Rehabilitation Compliance in an Athletic Training Environment

Paula N Byerly, MS, ATC, SPT
Teddy Worrell, EdD, PT, ATC
Julie Gahimer, MS, PT, HSD
Elizabeth Domholdt, EdD, PT

Abstract: *The purpose of this study was to determine the relationship between the rehabilitation adherence of athletes and their self-reported assessment of six variables that might influence rehabilitation adherence: pain, support from others, exertion, scheduling, motivation, and environment. Each of 44 Division II athletes sustained a musculoskeletal injury and was placed on a rehabilitation program. Adherence to the program was measured by attendance at and participation in scheduled rehabilitation sessions. Each athlete was classified as adherent (n = 27) or nonadherent (n = 17). Pain and support were significantly correlated to adherence. Pain and support from others were significantly different between the adherent and nonadherent groups. Principal components analysis was also performed and confirmed the t-test results that pain and support are the only subscales strongly associated with adherence scores. We conclude that controlling pain and providing emotional support is associated with sport rehabilitation adherence.*

Paula N. Byerly is a staff physical therapist at Community Hospital of Indianapolis.
Teddy Worrell is an assistant professor and Director of Research at the University of Indianapolis at 1400 E. Hanna in Indianapolis, IN 46227.
Julie Gahimer is an assistant professor at the University of Indianapolis.
Elizabeth Domholdt is Dean and an associate professor of the Krannert School of Physical Therapy at the University of Indianapolis.

Rehabilitation adherence after musculoskeletal injuries is frequently a challenge for the health care professional. The clinician, whether an athletic trainer or a physical therapist, schedules patients for rehabilitation sessions. Not all patients, however, keep their appointments and participate fully in the rehabilitation session. Moreover, there is a paucity of literature concerning adherence to rehabilitation programs in the athletic training environment.[4,5] Most literature about adherence concerns cardiac rehabilitation.[1,10,13]

Only three studies have dealt with rehabilitation adherence in the athletic training environment.[5–7] Therefore, additional research is needed to examine variables affecting athletic rehabilitation adherence. Consequently, the purpose of this study was to determine which of the following variables: 1) perceived exertion level, 2) pain, 3) self-motivation, 4) support from significant other, 5) scheduling, and 6) environmental conditions, are related to rehabilitation adherence.

A number of variables facilitate adherence to an exercise regimen.[9] These include: age, sex, socioeconomic status, intellectual and educational level, medical knowledge, acceptance or denial of illness, time from onset of illness, memory of patient, self-motivation, and exercise goal-setting.[9] In addition, over 200 variables have been reported that affect adherence due to physiological, medical, and psychological reasons.[12] Thus, exercise adherence is a complex issue for the clinician and researcher.

Many factors are thought to influence adherence. One factor is reinforcement. Positive reinforcement from health or exercise professionals, peers, and family facilitates rehabilitation adherence and is important for continued participation in the rehabilitation program.[3] A second factor is patient education. The educational component ensures that the athlete understands the nature of the injury, the treatment protocol, and the progression of recovery.[2] A third factor is input from the athlete. Participation of the athlete promotes a sense of control and should help with the athlete's dedication to the future.[2] A fourth factor is self-confidence. Self-confidence entails the athlete believing that a task can be completed, taking charge of the task, and completing the task.[4,5] Fisher et al[4,5] reported that self-confidence is the main factor in rehabilitation adherence. A fifth factor is social support. The support given to the athlete from the clinician, coach, teammate, and others closely associated with the athlete can improve adherence to the rehabilitation program.[4,8]

Even with the information available, no one has been able to predict adherence to exercise or rehabilitation programs. High self-motivation has been reported to predict adherence but not dropout rate.[3] Self-motivated individuals are also more likely to continue an exercise program without supervision.[3] However, neither personality traits nor demographic variables are useful predictors of adherent behavior.[4,5]

Methods

Forty-four Division II collegiate athletes, 5 women and 39 men between the ages of 17 and 25, were studied. Of these subjects, 31 participated in football, 4 in men's basketball, 2 each in wrestling, women's basketball, and volleyball, and one each in soccer, tennis, and swimming. The sample of subjects was one of convenience, meaning that the athletes were readily available to the researchers due to the nature of the study. For inclusion in the study, the athletes must have 1) sustained a musculoskeletal injury, 2) been evaluated by an athletic trainer, and 3) been scheduled for a rehabilitation program. Athletes' length of rehabilitation ranged from 2 to 32 days.

Adherence and Participation Score

Each athlete in the study came to the training room for evaluation of a musculoskeletal injury resulting from involvement in Division II athletics. One of three certified athletic trainers performed the initial evaluation and scheduled the athlete for a specific number of rehabilitation sessions per week. Daily attendance records were kept. When the athlete passed a functional test and returned to sport, he/she was discharged.

The athlete could attain a score of two points for each day's attendance. The first point was given for attendance at each scheduled rehabilitation session. A zero was given if he/she did not attend the rehabilitation session. In addition, a second point was awarded for participation. This was a subjective rating assigned by the athletic trainer. One point was given for completing 100% of the prescribed exercises, three-quarters of a point was given for completing 75% of the prescribed exercises, one-half point was given for completing 50% of the prescribed exercises, and one-quarter of a point was given for completing 25% of the prescribed exercises.

Although this scoring was subjective, it was an attempt to differentiate between those who participated in their rehabilitation and those who attended and did not participate in their rehabilitation program. Daily scores were kept and averaged across sessions for each athlete to produce a single adherence score with a maximum score of 2.0 if the athlete attended and participated fully in each scheduled rehabilitation session. Athletes were divided into two groups based on adherence scores: athletes with scores of 1.75 to 2.0 were labeled adherent; those with scores of less than 1.75 were labeled nonadherent.

Questionnaire

Each athlete completed a questionnaire at the conclusion of the rehabilitation period. The questionnaire, developed by Fisher and colleagues, consisted of 40 four-foil (strongly agree, agree, disagree, strongly disagree) Likert-scale items. Each item was coded numerically, with the most positive response coded as "4" and the least positive response coded as "1". The 40 items were collapsed into six subscales thought to represent the personal and situational factors encountered in the rehabilitation process. These subscales included perceived exertion level (2 items), pain (11 items), self-motivation (8 items), support from others (10 items), scheduling (6 items), and environmental conditions (3 items). Table 1 presents a representative item and its scoring for each of the six subscales represented within the questionnaire. The average score for each subscale was then calculated by adding the scores for the items in each scale and dividing by the number of items in the subscale. Thus, the average score for each subscale ranged from 1 to 4, with 4 representing the most positive responses to the subscale.

Table 1.—Sample Questionnaire Items and Scoring

	SA	A	D	SD
Perceived Exertion: I nearly always work at 100% effort.	(4)	(3)	(2)	(1)
Pain Tolerance: My rehabilitation program was physically painful.	(1)	(2)	(3)	(4)
Self-motivation: I enjoyed doing my rehabilitation program.	(4)	(3)	(2)	(1)
Support from others: I found rehabilitation to be very lonely and isolating	(1)	(2)	(3)	(4)
Scheduling: My rehabilitation program took up too much of my time.	(1)	(2)	(3)	(4)
Environmental Conditions: The training room makes me nervous.	(1)	(2)	(3)	(4)

SA = Strongly Agree.
A = Agree.
D = Disagree.
SD = Strongly Disagree.

Data Analysis

Independent *t*-tests were performed to determine whether there were significant differences between adherent and nonadherent athletes for the six subscales. The probability level was set at .05 for each test. To provide us with a sense of the relationships between variables, we then calculated Pearson product-moment correlations between the adherence score and the six subscales. To further examine the interrelationships among the adherence score and the six subscales, a principal components analysis with varimax rotation was performed.[14] This analysis identifies groups of highly related variables (factors) that are relatively unrelated to other factors.[14]

Results

Twenty-seven adherent athletes (attendance and participation scores from 1.75 and 2.00) and 17 nonadherent athletes (attendance and participation scores of less than 1.75) were identified. Group means, standard deviations, and *t*-test results for six subscales are reported in Table 2. The adherent group reported significantly lower levels of pain ($t = -2.38$, $p = .022$) and significantly higher levels of support from others ($t = 2.66$, $p = .011$), than the nonadherent group.

Table 3 shows the correlation matrix for the adherence score and the six subscores. The correlations confirm the results of the *t*-tests in that pain and support from others are the only subscores that are significantly correlated with the adherence score. Squaring a correlation coefficient gives the coefficient of determination, which indicates the proportion of variability in one score that can be attributed to variations in the other score. Thus, the pain subscale accounts for approximately 16% of the variability in adherence scores and the support from others subscale accounts for approximately 15% of the variability in adherence scores. In addition, the subscores of self-motivation, environment, and scheduling are significantly related to one another, with coefficients of determination of 52% (scheduling and self-motivation),

Table 2.—Differences Between Adherent and Nonadherent Groups

Score or Subscore	Group: Adherent (Mean ± SD)	Group: Nonadherent (Mean ± SD)	t	p
Scheduling	2.98 ± .49	2.90 ± .50	.52	.609
Pain	2.69 ± .25	2.89 ± .31	−2.38	.02*
Exertion	3.07 ± .47	2.79 ± .47	1.91	.06
Support	2.68 ± .31	2.42 ± .31	2.66	.01*
Motivation	2.92 ± .43	2.79 ± .40	.98	.33
Environment	3.09 ± .58	3.29 ± .47	−1.16	.25

* Statistically significant at .05.

Table 3.—Correlations Between Adherence Scores and Subscores

	Pain	Support	Exertion	Scheduling	Motivation	Environment
Pain						
Support	−.1260					
Exertion	.1788	.3281*				
Scheduling	.2410	.0204	.2813			
Motivation	.1215	.2434	.2385	.7220**		
Environment	.1274	.2005	−.0209	.4072**	.3804*	
Adherence	−.4026**	.3907**	.1527	.1467	.1774	.0943

*$p < .05$.
**$p < .01$.

17% (scheduling and environment), and 14% (self-motivation and environment). The only other statistically significant finding is that perceived exertion and support from others are significantly correlated to one another, with one variable accounting for approximately 11% of the variability in the other.

Because simple correlation techniques can only examine two variables at a time, we used a third data analysis technique, principal components analysis, to examine more complex interrelationships among variables. Principal components analysis identified three factors with eigenvalues above 1.0. Factor loadings for these three factors are shown in Table 4. Factor I, which accounted for 33.1% of the variability in the data set, consisted of the scheduling, self-motivation, and environment subscales. Factor II, which accounted for 23.6% of the variability in the data set, consisted of the adherence scores and the pain and support subscores. Factor III, which accounted for 15.3% of the variability within the data set, consisted of the perceived exertion subscale. This analysis confirms the *t*-test results, in that pain and support are the only subscales strongly associated with adherence scores. It also confirms the correlation results, in that the scheduling, self-motivation, and environment subscores clustered together as a single factor.

Table 4.—Factor Analysis Results (Rotated Factor Matrix)

Variable	Factors* I	II	III
Scheduling	.8396		
Motivation	.8306		
Environment	.7611		
Adherence		.8327	
Pain		−.7538	
Support		.5917	
Exertion			.9081

* Factor loadings of .45 and above are reported.

Discussion

Support From Others

Some researchers believe that people will adhere to a rehabilitation program if emotional support is received.[3] There appears to be a positive relationship between social support and adherence.[8,10,11] All three statistical analyses in our study supported a relationship between rehabilitation adherence and support from others. This finding agrees with Fisher et al,[5] who reported that support from others was the most significant variable in differentiating between adherent and nonadherent athletes. Comments made by the athletes to the primary researcher indicate they are not happy when their teammates do not show support for them. In a survey, 60% of the athletes rated teammates' support as important to adherence.[6] Social support from others may promote adherence by providing an individual with feelings of success.[10] This support from others may be received from the athletic trainer, teammate, coach, or significant other. Given the consistent relationship between adherence and support from others identified in this and other studies, we recommend that clinicians consider ways to maximize the support that injured athletes receive from others.

Pain Tolerance

The more pain experienced in the rehabilitation process, the less adherent the person was. This statement agrees with Fisher et al[5] who reported that adherent athletes can probably reduce pain, whereas nonadherent athletes may amplify pain. Therefore, a person's response to pain can influence adherence. An athlete's pain response may be influenced by: 1) emotional arousal, 2) motivational drive, and 3) cognition.[5] Therefore, the clinician needs to recognize the athlete's pain and instruct the athlete on techniques of how to cope with pain.[5]

Clinicians should consider ways to minimize pain during rehabilitation. Athletes who experience pain during rehabilitation are more likely to be nonadherent. The athlete needs to be educated about the amount and type of pain that may be expected with the rehabilitation program. For example, exertion pain should be differentiated from pain resulting from an inflamed joint. In a survey performed by Fisher,[6] 94% of the athletes responded that pain must be interpreted correctly. The athlete needs to understand the difference between pain that may be detrimental and pain that is unavoidable, because some pain will more than likely be experienced during rehabilitation.

Therefore, a major component in the rehabilitation program should be pain

control. Modalities may be implemented for pain control. Dissociation, another pain-control technique, eliminates the focus on pain by having the patient concentrate on other activities, such as breathing.[4] In summary, rehabilitation programs should be based on pain-free progressions and techniques that control and minimize pain. Athletes should rate their pain during rehabilitation so that the clinician can modify rehabilitation based on their pain level.

Perceived Exertion

Both adherent and nonadherent athletes rated perceived exertion similarly, with the adherent group being slightly higher. This is in contrast with Fisher et al,[5] who reported that adherent athletes perceived they worked harder at their rehabilitation than the nonadherent athletes.

Scheduling

Our results were in contrast to Fisher et al[5] who reported scheduling to be an important distinction between adherent and nonadherent athletes. However, Fisher did not state the hours the athletic training room was available to the athletes. The training room in this study may have had hours more amenable to the athlete. Also, appointments for rehabilitation sessions were made for specific times that were conducive to the athlete's schedule. The importance of convenient scheduling is supported by 95% of the athletes who responded to a survey indicating that rehabilitation schedules should be compatible with their schedules.[6]

Self-Motivation

Again, our results were in contrast to Fisher et al[5] who reported that adherent athletes had increased self-motivation compared to nonadherent athletes. Self-motivated individuals do not allow distractions such as inconvenient scheduling or lack of support from others to deter them from attending rehabilitation sessions. Athletes should be sufficiently self-motivated to complete the rehabilitation program in order to return to their sport.

Environmental Conditions

Our results agreed with Fisher et al,[5] who reported that environmental conditions were the least significant variable in determining adherence. The environment should fit the needs of the athlete. This relates to the variable of scheduling and also to support from others. If the athletic training room is too busy, the athlete cannot receive individualized attention. When surveyed, 56% of the Certified Athletic Trainers[7] and 74% of the athletes[6] believe training room environment affects rehabilitation adherence.[6,7] However, 95% of the Certified Athletic Trainers believed that convenience and accessibility of the rehabilitation facility affected adherence.[7]

Future Research

The results of this study only report one specific athletic training environment. Therefore, caution should be used in generalizing these results to other environments. We do believe, however, that our statements concerning pain and support from others are appropriate and in agreement with Fisher et al.[5] In addition, the small number of subjects precluded the use of multivariate analysis of variance techniques. We compensated for this by using three different statistical approaches (*t*-test, Pearson product moment correlation, and principal component analysis) appropriate to our sample size. Each analysis yielded conclusions consistent with the other analyses.

Since our results differ from Fisher in the relationship of perceived exertion, self-motivation, and scheduling, these areas should be studied further. Although pain and support from others have been consistently related to adherence in this study and in the work of Fisher, the effect on adherence of reducing pain or increasing support has not been studied experimentally. Future research might attempt to manipulate pain or support from others to see if predicted differences in adherence result.

Conclusion

The results of this study indicate that pain should be controlled to achieve better adherence to rehabilitation programs. In addition, athletes who received support from others were found to be more adherent. Therefore, the clinician should implement pain control strategies with the athlete and educate the athlete about the role of pain in the rehabilitation process. Secondly, the clinician should demonstrate support to the athlete and encourage peers and coaches to support the injured athlete. Overall, the clinician needs to educate the athlete concerning all aspects of the rehabilitation program.

Acknowledgment

We would like to thank Dr. A. Craig Fisher for the use of his questionnaire.

References

1. Andrew G, Parker JO. Factors related to dropout of postmyocardial infarction patients from exercise programs. *Med Sci Sports Exerc.* 1979;11:376–378.
2. DePalma M, DePalma M. The use of instruction and the behavioral approach to facilitate injury rehabilitation. *Athl Train, JNATA.* 1989;24:217–219.
3. Dishman R. Exercise adherence: a new view for public health. *Phys Sportsmed.* May 1986;14:127–143.
4. Fisher AC. Adherence to sports injury rehabilitation programmes. *Sports Med.* 1990;9:151–158.
5. Fisher AC, Domm MA, Wuest DA. Adherence to sports-injury rehabilitation programs. *Phys Sportsmed.* Jul 1988;16:7:47–51.
6. Fisher AC, Hoisington LL. Injured athletes' attitudes and judgments toward rehabilitation adherence. *J Athl Train.* 1993;28:48–54.
7. Fisher AC, Mullins SA, Frye PA. Athletic trainers' attitudes and judgments of injured athletes' rehabilitation adherence. *J Athl Train.* 1993;28:43–47.
8. Fisher AC, Scriber KC, Matheny ML, Alderman MH, Bitting LA. Enhancing athletic injury rehabilitation adherence. *J Athl Train.* 1993;28:312–318.
9. Ice R. Long term adherence. *Phys Ther.* 1985;65:1832–1839.
10. Levy R. Social support and adherence: a selective review and critique of treatment integrity and outcome measurement. *Soc Sci Med.* 1983;17:1329–1338.
11. Martin J, Dubbert P. Adherence to exercise. *Exerc Sport Sci Rev.* 1985;13:137–167.
12. Meichenbaum D, Turk DC. *Facilitating Treatment Adherence.* New York, NY: Plenum Publishing; 1987:111–134.
13. Oldridge N. Compliance of postmyocardial infarction patients to exercise programs. *Med Sci Sports Exerc.* 1979;11:373–375.
14. Tabachnick B, Fidell L. *Using Multivariate Statistics.* New York, NY: Harper & Row Publishers; 1989:597–600.