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Return to Physical Education Is Not the Same as Return to Play:

Proposed Guidelines for Reintegrating Students Into Physical Education After Concussion

BRIAN P. RIEGER, MATTHEW MURPHY,
PAMELA TUCKER, AND JOHN LEDDY



Current guidelines for proper management of pediatric concussion include recommendations for return to sports and general suggestions for return to school (e.g., Baker et al., 2014; Iverson & Gioia, 2016; Patricios et al., 2023), but currently there are no specific recommendations for a safe and successful return to the physical education (PE) curriculum after concussion. This article proposes a graduated return-to-physical education (RT-PE) plan that can be initiated as soon as the student is able to return to school, even while still experiencing concussion symptoms. This protocol is based in part on growing evidence that returning to exercise and physical activity before concussion symptoms have resolved is not only medically safe but can also promote recovery (Leddy et al., 2019, 2021).

Background

Concussion is an injury to the brain that is caused by a blow or jolt to the head (Centers for Disease Control and Prevention, 2019). Clinical imaging of the brain such as computed tomography scans or magnetic resonance imaging is almost always normal after concussion (Sharif-Alhoseini et al., 2011). However, even though the brain *appears* normal, it is not *functioning* properly due to the injury, causing a characteristic set of signs and symptoms (see Table 1). These symptoms can adversely affect school participation, physical activity, and quality of life (Russell et al., 2019). Although the symptoms of concussion typically resolve within weeks, it is not uncommon for symptoms to last longer. A 2014 study by Eisenberg et al. found that, at one month after injury, nearly a quarter of youth, diagnosed with concussion in an emergency department were still reporting headache, over 20% experienced fatigue, and nearly 20% reported taking longer to think. Babcock et al. (2013) conducted a three-month follow-up survey of children and adolescents seen in the emergency department for concussion and found that 29% still had at least three symptoms and had missed at least a week of school.

Benefits of Exercise and Activity During Recovery From Concussion

Though adequate rest is important during recovery from concussion, there is growing interest and increasing research support for so-called active rehabilitation, where youths are encouraged to return to exercise and other activities once symptoms allow and not to simply wait to feel better (Dobney et al., 2017). Beginning light physical activity and individualized sub-symptom threshold aerobic exercise within a few days after injury, and before concussion symptoms have resolved, has been shown to reduce recovery time in concussed athletes and to reduce the

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Table 1.
Common Concussion Signs (Observed) and Symptoms (Reported)

Concussion Signs Observed	Concussion Symptoms Reported
Cannot recall events <i>prior to</i> or <i>after</i> a hit or fall	Headache or “pressure” in head
Appears dazed or stunned	Nausea or vomiting
Forgets or is confused about what is going on	Balance problems or dizziness
Moves clumsily	Double or blurry vision
Answers questions slowly	Bothered by light or noise
Loses consciousness (even briefly)	Feeling sluggish, hazy, foggy or groggy
Shows mood, behavior, or personality changes	Confusion, or concentration problems
	Memory problems
	Just not “feeling right” or “feeling down”

Adapted from Torres (2020).

incidence of delayed recovery (beyond one month; Leddy et al., 2021, 2023). Exercise can also reduce the fear and avoidance of activity and reduce the focus on concussion symptoms some adolescents experience (Carter et al., 2021). In a survey of participants engaged in an active rehabilitation program after concussion, Hunt and colleagues (2018) found several benefits reported by students and their parents, including learning energy management, enjoying the chance to engage in physical activity, and building confidence through structured activity.

In the authors’ experience, many schools do not allow participation in PE until the student has completed the return-to-play (RTP) progression recommended by an international consensus conference (Patricios et al., 2023) and is cleared for return to contact and collision sports. Rather than participating in regular PE activities, students may be asked to complete written or research assignments, even though doing so may aggravate symptoms as much as physical activity. They may also be scheduled for additional PE classes once recovered to make up for missed sessions. Some students may be advised to sit in the gymnasium during PE class, watching other students participate. Falling behind or not being allowed to participate in PE class can cause significant stress and contribute to a student feeling isolated.

Although the incidence of pediatric concussion is highest in organized sports, particularly soccer and football, concussions also occur in PE class, especially during basketball and volleyball activities (Yaramothu et al., 2019). An increased risk of another head injury may partly explain why schools are often reluctant to allow students to return to PE class until they are fully recovered from concussion. Unfortunately, this conservative approach is inconsistent with the active rehabilitation model. We propose that allowing students to participate in PE class while they are still experiencing concussion symptoms can leverage the potential benefits of physical activity, allow them to feel more confident in their recovery, and reduce the stress of having to make up classes later.

Return to Physical Education Is Not the Same as Return to Play

As noted earlier, there is ample guidance in the literature on returning to school after concussion, typically involving a gradual reentry with accommodations that taper as the student's symptoms improve. However, there are no specific guidelines for returning to PE, resulting in wide variability in how this is managed. Tsuchida and colleagues (2022) recently outlined an RT-PE progression that follows the standard scholastic sports RTP guidelines but, like RTP, does not begin until a student is medically cleared from concussion. This is the most common approach followed in schools, and many physicians will simply provide a note indicating that a student is "out of sports and PE until cleared." Whether a student recovers quickly from a concussion or has a more prolonged course, it is appropriate for the student to reengage in the PE curriculum whenever he or she can be back in school, even if still experiencing symptoms. Just as adjustments or accommodations are made in other academic subjects, PE teachers can modify the nature of students' assignments and in-class participation to meet their needs.

To facilitate students returning to PE after concussion, and to encourage more consistency in this process, we are proposing a stepwise

progression for RT-PE that mirrors the current RTP progression developed and refined through several international consensus conferences on sport concussion (Patricios et al., 2023). There are important differences, however, between the RTP and RT-PE guidelines (Table 2).

Recommended Adjustments for RT-PE After Concussion

There are three key considerations for a successful return to PE while a student is still symptomatic from concussion: (1) environment, (2) activity, and (3) symptoms. *Environment* pertains to the amount of stimulation (e.g., noise and light), supervision, and risk of reinjury, such as being in a gymnasium where balls are being thrown around. *Activities* vary in terms of exertion level, visual and balance challenge, risk of reinjury, and student interest. *Symptoms* serve as a guide for the student's tolerance of any activity or environment and should be monitored by the student and PE teacher both at the start of PE class and during participation. To this end, Leddy and colleagues (2019, 2021) have found the 0–10 visual analog scale (VAS; see Figure 1) to be an easy and effective tool for assessing overall symptom burden — students can simply

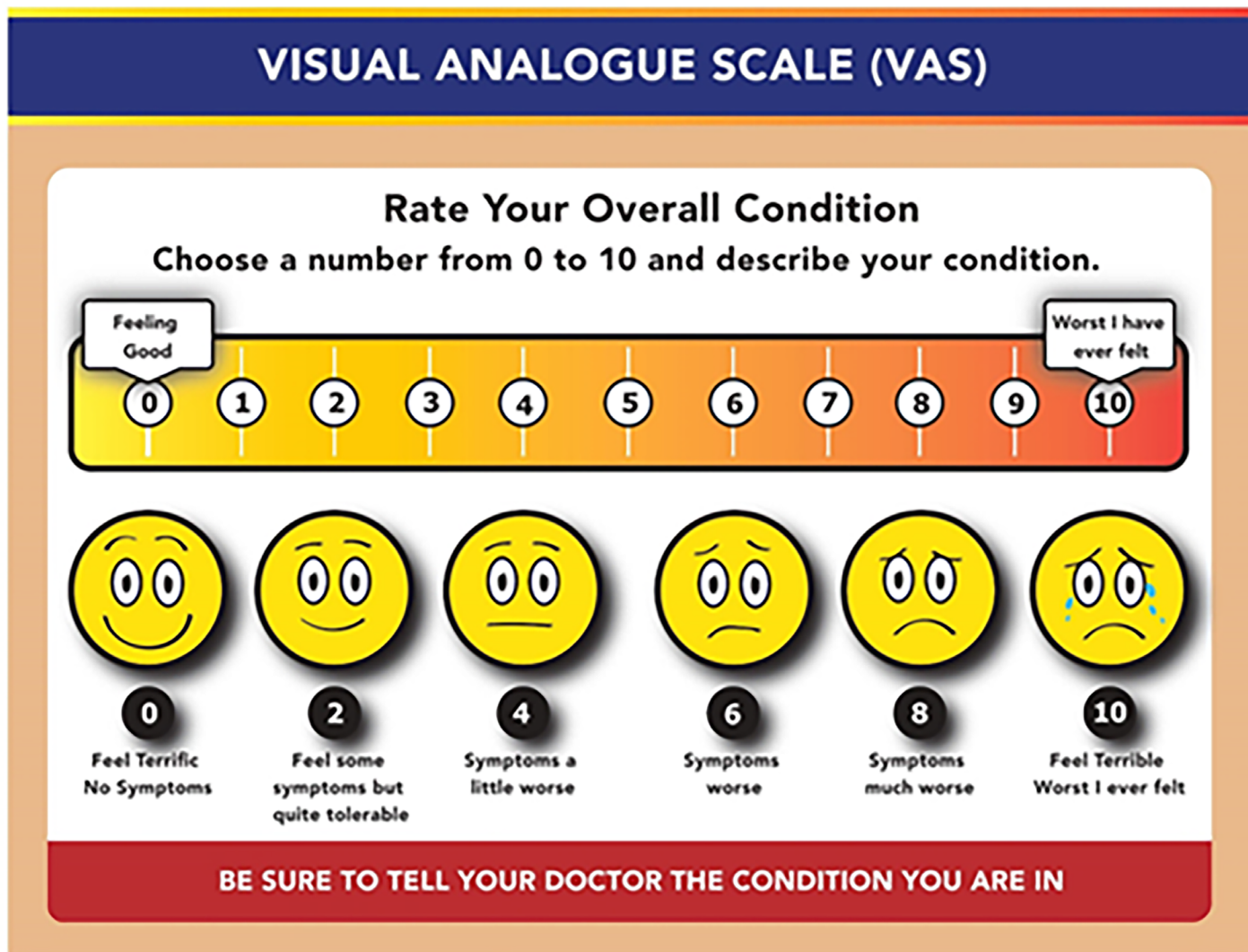


Figure 1.
VAS for use in monitoring concussion symptoms
Adapted from Hayes and Patterson (1921).

Table 2.
Differences Between Existing Return-to-Play and Proposed Return-to-Physical Education Guidelines

Return to Play	Return to Physical Education
Unrestricted return to sport begins when student is concussion-symptom free at rest and with maximal exertion	Begins when student can tolerate being in school at least part-time, even if still having concussion symptoms
Goal is to verify recovery	Goal is to help the student participate in normal school activities during recovery, including exercise
The same protocol is used for every student-athlete	Every student is affected differently and will need individualized accommodations
Uniform protocol well known now by athletes, parents, coaches, and others	Many schools and teachers are still unsure how best to handle this, and there are no uniform guidelines
Mostly overseen by athletic trainer and/or school nurse	Requires teachers and administrators working closely with the medical team and student/family

be asked at the start of class to rate their overall symptoms by choosing a point on the scale. If the overall symptom score on the VAS is greater than 7/10, then physical activity should be avoided that day. If the score is $\leq 7/10$ at the start of PE class, then the student can participate but should stop activity and take a break when the symptom score has risen by two points from baseline. Taking a break may mean leaving the environment if it is too bright or noisy, as well as stopping physical activity.

Table 3 presents a progressive framework for a student's return to PE after concussion. As is the case with the well-known RTP guidelines, a graduated series of steps is recommended, tailored to the individual student's needs and sensitive to each student's tolerance for exertion and stimulation. This framework is not intended to be a rigid protocol but rather to offer some considerations and suggestions for a safe and successful return to PE. Each student will have a unique profile of concussion symptoms and activity tolerance, so PE teachers will need to work with students to identify the best program for them during their recovery. As the student's concussion symptoms improve, the adjustments and supports can be tapered down. Some students may be fully cleared shortly after injury and not require any specialized support, others may have mild symptoms and will move rapidly through the proposed stages, and still others may have a protracted and inconsistent symptom course that requires more active support and accommodations. It should also be noted that, though there is currently no empirical support for our proposed approach to RT-PE, we have anchored our recommendations in both the current science and best-practice clinical guidelines for concussion management.

There are three proposed phases in the RT-PE process: (1) prepare, (2) progress and (3) exit. The focus of Phase I — Prepare is on gathering information from the student, parents, medical providers, and others so that an initial reentry plan can be developed. In Phase II —

Progress, the goal is to move the student through progressively higher levels of challenge, exertion, and stimulation as their symptoms improve. Importantly, this can be a dynamic and variable process, with students more able to tolerate activity on some days than others. For example, a student who took a test in a prior class may have more symptoms at the start of PE. In this phase, it is important to allow students to participate in physical activities but to instruct them to stop any activity that more than mildly exacerbates symptoms (i.e., no more than a two-point increase on a 0–10 scale) and to try again when the symptom exacerbation has subsided. Once the student is fully cleared by their medical provider to participate in PE without restriction, they will proceed to Phase III — Exit, where the RT-PE supports and accommodations will be discontinued. The PE teacher should stay in communication with the school nurse throughout the entire process to provide feedback on the student's progress and to stay informed on any changes in medical guidance, including eventual clearance.

Good communication is an essential ingredient in this process, beginning in Phase I and continuing throughout. Communication between the student and PE teacher is especially important, as well as communication with parents and medical providers. Students — especially adolescent high school students — can feel abnormal, anxious, ashamed, or angry about their concussion symptoms and may be reluctant to talk about them. PE teachers can encourage a more honest and open rapport by validating and normalizing symptoms, offering supports and accommodations without judgment, and welcoming the student's participation in class. Importantly, any questions about the validity of the student's symptoms or need for supports should be brought to the student's parents and medical providers and not presented to the student in a way that leaves them feeling judged or doubted. Postconcussion symptoms can have complex physiological and psychological underpinnings, especially in cases where symptoms persist for a month or more, and even trained clinicians can have difficulty figuring out what is driving symptoms and what the best treatment approach is for each patient (McNally et al., 2013).

The RT-PE process proposed here is an opportunity for PE teachers to help students gradually return to PE in a meaningful way after concussion. The activities provided in the model are suggestions. PE teachers will need to choose specific activities based on information gathered during Phase 1 as well as considering their facilities, current unit being taught, and overall PE curriculum.

PE teachers should also anchor RT-PE activities in national standards (SHAPE America – Society of Health and Physical Educators, 2013b) as well as their state's standards. National Standards 4 and



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Table 3.
Recommended Steps for Return to Physical Education After Concussion

Phase I — Prepare			
Step	Goal	Suggested Activities	Activities to Avoid
1	Ensure permission to begin RT-PE Discuss concerns and gather feedback from parent/guardian Listen to and learn from student Empower student	Discussion with nurse/district physician <ul style="list-style-type: none"> • Confirm approval to begin RT-PE • Reach out to the student’s healthcare provider if necessary Discussion with parent/guardian <ul style="list-style-type: none"> • Review checklist on signs/symptoms and use of the VAS • What are parents’ concerns about RT-PE? Discussion with student <ul style="list-style-type: none"> • Possible checklist on signs/symptoms • Review use of the VAS • What are student’s concerns about RT-PE? • Discuss: <ul style="list-style-type: none"> ○ Tolerance of physical activity ○ Environmental impact (noise, light, etc.) ○ Balance 	No activities during this phase
Phase II — Progress			
Step	Goal	Suggested Activities	Activities to Avoid
2	Low impact, nonstrenuous, light aerobic activity in a <i>safe</i> environment	Low intensity walking, stationary bike, or light yoga	No resistance training No activities that rapidly increase heart rate (e.g., sprinting). No risk for contact or collision
3	Medium-impact, higher-exertion, and moderate aerobic activity in a <i>safe</i> environment	Moderate-intensity jogging, yoga, or elliptical machine	No resistance training No activities that rapidly increase heart rate No risk for contact or collision
4	Unit-specific noncontact activity in a <i>safe</i> environment Activity should be modified for individual work	Individual skill work relevant to unit and curriculum benchmarks E: locomotor skills, throwing, catching MS/HS: Low-resistance weight training with a spotter	No risk for contact or collision
5	Unit-specific noncontact activity in a <i>safe</i> environment Activity should be modified for individual <i>or</i> partner work	Individual <i>or</i> partner skill work relevant to unit and curriculum benchmarks E: Throw and catch with a partner using safe equipment, rhythm activity, station work in own work area MS/HS: Higher-resistance weight training with a spotter	No risk for contact or collision
6	Unit-specific activity in a <i>safe</i> environment Activity should be modified for small-group work	Small-group skill work E: Station work, small-sided volley games MS/HS: Small-sided games, intense aerobic activity	No risk for contact or collision
Phase III — Exit			
7		Return to all unit activities without restrictions	

E= elementary; MS/HS=middle school/high school.

5 are particularly relevant, as the RT-PE process presents an opportunity for students to enhance their personal (self-respect) and social responsibility and to learn to value physical activity in a new way, especially as it relates to their health. National Standard 1 and its related student outcomes (SHAPE America, 2013a) outline concrete

skills that students can demonstrate while working together with the PE teacher to reduce risk of reinjury and avoid more than mildly aggravating concussion symptoms.

Successful change to an existing return-to-PE process will require that schools develop their own district- or school-wide procedures,



based on the resources available. Ideally, students will be integrated into regular PE class activities as much as possible, but certainly some students may require alternate spaces and more creative accommodations. Allowing students to walk in the hall with a pedometer, to utilize a separate workout room, to wear earplugs and/or sunglasses, and to do some stretching and light exercise in a safe space within the gymnasium would all be appropriate adjustments. The school medical director will need to be engaged and supportive of the RT-PE protocol adopted by a school district and may need to reach out to local pediatricians and other medical providers to educate them about the district's approach to RT-PE. Providing ready-made templates for medical clearance letters can assist in this process and avoid confusion or conflict. There is also a need to educate school staff on the rationale and process for returning students to PE before they are fully asymptomatic and medically cleared for unrestricted return to sport, including PE teachers, administrators, nurses, and counselors.

The recommendations presented here for returning students to PE prior to the resolution of concussion symptoms and complete medical clearance may raise concerns about safety and liability. This is understandable given the strong emphasis that has been placed on keeping student-athletes *out of contact or collision sports* until the brain is fully recovered. However, as noted earlier, there is now good evidence to suggest that (1) excessive limitation of activity — including physical activity — during recovery from concussion can have negative effects on the student's well-being and (2) limited

exercise during recovery from concussion is both safe and potentially beneficial. The most recent recommendations from the International Concussion in Sport Group (2022) specifically indicate that mild symptom exacerbation, meaning no more than a 2-point increase on a 0-10 scale compared with the pre-activity level, is typically brief (less than 1 hour), is not harmful, and does not delay recovery (Leddy et al., 2023).

Along similar lines, the New York State Education Department recently (July 2022) updated its *Concussion Management Guidelines for Schools* to better differentiate between return to *athletic activity*, which includes after-school sports, and return to *physical activity*, which includes PE class (New York State Education Department, Office of Student Support Services, 2022). The new guidelines support a return to physical activity while the student is still recovering from concussion and recommend using the VAS to monitor symptoms, as described in this article. Students commonly experience an increase in concussion symptoms when participating in classes other than PE, so as long as the risk of reinjury is addressed and students are allowed to take breaks when needed, there should be no reason why they cannot safely participate in PE as well. Also, students returning to PE following any injury often have a note from a healthcare provider that specifies activities that allow the student to return to PE with modifications. For example, a student with a broken arm may be able to participate in noncontact activities or lower body activities. The recommendations presented here aim to apply this same logic to students recovering from a concussion.

Summary

Students recovering from concussion can and should be allowed to return to PE class when they return to school — even if they are still having symptoms — because light physical activity, including aerobic exercise that does not more than mildly increase concussion-related symptoms, can have psychological and health benefits. Many schools currently treat return to PE like return to sport and athletics, keeping students out of PE class until they are symptom free and fully recovered. We propose guidelines for return to PE that mirror current recommendations for return to other academic subjects, with appropriate supports and accommodations provided during the recovery process to allow the student to participate as much as possible. Providing a safe environment and working with the student to avoid more than mildly aggravating symptoms is essential, as is communication with parents, other school staff, and medical providers. The stepwise RT-PE progression outlined here is a recommended framework that we believe can help reduce students' stress and optimize their recovery. Each district and school will need to develop its own procedures based on the resources available.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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