, $p > .05$. $N = 42$.

Table 5

Spearmann's Rho Analysis for the predictors of perceived improvement distributed by gender

	Autonomous Motivation	Self-Efficacy	Autonomy Support	Perceived Improvement
Autonomous Motivation	-	-.005	.038	-.275
Self-Efficacy	.036	-	-.228	-.075
Autonomy Support	-.112	.294	-	-.176
Perceived Improvement	.254	.360	.065	-

Note. Correlations for males (n = 14) are presented below the diagonal, and correlations for females (n = 27) are presented above the diagonal.
All correlations were non-significant (p > .05).

Appendix A

Flyer used to recruit participants

Help Needed for Union College Senior Research Thesis

My name is Noemie Bechu and I am a senior psychology major at Union College. For my thesis, I will be exploring how behavioral research and theories can be applied to the rehabilitation of patients and I need your help!

What would be required of you?

To complete **2 anonymous and confidential 15-minute surveys online** at two different time periods regarding your desire to engage in and your experience in physical therapy.

1 in 10 chance to win **$50** once both surveys are completed!

Please provide your email below if interested or email me at bechun@union.edu!

For more information:
Noemie Bechu, Senior Student, bechun@union.edu
Lindsay Morton, Faculty Advisor, mortonl@union.edu

Appendix B

Demographic questionnaire

1) What is your gender?

(1) Male

(2) Female

2) What is your gender identity?

(1) Male

(2) Female

(3) Non-Binary

(4) Prefer not to answer

3) What ethnicity do you consider yourself to be?

(1) Hispanic or Latino

(2) NOT Hispanic or Latino

(3) Prefer not to answer

4) In which racial or national-origin group do you consider yourself to be included? Select one or more of the following.

(1) American Indian or Alaskan Native

(2) Asian

(3) Black or African-American

(4) Native Hawaiian or other Pacific Islander

(5) White

(6) Other (Please specify) _____

(7) I prefer not to answer this question

5) Is English your native language?

(1) Yes

(2) No

6) How would you describe your religious background?

(1) Catholic (Christian)

(2) Orthodox Eastern (Christian)

(3) Protestant (Christian - e.g., Baptist, Methodist, Lutheran)

(4) Mormon (Christian)

(5) Jewish

(6) Muslim/Islamic

(7) Buddhist

(8) Hindu

(9) Other

(10) No religion

(11) Prefer not to answer

7) Please indicate how committed you are to your religious beliefs:

(1) Devout (Strong)

(2) Moderate

(3) Inactive

(4) Not applicable

8) What is your age? _____

9) What is your height? ___feet _____inches

10) What is your weight? _____ pounds

11) Why are you currently undergoing physical therapy?

(1) back injury

(2) neck/shoulder injury

(3) trauma and post-operative condition

(4) leg injury

(5) other (please specify)

12) How many weeks have you been attending physical therapy? _____

13) On average, how many physical therapy sessions have you attended? _____

14) How many hours per week , on average, do you preform the exercises prescribed by your physical therapist? _____

15) On average, how many physical therapy sessions have you missed? _____

16) How serious do you find your injury?

(1) not serious

(2) somewhat serious

(3) rather serious

(4) very serious

17) How much of a handicap does this injury form for you compared with your normal activities?

(1) No pain

(2) Some pain

(3) Rather considerable pain

(4) Very considerable pain

18) People take surveys for a lot of reasons. Were you completely honest and serious in responding to this survey? Or were you joking around or giving less-than-honest responses?

(1) I answered the survey seriously and honestly.

(2) I provided joking or less-than-honest responses to the survey.