Adherence to sport injury rehabilitation

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Sport injuries are a substantial public health concern across forms of physical activity and around the world (Caine, Caine, & Lindner, 1996). Athletes who sustain injuries, especially those that are severe or involve lengthy periods of time away from sport, are often prescribed a rehabilitation program as part of their medical treatment. Although adhering to rehabilitation regimens is considered central to recovery from sport injury (Taylor & Taylor, 1997), it is not uncommon for athletes to fail to complete their recommended rehabilitation activities (Brewer, 1999). Typically involving maintenance of one or more rehabilitative behaviors, adherence to sport injury rehabilitation falls squarely within the realm of applied sport psychology.

Defining adherence to sport injury rehabilitation

In the medical literature, a variety of terms (e.g., compliance, cooperation, concordance, mutuality) and operational definitions have been applied to the general concept to which client adherence refers (Bosworth, Weinberger, & Oddone, 2006). Common elements across the various definitions include the opinions or directions given by health care professionals to prevent or treat medical conditions, the role and self-care responsibilities of clients in their treatments, and the degree to which the behaviors of clients are consistent with the expert recommendations they have received (Bosworth et al., 2006; Christensen, 2004). Incorporating these key elements, Christensen defined adherence as reflecting “the extent to which a person’s actions or behavior coincides with advice or instruction from a health care provider intended to prevent, monitor, or ameliorate a disorder” (p. 3). In the context of sport injury rehabilitation, adherence typically involves participation in activities in clinical and home or other (nonclinical) settings. Common clinic-based activities in sport injury rehabilitation include attending appointments, experiencing therapeutic modalities (e.g., cryotherapy, electrical stimulation, massage), and completing exercises designed to enhance such parameters as agility, balance, flexibility, and strength. Away from the clinical setting, athletes undergoing injury rehabilitation may be asked to...
avoid potentially harmful activities, take prescribed medications, wear therapeutic devices, self-administer therapeutic modalities, and do exercises similar or identical to those featured in clinic-based regimens.

**Measuring adherence to sport injury rehabilitation**

Given the wide range of behaviors that can be involved in adhering to sport injury rehabilitation programs, it is not surprising that a diverse array of methods have been used to measure adherence to sport injury rehabilitation for clinical and research purposes. For any particular rehabilitation regimen, measures of adherence should, of course, correspond closely to the behavioral demands of the regimen. Accordingly, adherence measurement strategies have been developed for clinic- and nonclinic-based activities.

**Clinic-based measures of sport injury rehabilitation adherence**

The most commonly used measure of adherence to clinic-based sport injury rehabilitation programs is attendance at rehabilitation appointments. Objective and easily calculated by dividing the number of rehabilitation sessions that athletes attend by the number of rehabilitation sessions scheduled, attendance indices are helpful for documenting gross nonadherence to clinic-based rehabilitation in the form of failing to show up for scheduled appointments. Because there is a strong tendency for athletes to be present for their scheduled appointments and because attendance measures do not provide information on athletes’ behavior during rehabilitation sessions (Brewer, 1999), additional means of assessing adherence to clinic-based sport injury rehabilitation have been developed.

The most elaborate method of assessing what athletes actually do during rehabilitation sessions is the Sports Medicine Observation Code (SMOC; Crossman & Roch, 1991), which involves observing athletes at regular time intervals during their appointments and recording their behavior in 13 categories (e.g., active rehabilitation, waiting, non-activity). Such an approach to measuring adherence to sport injury rehabilitation is labor-intensive, impractical in most rehabilitation environments, and unlikely to yield precise information about adherence unless the prescribed allocation of behaviors in each of the categories can be specified.

Another method of assessing adherence in clinical settings is to compare the number of sets of rehabilitation exercises completed with the number of sets prescribed. Although this approach is appealing in that it produces a quantifiable index of adherence, athletes undergoing rehabilitation in supervised clinical environments rarely do less than the prescribed number of sets of rehabilitation exercises, exceptions being when their medical conditions prevent them from completing exercises (in which case the exercise prescription is adjusted) or in the rare instances when they openly defy the instructions of their rehabilitation practitioners.

A fourth option for measuring adherence to clinic-based sport injury rehabilitation is to have the professionals supervising the rehabilitation of athletes rate the extent to which the individuals under their care adhere to the rehabilitation program. An example of such a measure is the Sport Injury Rehabilitation Adherence Scale (SIRAS; Brewer et al., 2000), with which practitioners evaluate clients’ efforts to complete rehabilitation exercises, follow instructions and advice, and be receptive to changes in the rehabilitation program during a given clinic session. The SIRAS is a brief (i.e., three items), psychometrically sound means
of assessing what athletes do relative to their rehabilitation professionals’ expectations of their behavior during clinic appointments.

**Nonclinic-based measures of sport injury rehabilitation adherence**

Home exercise prescriptions are the central feature of many sport injury rehabilitation programs. Adherence to prescribed home exercises has been assessed in a variety of ways, ranging from single-item retrospective reports to objective methods. The most common means of measuring adherence to home exercises has been simply to ask athletes to indicate the extent to which they adhered to their home exercise prescription (Brewer, 1999). Although appealing in its convenience and simplicity, this retrospective approach is subject to forgetting and response bias (Meichenbaum & Turk, 1987). Obtaining frequent, even daily, self-reports of home exercise completion during the rehabilitation period is a way of minimizing recall inaccuracies. Objective measurement of adherence to home exercise prescriptions, which is desirable because it is not susceptible to recall and response biases and can therefore validate self-reports, can be accomplished by embedding electronic counting devices in exercise equipment (for a review of objective measures of rehabilitation adherence, see Brewer, 2004). Under the assumption that athletes who cannot correctly recall or replicate the home exercises they were asked to perform are unlikely to have done the exercises, nonadherence to prescribed home exercises can be assessed indirectly by having athletes articulate the details of (or actually demonstrate) their home exercise programs (Friedrich, Cermak, & Maderbacher, 1996; Webborn, Carbon, & Miller, 1997).

Subjective and objective means are available for assessing adherence to other nonclinic-based aspects of sport injury rehabilitation programs. For example, in the subjective realm, self-reports can be used to measure use of prescribed medications and therapeutic devices such as orthopedic braces and splints. Self-reports of medication and device use are subject to the same limitations as self-reports of home exercise completion. Objective indices of adherence to medication regimens include pill counts, pharmacy refills, reimbursement records, biochemical indicators (e.g., blood levels, drug assays), and electronic monitoring devices. As noted in a review of rehabilitation adherence measurement strategies (Brewer, 2004), adherence to prescribed use of orthotics and orthopedic braces can be measured with devices such as a hidden step-counter and a mechanical timer, respectively. Objective measurement strategies do not guarantee detection of instances in which medications have been taken or therapeutic devices have been worn or used as prescribed, but they reduce or eliminate the potential adverse effect that memory and response biases can have on subjective measurements of adherence.

**Predicting and explaining adherence to sport injury rehabilitation**

Researchers have adapted theoretical models of adherence that were originally developed for other health behaviors in an attempt to provide a framework for understanding associations between predictor variables and sport injury rehabilitation adherence. Among the theoretical perspectives that have been adopted are: protection motivation theory (Prentice-Dunn & Rogers, 1986), cognitive appraisal models (Lazarus & Folkman, 1984; Wiese-Bjornstal, Smith, Shaffer, & Morrey, 1998), and the theory of planned behavior (Ajzen, 1991). Because most of the theoretical approaches have been applied to sport injury
rehabilitation adherence in one or, at the most, several studies, there is not an empirical basis for recommending one perspective over another. Moreover, because there are conceptual overlaps among the theories (e.g., the concept of self-efficacy figures prominently in multiple perspectives), it seems prudent to identify regularities in the research literature independent of the theoretical approach under investigation.

Factors that have consistently been associated with adherence to sport injury rehabilitation include personal characteristics, contextual/environmental characteristics, and rehabilitation-related beliefs and reactions. Personal characteristics are attributes that affect the likelihood of adhering to sport injury rehabilitation programs. Given the rigors of many injury rehabilitation regimens, it is not surprising that athletes who are self-motivated, strongly identified with the athlete role as a source of self-worth, tolerant of pain, and tough-minded are especially likely to adhere to their prescribed rehabilitation activities (Brewer, 2007).

The context in which sport injury rehabilitation occurs appears to be particularly influential in determining whether athletes adhere to rehabilitation prescriptions. Numerous characteristics (or, to be more accurate, perceived characteristics) of the social and physical setting of rehabilitation have been correlated with sport injury rehabilitation adherence. Athletes are more likely to adhere to their injury rehabilitation program when they report that others are supportive of their rehabilitation activities, their practitioners expect them to adhere, the clinical setting in which their rehabilitation occurs is comfortable, and the scheduling of their rehabilitation appointments is convenient (Brewer, 2007).

Beliefs and reactions associated with adherence to sport injury rehabilitation include athletes’ interpretations of the severity of their injuries, perceptions of control over their recoveries, beliefs about the efficacy of their treatments, assessments of their abilities to complete their rehabilitation activities, and psychological responses to injury (Brewer, 2007). Athletes tend to adhere better to their rehabilitation when they consider their injuries severe and perceive themselves as susceptible to further health complications without rehabilitation. Athletes who report believing that they can exert control over their health in general, and their rehabilitation outcomes in particular, tend to adhere better to their injury rehabilitation programs than those who do not report such beliefs. Similarly, adherence levels are higher for athletes who deem their rehabilitation programs effective and who describe themselves as capable of completing the tasks of rehabilitation than for athletes whose perceptions of the efficacy of their rehabilitation regimens and their abilities to complete them are less favorable. Mood disturbances and fears of reinjury are psychological responses that have been associated with adherence to sport injury rehabilitation, with greater emotional distress related to lower levels of adherence.

Enhancing adherence to sport injury rehabilitation

In light of the putative importance of treatment adherence to achieving successful rehabilitation outcomes, adherence enhancement is a logical target of psychological intervention. Although a variety of interventions have been suggested to enhance adherence to sport injury rehabilitation, few experimental studies have examined the efficacy of such interventions, and a causal link with improved sport injury rehabilitation adherence has been established only for a single type of intervention – goal setting. Penpraze and Mutrie (1999) found that relative to athletes who were assigned nonspecific rehabilitation goals, athletes who were given specific rehabilitation goals exhibited greater understanding of, and adherence to, their injury rehabilitation programs. Evans and Hardy (2002) obtained complementary findings,
reporting that athletes who were given a goal-setting intervention displayed better adherence to their injury rehabilitation protocols than those who received either social support or no treatment. A qualitative follow-up study revealed that the favorable effect of goal setting on adherence may have been due to increases in self-efficacy, focus on the rehabilitation program, and attributions of recovery to internal, personally controllable factors in athletes in the goal-setting group as compared with athletes in the social support and no treatment groups.

Outside the sport injury domain, empirical support has been found for several other psychological interventions as enhancers of adherence to rehabilitation regimens (Brewer, 2004). Educational approaches in which participants are provided with information and instructions about their medical conditions and rehabilitation programs have been successful in improving rehabilitation adherence. The efficacy of educational interventions in enhancing adherence can be bolstered through supervision by qualified professionals and use of instructional media that help to clarify the details of rehabilitation regimens, such as audio recordings, written/illustrated materials, and video recordings. Another beneficial approach to boosting rehabilitation adherence is reinforcement of the prescribed rehabilitation behaviors. Support also exists for multimodal interventions in which multiple procedures intended to enhance adherence are combined. Counseling/information, reinforcement, contingency contracting, modeling, self-monitoring, mental practice, and goal setting are among the procedures that have been included in successful multimodal interventions.

Although featuring correlational studies almost exclusively, the literature on predictors of adherence to sport injury rehabilitation is instructive in developing adherence enhancement interventions. Extrapolating from the synopsis of research presented in the previous section, it is possible to formulate suggestions for the foci and content of procedures designed to improve sport injury rehabilitation adherence. In clinical settings, the environment should be made as comfortable and conducive to rehabilitation activities as possible. Rehabilitation appointments should be made as convenient to athletes as is feasible so as not to pose a barrier to attendance. Rehabilitation practitioners should furnish athletes with detailed information and instructions pertaining to their rehabilitation programs, convey to athletes expectations that they will adhere to their rehabilitation regimen, provide athletes with support for their rehabilitation activities, and, where possible, assist athletes in obtaining additional support for their rehabilitation from other significant individuals (e.g., coaches, teammates, partners, family members). Practitioners should also emphasize the importance of engaging in rehabilitation activities to facilitate recovery, promote confidence in the efficacy of the rehabilitation program, and instill in athletes the belief that they are responsible for the rehabilitation outcomes that they incur. Procedures that help reduce athletes’ emotional distress and fear of reinjury (e.g., counseling, cognitive restructuring, relaxation training, guided imagery) may also have beneficial effects on adherence.

An important applied consideration pertains to who implements sport injury rehabilitation adherence enhancement interventions. From a pragmatic standpoint, sport injury rehabilitation professionals (e.g., physiotherapists, athletic trainers) may be the most suitable practitioners to implement adherence enhancement interventions. By virtue of their established relationships and regular contacts with athletes undergoing rehabilitation, sport injury rehabilitation professionals are well-positioned to initiate interventions designed to enhance the rehabilitation programs that they or other sports medicine personnel (e.g., physicians) have prescribed. Although rehabilitation professionals may be concerned that adherence enhancement interventions will add tasks to their already-busy schedules and may be reluctant to
administer what are essentially psychological interventions, potentially perceiving the interventions as outside their areas of expertise, they have a vested interest in the success of the rehabilitation and can easily learn the basics of adherence enhancement.

Through educational presentations (i.e., in services) and consultation, sport psychology practitioners can help rehabilitation professionals acquire adherence enhancement skills, integrate those skills into their existing methods of practice, provide athletes with treatment-related information in understandable terms, and create a rehabilitation environment conducive to adherence. For example, rehabilitation professionals can be taught that a goal-setting intervention can be incorporated into clinical practice by having the rehabilitation professionals collaborate with athletes under their care in setting short- (and possibly long-) term goals pertaining to rehabilitation processes (e.g., number of sets of home rehabilitation exercises) and outcomes (e.g., range of motion) at the time the rehabilitation prescription is given. Sport psychology practitioners can teach rehabilitation professionals how to inquire about potential barriers to goal achievement, help devise strategies to overcome those barriers, and monitor progress toward goal achievement throughout rehabilitation, revising and resetting goals as needed. Neither elaborate nor time-consuming, such interventions increase the likelihood of adherence to the rehabilitation program (Evans & Hardy, 2002; Penpraze & Mutrie, 1999) and may ultimately improve rehabilitation outcomes.

Another option – feasible in sports medicine settings where sport injury rehabilitation professionals and sport psychology practitioners work in close contact with each other – is a team approach in which athletes with injuries are seen (jointly or separately) by both types of personnel, who confer in an attempt to optimize the athletes’ treatments. Procedures designed to enhance adherence to rehabilitation can be implemented by rehabilitation professionals in consultation with sport psychology practitioners or vice versa. The latter circumstance might be most likely to occur for athletes with injuries who have sought services for issues involving psychological adjustment to injury and performance enhancement. It is common for athletes to experience negative emotions such as depression, anxiety, fear, anger, and frustration following injury and during the rehabilitation period (Brewer, 2007). Emotional distress and the negative cognitions that can accompany and perpetuate it may not only be sources of concern (and targets of intervention) in their own right, but may also impair motivation and compromise adherence. Sport psychologists can help athletes gain perspective on their injuries and view their situations constructively. Athletes can be shown that the sense of identity that they may derive from sport involvement can both contribute to negative emotions and serve as a source of resilience and motivation to adhere to the rehabilitation program, presumably expediting their recovery and alleviating their distress.

A final caution about adherence enhancement is needed. Although it is widely assumed that better adherence is likely to produce better outcomes, this assumption may be unwarranted. The general medical literature is replete with interventions for which better adherence is associated with better outcomes (Dunbar-Jacob & Schlenk, 1996). Nevertheless, there are also examples to the contrary, where better adherence is not associated with better outcomes. In a compelling study of the relationship between treatment adherence and treatment outcome for multiple nonrehabilitation diagnoses and interventions, only 11 of 132 comparisons of adherent and nonadherent individuals were statistically significant (Hays et al., 1994). Despite a trend for positive associations between adherence and outcome in the rehabilitation domain, nonsignificant or negative adherence–outcome relationships have been documented in at least five studies (for a review, see Brewer, 2004). Negative associations between adherence and outcome are particularly worrisome, potentially signaling that the rehabilitation program is ineffective and should be modified. In a dramatic
example of this circumstance, Shelbourne and Wilckens (1990) reported how clinical observations that people who adhered less well to a conservative rehabilitation regimen following anterior cruciate ligament reconstruction experienced better rehabilitation outcomes prompted a change – almost a complete reversal in rehabilitative approach – to an accelerated postoperative rehabilitation protocol. Positive adherence–outcome associations have been documented for the modified protocol (Brewer et al., 2004). Because one cannot automatically assume that better adherence to rehabilitation regimens will yield better rehabilitation outcomes, practitioners should make every effort to ensure that adherence to a given rehabilitation protocol is likely to produce the desired outcomes before attempting to enhance adherence to that protocol. Doing so is consistent with the tenets of evidence-based practice.

Summary and conclusions

Injury is a common occurrence in sport. Rehabilitation programs are often prescribed for athletes who sustain injuries. Athletes frequently do not adhere fully to their prescribed rehabilitation regimens, and this limited adherence has potential implications for the rehabilitation outcomes incurred by athletes. A variety of methods can be used to assess adherence to clinic- and nonclinic-based rehabilitation activities. Numerous predictors of sport injury rehabilitation adherence have been identified and provide a preliminary basis for understanding the circumstances under which athletes are most likely to adhere to their rehabilitation programs. Several interventions to enhance rehabilitation adherence have been developed and found effective. Along with sport psychology practitioners who work in sports medicine settings, sport injury rehabilitation professionals are in a desirable position to consider the suggestions for application summarized in Box 25.1, implement methods of adherence enhancement, and, in so doing, better serve the athletes in their care.

Box 25.1

Summary of suggestions for measuring, predicting, and enhancing adherence to sport injury rehabilitation

- Adhering to sport injury rehabilitation programs typically involves completing rehabilitation activities in clinical and/or nonclinical (e.g., home) settings.
- Using attendance at rehabilitation appointments to assess adherence to clinic-based sport injury rehabilitation is objective and convenient, but does not yield information on what athletes do while they are at clinic-based sessions.
- Obtaining rehabilitation practitioner ratings of athlete adherence during rehabilitation appointments can be used to complement attendance indices in assessing adherence to clinic-based sport injury rehabilitation.
- Self-reports of adherence to nonclinic-based sport injury rehabilitation activities should be obtained as frequently as possible and should be complemented with objective measures when possible.
Personal characteristics of athletes who tend to adhere to their prescribed rehabilitation activities are self-motivation, strong identification with the athlete role as a source of self-worth, pain tolerance, and tough mindedness.

Environmental characteristics associated with high levels of clinic-based sport injury rehabilitation adherence include social support for rehabilitation, practitioner expectancies of adherence, comfortable clinical settings, and convenient scheduling of appointments.

Along with emotional distress, perceptions of injury severity, personal control over injury recovery, treatment efficacy, and rehabilitation self-efficacy are positively associated with sport injury rehabilitation adherence.

Goal setting, reinforcement, educational approaches, and multimodal interventions can be effective in enhancing rehabilitation adherence.

Adherence enhancement interventions are most suitable for use with rehabilitation programs for which better adherence is likely to lead to better rehabilitation outcomes.

Sport psychology professionals can play an educational or consultative role in helping sport injury rehabilitation practitioners learn and implement adherence enhancement interventions.

References


