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Return to Play

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The return-to-play (RTP) decision is not a static, simple decision but rather a decision-making process that is complex and dynamic. The process begins when a player is first deemed to be injured and continues beyond the time the player returns to full competition. The goal of the decision-making process is to return the player to competition at a point when it is most safe to so while not restricting a player from competition unnecessarily. This aspect of sports neuropsychology is unique since it is the only situation in neuropsychology where a decision is routinely being made to place an individual back into a situation in which they are known to be at increased risk for additional brain injury, since data suggest that individuals who have sustained a concussion are at much higher risk for subsequent concussions (Gerberich, Priest, Boen, Straub, & Maxwell, 1983; Guskiewicz et al., 2003; Echemendía, Rosenbaum, & Bailey, 2003; Guskiewicz, Weaver, Padua, & Garrett, 2000). Clinical neuropsychologists, by virtue of their training, assessment tools, clinical experience, and research, can play a vital role in the RTP decision-making process, yet they are only one piece of the puzzle (Guskiewicz & Cantu, 2004).

The purpose of this chapter is to acquaint the reader with the issues and approaches that have been used in the RTP decision. This chapter will not provide an exhaustive review of the literature that underlies many of the elements of the RTP decision. The interested reader is referred to earlier chapters in this book as well as to Lovell, Echemendía, Collins, and Barth (2004). I will emphasize throughout this chapter that RTP is a collaborative and cooperative decision-making process that is usually managed by the team physician. The role of the neuropsychologist is to aid the team physician in

this decision-making process and not to assume that neuropsychological data and approaches are the sole or even the most important determinants of the decision. Nevertheless, neuropsychologists must be aware of the various components of the RTP decision and how these components, either in isolation or in combination, may influence RTP. This is particularly important in situations where neuropsychologists are being called upon to provide input and guidance to physicians who are not well versed in sports medicine or sports-related concussion.

RETURN TO PLAY: WHO MAKES THE DECISION?

As will be outlined in greater detail later in this chapter, the RTP decision is based on a variety of factors and is impacted by personnel from several different professions. The RTP decision has generally been the responsibility of the team physician and continues to be so in most settings. It is the team physician's role to evaluate the athlete and talk with Certified Athletic Trainers (ATCs) and other consultants, including neuropsychologists (if available), and then make a decision based on the aggregate information. However, the immediate RTP decision is usually made by ATCs on the sideline. ATCs typically have extensive training in recognizing the signs and symptoms of concussion and are prepared to make RTP decisions "on the spot." In high school and younger age groups the decision to allow an athlete to continue playing once an injury is suspected may be made by coaches, parents, or primary care physicians. However, it is likely that most concussion injuries are not identified or brought to the attention of physicians (Echemendía & Julian, 2001).

It is important to understand that physicians vary widely in their sophistication, understanding, and experience with detecting and managing sports concussions. Depending on the level of play (e.g., high school, college, professional), a team physician may be a family practitioner, a podiatrist, or even a gynecologist. Most junior high school and high school teams (and even some college teams) do not have a designated "team" physician and rely on each athlete's primary care physician to clear the athlete for RTP.

Typical medical training does not adequately prepare physicians to effectively deal with sports-related mild traumatic brain injury (MTBI). Specialty trained physicians in sports medicine generally have the most robust training in managing sports concussions. Fellowship trained sports medicine physicians usually hail from orthopedics or primary care medicine. These physicians usually have extensive experience working with MTBI and also generally know their athletes well. Obviously, neurologists and neurosurgeons have extensive training in brain functioning and brain pathology; yet, many

do not have adequate experience working with sports concussions since these injuries represent the mild spectrum of brain pathology and usually do not come to the attention of these specialized physicians. Neurologists and neurosurgeons can be quite helpful in complicated cases or when protracted postconcussive symptoms exist. Surprisingly, emergency department physicians are often not well trained in managing sports concussions. Many still operate under the assumption that a concussion occurs only when there is a loss of consciousness.

Neuropsychologists generally serve as consultants to the team physician, who will often ask for the neuropsychologists' interpretation of test data and/or recommendations regarding RTP. In this instance the team physician is making the RTP decision. There are times, however, when a physician delegates the RTP decision to a neuropsychologist (assuming a negative physical examination). This typically occurs when the neuropsychologist has established a neuropsychological testing program and the physician, usually a primary care physician, does not feel as well versed in the issues related to the RTP as the neuropsychologist. Or, the situation may arise where a concussed athlete is deemed symptom-free and "medically cleared," but the final RTP will be made based on the results of neurocognitive testing. In each of these situations there is consultation between the physician and the neuropsychologist. A different situation exists when a program is established where the neuropsychologist is working with an ATC who may delegate the final RTP decision to the neuropsychologist. This situation can be problematic. Although every program and situation is guided by its own resources and limitations, it is widely recommended that every athlete who has sustained a concussion be evaluated by a physician (McCrory et al., 2005). Whether the physician makes the RTP decision or delegates that responsibility to the neuropsychologist, a medical evaluation of the athlete should occur. Failure to do so may lead to substandard care and increase the medicolegal liability of the neuropsychologist.

RETURN-TO-PLAY GUIDELINES

Historically, the RTP decision has been based on a series of guidelines that were developed in association with classification schemes used to "grade" the severity of the injury. As many as 14 different classification systems have been documented by Collins, Grindel, et al. (1999). Although useful in standardizing RTP, particularly in the case of physicians with limited knowledge of sports MTBI, these guidelines lacked empirical support. The most widely used grading systems had three grades of concussion: mild (I), moderate (II),

and severe (III). Injury severity was based on symptom duration, the presence of posttraumatic or retrograde amnesia, and loss of consciousness (LOC). The three most commonly used systems are presented below.

As can be seen in Table 7.1, these systems place a great deal of emphasis on LOC as an indicator of the most severe type of injury. In each case the most severe classification was based on LOC, irrespective of duration or the presence of other symptoms. The emphasis on LOC was carried forward from the traumatic brain injury literature, where duration of coma was found to be a significant predictor of injury outcome (e.g., Benson, Gardner et al., 1976; Alexander, 1982; Katz, 1992). Recent studies (Lovell, Iverson, Collins, et al., 1999; McCrae, Kelly, Randolf, et al., 2002; McCrae, Guskiewicz, Marshall, et al. 2003) have cast doubt on this assumption, particularly in the case of sports concussion, where the period of altered consciousness is usually measured in seconds or minutes rather than hours and days. These studies suggest that while loss of consciousness may be related to greater early deficits, there is no significant relationship with overall injury severity or neuropsychological functioning.

Amnesia after MTBI has also been regarded as a potent indicator of injury severity. However, the research on amnesia has produced conflicting results. For example, Collins, Iverson, Lovell, et al. (2003) found that amnesia predicted symptoms and cognitive deficits 48 hours postinjury. Erlanger, Feldman, et al. (2003) also found significant relationships among symptom duration, amnesia, and neuropsychological test performance, but others have found no association between amnesia and symptom duration or neuropsy-

TABLE 7.1. Concussion Grading Systems

	Severity		
System	Mild (I)	Moderate (II)	Severe (III)
Cantu	• No LOC • PTA < 30 minutes	• LOC < 5 minutes • PTA > 30 minutes, < 24 hours	• LOC 5 minutes • PTA 24 hours
Colorado Medical Society	• Confusion • No LOC • No amnesia	• Confusion • No LOC • Amnesia	• LOC • LOC
American Academy of Neurology	• Confusion • No LOC • Symptoms < 15 minutes	• Confusion • No LOC • Symptoms > 15 minutes	• LOC

Note. LOC, loss of consciousness; PTA, posttraumatic amnesia.

chological test performance (McCrae et al., 2003). The weight of the evidence seems to suggest that LOC of less than a minute may not have significant postinjury sequelae, whereas the presence of posttraumatic amnesia may be associated with poorer neurocognitive performance.

Cantu (see Echemendía & Cantu, 2004) revised his grading system to incorporate the research on LOC, amnesia and symptom duration. He defined a Grade I concussion as having no LOC or amnesia, and postconcussion signs and symptoms (PCSS) lasting less than 30 minutes. A Grade II concussion has LOC less that 1 minute or amnesia and PCSS lasting more than 30 minutes. Grade III concussions have LOC in excess of 1 minute or amnesia for 24 hours or longer and PCSS in excess of 7 days. This system represents a move forward toward generating empirically based RTP criteria. While Cantu's new system incorporates research findings on injury severity, there is very little empirical research that speaks directly to the issue of *when* it is safe to return to competition and the consequences of being returned prematurely.

Each of the grading systems enumerated above had accompanying RTP guidelines, which are presented in Table 7.2.

As can be seen, the systems differed on several important dimensions. The Cantu system required that a player be asymptomatic at rest and upon exertion for 1 week following MTBI, whereas the Colorado Medical Society and American Academy of Neurology guidelines allowed RTP to the same

TABLE 7.2. Return to Play Guidelines

	Severity		
System	Mild (I)	Moderate (II)	Severe (III)
Cantu	RTP if no symptoms for 1 week [2 weeks[a]]	RTP if no symptoms for 1 week [2 weeks[a]]	RTP minimum 1 month postinjury if no symptoms for 1 week [terminate[a]]
Colorado Medical Society	RTP if no symptoms and no amnesia for 20 minutes	RTP if no symptoms for 1 week	RTP if no symptoms for 2 weeks
American Academy of Neurology	RTP if no mental status exam changes or symptoms for 15 minutes	RTP if no symptoms for 1 week	RTP if no symptoms for 2 weeks

[a]The Cantu system provides for additional conservatism if the player has had a previous concussion in the same season.

game if symptoms were absent for 20 minutes or less. At the other end of spectrum, Cantu required 1 month and both the Colorado Medical Society and American Academy of Neurology required 2 weeks of no PCSS prior to RTP for Grade III concussions.

Although these guidelines did provide some direction for RTP, there was much disagreement about which guidelines were the "best." There was no standardization of the use of the guidelines, and teams and programs varied widely with respect to which guidelines, if any, were being applied and whether they were being applied consistently. Many team physicians and athletic trainers felt that the guidelines were overly restrictive, particularly with college and professional athletes. Arguments were put forth that "one-size-fits-all" guidelines were not appropriate for the management of a broad array of athletes.

THE VIENNA STATEMENT

In November 2001 an international symposium was held in Vienna, Austria. A summary and agreement statement was published (Aubry et al., 2002) that set forth a new definition of concussion and revised guidelines for the diagnosis and management of sports concussion (henceforth referred to as the Vienna statement). The summary statement defined concussion as follows:

> Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathological, and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include:
>
> - Concussion may be caused either by a direct blow to the head, face, neck, or elsewhere on the body with an "impulsive" force transmitted to the head.
> - Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously.
> - Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than structural injury.
> - Concussion results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course.
> - Concussion is typically associated with grossly normal structural neuroimaging studies. (Aubry et al., 2002, p. 3)

This document also recommended changes in the management of concussions. Importantly, the document recognized the limitations of existing RTP guidelines and recommended that they be abandoned in favor of *individualized graded return to play*. Also of importance was the recommendation that concussion severity should only be assessed retrospectively, after all concussion symptoms have cleared, physical examination is normal, and cognitive functioning has returned to preinjury levels. In a clear departure from then existing guidelines, the Vienna statement included the recommendation that a player with any signs or symptoms of concussion "should not be allowed to return to play in the current game or practice." This statement is significant since it has been estimated that 30% of all high school and college football players return to the same game in which an MTBI is suspected and the remaining 70% return within 4 days (Guskiewicz et al., 2000). In the National Football League it has been estimated that 56.5% of players return to play in the same game and 92% return to play by the 6th day postinjury (Pellman et al., 2004). The recommendations further state that the player should be monitored regularly for any deterioration in condition, evaluated medically following the injury, and RTP should follow a "medically supervised, stepwise process." Prior to beginning the rehabilitation process, the player should be "completely asymptomatic and [have] normal neurological and cognitive evaluations." The player should have complete rest with no activity until asymptomatic. Once asymptomatic at rest, the player should progresses to light aerobic exercise, followed by sport-specific training (e.g., skating, running), then progress on to noncontact training drills, followed by full-contact training and eventually game play. Progression to each subsequent step is predicated on remaining asymptomatic at each previous step. If any postconcussion symptoms appear, the player is instructed to rest for 24 hours and then resume the graded progression if asymptomatic.

The Vienna statement was also unique because it firmly established the importance of neuropsychology in the management of concussion. Neuropsychological testing was described as "*one of the cornerstones of concussion evaluation and contributes significantly to both understanding of the injury and management of the individual*" (Aubry et al., 2002, p. 9; emphasis in original).

THE NATIONAL ATHLETIC TRAINERS' ASSOCIATION POSITION STATEMENT

The National Athletic Trainers' Association (NATA) produced a comprehensive position statement on the management of sports-related concussion (Guskiewicz, Bruce, Cantu, et al., 2004). The statement was prepared by a

multidisciplinary team including ATCs, a team physician, a neurologist, a neurosurgeon, and a neuropsychologist, all of whom had extensive experience in the management of sports-related MTBI. Although the statement did not endorse a particular approach, it did emphasize that the ATC and team physician need to agree on a philosophy for identifying a concussion and determining RTP. It recommended that the term "ding" no longer be used to describe concussion, since the term diminishes the seriousness of the injury. Baseline cognitive and postural stability testing was recommended for all sports having a high risk for concussion. The use of concussion symptom checklists was recommended, as well as monitoring the severity and duration of all symptoms, including LOC, amnesia, and PCSS. The report states that "formal cognitive and postural-stability testing is recommended to assist in objectively determining injury severity and readiness to return to play (RTP). No one test should be used solely to determine recovery or RTP, as concussion presents in many different ways" (p. 281). The report recognized the role of neuropsychologists in the RTP decision-making process as follows: "A neuropsychologist should be identified as part of the sports medicine team for assisting athletes who require more extensive neuropsychological testing and for interpreting the results of neuropsychological tests" (p. 282). Unlike the Vienna statement, the NATA document allows a player to return to the same game if symptom duration is less than 20 minutes. The NATA document suggests that a player who has symptoms in excess of 20 minutes should be held out of competition for 7 symptom-free days unless specific assessment tools (e.g., neuropsychological testing, balance testing, formal sideline evaluation) have been used. This recommendation is important because it requires conservative treatment for those athletes who have not had formal assessment procedures.

The NATA statement recognizes that younger players should be managed more conservatively than older players. They note that recovery in younger players may take longer, and they may require more frequent baseline measures due to the process of cognitive maturation. The report emphasizes that catastrophic injuries have occurred in younger athletes (i.e., second-impact syndrome) and that athletes under the age of 18 need to be managed more conservatively than older athletes.

The NATA position statement is similar to the Vienna statement, which emphasizes an individual approach to RTP using a graded method of increased activity after the player is symptom-free and all tests, if administered, have returned to baseline. The statement does emphasize that players with recurring injury should be treated more conservatively than those with a first injury, recommending that players with a history of MTBI, especially

in the same season, be held out for approximately 7 days following symptom resolution.

THE PRAGUE STATEMENT

In November 2004 the Second International Conference of Concussion in Sports was held in Prague, Czech Republic. The "summary and agreement" document (McCrory et al., 2005), hereafter referred to as the Prague statement, affirmed the definition of concussion that was put forth by the Vienna statement. The document also endorsed the use of individually tailored RTP decisions, as opposed to the use of grading systems. The Prague statement departed from all other documents and guidelines in proposing a distinction between "simple" and "complex" concussions. The basis for this distinction was related to issues of "management," since no empirical data were cited to support such a distinction. Simple concussions were defined as those injuries that resolve without complication within 7–10 days. Whereas the Vienna summary document highlighted the role of neuropsychological data in RTP decision making, the Prague statement downplayed the role of neuropsychology in the management of simple concussions. Curiously, the document states: "Formal neuropsychological screening does not play a role in [simple concussions,] . . . [which] can be appropriately managed by primary care physicians or by certified athletic trainers working under medical supervision " (p. 197). This view of the role of neuropsychological data is inconsistent with the extant literature, which documents that cognitive symptoms may persist beyond the resolution of physical symptoms (e.g., Echemendía et al., 2001; McCrea et al., 2005). This is particularly true for younger athletes (Field, Collins, Lovell, & Maroon, 2003; Moser & Schatz, 2002). Further, if these recommendations are followed, the primary basis for the RTP decision is the athlete's self-report, which has been shown to be unreliable because (1) players will minimize their symptoms in order to return to play more quickly (Mittenburg & Strauman, 2000); (2) players report symptoms differently based on gender and concussion history (Bruce & Echemendía, 2004); and (3) players may be unaware that they are experiencing cognitive difficulties. The unreliability of player report is even recognized within the document: "It should be recognized that the reporting of symptoms may not be entirely reliable. This may be due to the effects of a concussion or because the athlete's passionate desire to return to competition outweighs their natural inclination to give an honest response" (p. 199). The recommendation against the use of neuropsychological testing in simple concussions is even more puzzling, since the document recognizes that "It has been shown that

cognitive recovery may precede or follow clinical symptom resolution, suggesting that the assessment of cognitive functioning should be an important component in any return to play protocol" (p. 201). The recommendation against the use of testing in assessing simple concussions also belies the fact that a player who receives a concussion is more likely to sustain another concussion. If players are routinely tested after a simple or complex concussion, that testing then forms a new baseline that can be used if the player is injured again. Lastly, the use of the term "simple" concussion may be seen as minimizing the importance of the injury and may be viewed as being equivalent to "ding," a term whose use has been denounced by NATA (Guzkiewicz et al., 2004).

In contrast to the conclusions reached about simple concussions, the Prague guidelines did reemphasize the importance of neuropsychological testing in "complex" concussions: "Neuropsychological testing in concussion has been shown to be of value and continues to contribute significant information in concussion evaluation" (p. 201). The Prague statement recommends that neuropsychological testing not be performed while the player is still symptomatic. The document emphasizes that neuropsychological tests should not be used as the sole basis for RTP decisions and that "the final return to play decision should remain a medical one in which a multidisciplinary approach has been taken" (p. 201).

The Prague statement does produce a useful tool for evaluating the signs and symptoms of concussion un a two-sided card. The Sport Concussion Assessment Tool (SCAT) contains basic concussion information, the Post-Concussion Symptom Scale, and a sideline evaluation protocol that assesses orientation, symptoms, five-item word recall, digits backward (or months in reverse), and a neurological screening. The card also has a useful summary of graded return to play:

1. Rest until asymptomatic (24 hours).
2. Light aerobic exercise (e.g., stationary bicycle).
3. Sport-specific training.
4. Noncontact training drills (start light resistance training).
5. Full-contact training after medical clearance.
6. Return to competition (game play).

Another novel aspect of the Prague statement is the recognition that injured players should have cognitive rest in addition to physical rest following concussion. This is important since many high school and college athletes complain that they return to school or classes and then reexperience concussive symptoms because of the cognitive strain caused by those experiences.

A DYNAMIC APPROACH TO RETURN TO PLAY

Echemendía and Cantu (2003, 2004) conceptualized RTP decision making as a series of cost–benefit analyses that involve a complex interplay of many variables that interact in direct and indirect ways. The model, presented in Figure 7.1, contains several major variable groups such as factors related to the concussion itself (concussion factors), factors associated with medical findings and history (medical factors), variables related to the player (player factors), those related to the team (team factors), and any other extraneous factors, such as field conditions, playing surface, quality and upkeep of equipment, facilities, and the like (extraneous factors). This model seeks only to describe the various elements of the RTP decision and does not proscribe a specific approach to RTP decision making, although it inherently endorses an individualized approach to the RTP decision. The model makes allowances for those elements or factors that have direct relationships to the RTP decision. For example, whether the player has positive radiological findings, whether there are positive findings on physical examination, and whether physical symptoms are present all have a direct bearing on whether or not to withhold the player from competition. Similarly, neurocognitive decline

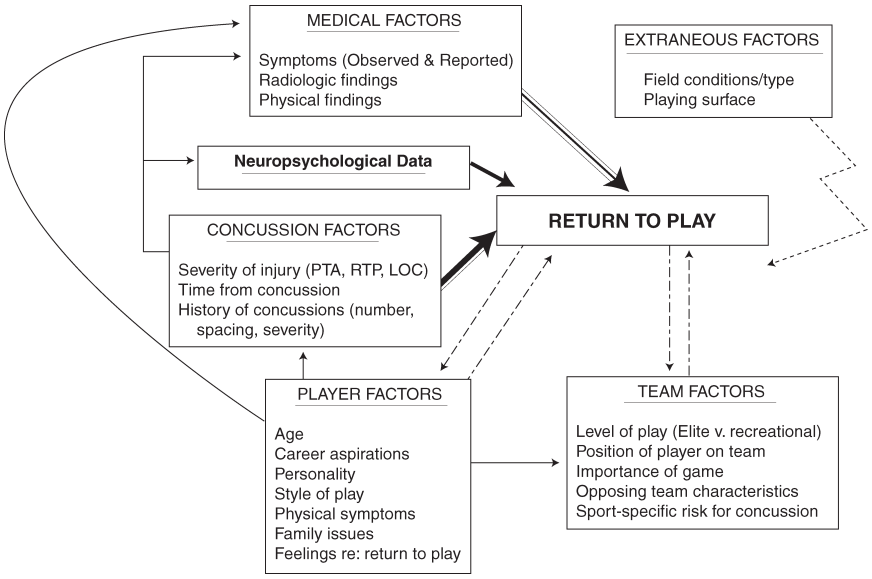

FIGURE 7.1. A dynamic model of Return to Play. From Echemendía and Cantu (2004).

from baseline has a very direct effect on the decision-making process. The player's prior history of concussions, the spacing of those concussions, and the severity of the concussions all have a direct and important impact on the RTP decision. To a lesser extent, the player's career aspirations, personality, style of play, family pressures, and their feelings regarding RTP are also considerations in the RTP decision. Although some would argue that team factors should not be a part of any RTP decision, in reality team factors are often considered in the RTP decision. For example, it is common to consider whether the player is playing at a recreational level versus an elite or professional level, whether the player's position on the team is that of a journeyman or the "star" player, and whether the game or competition is relatively unimportant or whether it is the championship game. Other factors include whether the opposing team is known to be passive or very aggressive and whether the player has been "marked" because his or her concussion history is known.

One factor that was not included in the original model but that research has shown should now be included is player age. Recent data suggest that high school students have a more protracted period of recovery on neuropsychological tests as compared to college students (Field et al., 2003). Lovell et al. (2003) found that high school athletes may also be more vulnerable to concussion as compared to their college counterparts. Moser and Schatz (2002) also concluded that younger athletes may have more enduring neuropsychological deficits than college athletes. Animal studies have confirmed the unique vulnerability of the younger brain (e.g., McDonald & Johnston, 1990; McDonald, Silverstein, & Johnston, 1988).

A related issue with younger players is the need for more frequent baseline neurocognitive testing. Since younger players' cognitive functioning continues along a developmental trajectory, baseline testing conducted when the child is 13 may not be representative of the child at 15 years of age. If the baseline neuropsychological data at a younger age cannot be assumed to represent the child's present neuropsychological "baseline," then the utility of neuropsychological data in RTP for children may be questionable. It has long been recognized in psychological and neuropsychological assessment that age cohort norms must incorporate much narrower bands with children (e.g., 6 months) than with adults. In view of this, research must be conducted to determine the most appropriate interval for retesting children who are involved in high-risk sports. One important avenue for further study is to examine whether an individual's relative standing (percentile rank) changes from year to year at the same rate as absolute changes in test scores. If the child's standing relative to other children does not change significantly, then more frequent baseline testing may not be necessary. Until such research has

been conducted, it is recommended from a practical standpoint that children 16 years or age and younger should have baselines renewed yearly.

All things considered, the Echemendía and Cantu model is highly consistent with the summary statements of Vienna and Prague, since it calls for an individualized approach to RTP decision making that takes into account the complex and dynamic interactions that exist among variables. The model also strongly underscores the recommendation that RTP decisions cannot be based on one single test result.

WHEN IS IT TIME TO STOP PLAYING?

When an athlete should cease playing is one of the most difficult decisions that must be made by the sports medicine team. Although of utmost importance, there is little empirical research to definitively guide the clinician toward an answer. As the chapters in this volume have pointed out, there is evidence to suggest that multiple concussions may lead to detrimental long-term outcomes. There are other data to suggest the opposite. Some studies suggest that the density or spacing of concussions appears to be more important than the absolute number of concussions. There is ample clinical data to suggest that chronic subconcussive blows may lead to long-term neurocognitive sequelae. The complexity of this decision is underscored by clinical experience in which a player with one concussion may be counseled to terminate his or her career because of persistent neurocognitive dysfunction while another with a history of 12 concussions feels "perfectly fine" and looks "normal" on neuropsychological testing. In situations in which there is such tremendous individual variability and lack of clear and consistent empirical findings, it is important to examine the "collective wisdom" of the field. That collective wisdom suggests several important variables that must be examined (Echemendía & Cantu, 2004). The pattern and duration of PCSS must be examined. When PCCS extend from a period of days to a period of weeks, then RTP may not be advisable. Similarly, it is important to examine the nature of the injury and the amount of force needed to bring about concussive symptoms. Whereas early concussions may have been caused by significant blows to the head, later concussions may be generated by relatively minor blows to the head or torso. This pattern of increasingly minor forces leading to concussion should be viewed as a clear warning that RTP may not be advisable. Lastly, patterns of neurocognitive recovery should be examined. If a player is taking increasingly longer periods of time to return to neurocognitive baseline or the player does not reasonably reach baseline functioning, then it is time to consider discontinuation of play.

Whatever the pattern of symptoms or neurocognitive functioning, I always emphasize to the player and family that RTP is a cost–benefit analysis. There are no clear rules or guidelines. For example, one of the players that I worked with had a history of multiple concussions with a pattern of increasingly longer time periods for resolution of symptoms and cognitive recovery. His concussions were now brought on by relatively minor blows. He was about to enter his senior year in college playing ice hockey for a Division I school and was highly regarded as an impact player. His plans were to secure a position in business following graduation from a prestigious university, and he had no plans to play professional ice hockey. After his last concussion it took him 2 months for complete symptom resolution and cognitive recovery. Following this concussion I suggested to him that it was time to examine whether it was wise for him to continue playing hockey. This was an agonizing decision-making process for him and his family. In the end the player decided "it wasn't worth it" and chose not to play hockey. We then instituted a plan to help him deal with the psychological and physical adjustments that would be needed, given this decision. It is important to recognize that a decision to terminate play may create profound changes in players' self-identification, time management, physical conditioning, peer-group relations, view of themselves, and how others view them and their self-worth. It is very easy for players in these situations to slide into a clinical depression. Appropriate psychological interventions and support must be instituted. Family members should also be allowed to express their feelings and reactions to such a decision. As with many families, this family structured its schedule so that family members could travel to see as many of the games as possible. Because of the premature termination of their son's career, they were left with a void and asked, "What do *we* do without hockey in our lives?"

CONCLUSIONS

The RTP decision-making process is complex and dynamic. Although there has been a virtual explosion of research into the diagnosis and management of sports-related traumatic brain injury during the past 10 years, the RTP decision remains largely a clinical endeavor without firm empirically derived guidelines. The clinical neuropsychologist is an important member of the decision-making process in all types of sports-related concussions, but the RTP decision should not be made without the consultation of a physician. The weight of clinical and empirical evidence suggests that the RTP decision-making process should be individualized rather than relying on generic RTP guidelines. At the very least, all athletes who are diagnosed or

suspected of having a concussion should be removed from play immediately. An individualized and graded approach to RTP should begin after the player is asymptomatic at rest and during exertion for at least 24–48 hours. During this interim period the player should have both physical and cognitive rest. The length of time a player must be symptom-free will vary, depending on the nature of the injury, the player's concussion history, the level of play, age, and so on. Younger players (years of age) should be treated much more conservatively than older players. In my view, these players should be held out for a minimum of 1–2 weeks (depending on history) of being symptom-free before beginning gradual physical challenges. The player should also have returned to baseline neurocognitive functioning, as measured by neuropsychological tests, prior to beginning the graded RTP process. Once symptom-free and at neurocognitive baseline for a specified period of time, the player can begin the gradual process of light aerobic workouts, followed by more intense aerobic workouts, strength training, noncontact sport-specific drills, contact sport-specific drills, and finally full RTP. At all times the player should be monitored for the possible reemergence of somatic and cognitive symptoms.

Lastly, the clinical neuropsychologist is in a unique position to be able to assess and intervene with both a player's neurocognitive functioning and his or her psychological functioning. The psychological functioning of a player is often overlooked in the RTP process, but neuropsychologists should be particularly attuned to the issues that may arise in this domain and be prepared to intervene as necessary. In my experience, players and team physicians very much appreciate the impact that we can have in this regard.

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