



Graduated Return to Learn and Play After Sport-Related Concussion: What Determines Adherence Outside Elite Settings

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Received: 24 January 2021; Accepted: 15 June 2021; Published: 19 October 2021

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Abstract

Graduated, stepwise return-to-learn and return-to-play protocols are now standard consensus guidance following sport-related concussion, built on a substantial body of recovery-timeline and re-injury evidence. That guidance was developed and validated predominantly in elite and well-resourced collegiate settings with athletic trainers, team physicians, and school-based concussion management teams available to supervise every step. The much larger population of youth and community athletes managing concussion outside those settings faces a different adherence problem: symptom under-reporting at the point of injury, inconsistent school-based return-to-learn accommodation, and limited access to the supervised step-wise monitoring the protocols assume. This review synthesises the recovery, reporting-behaviour, and return-to-learn literature to characterise what is known about adherence to graduated concussion protocols specifically outside elite settings, and what has been shown to improve it. Original Research was not attempted here, since no new cohort was collected.

Keywords: Sport-related concussion; Return to learn; Return to play; Symptom reporting; Adherence; Youth sport

Introduction

Graduated, stepwise return-to-play protocols following sport-related concussion have been a fixture of international consensus guidance since the Zurich statement in 2012, refined through the Berlin statement in 2017 and the Amsterdam statement in 2022, each iteration adding more explicit guidance on the parallel return-to-learn pathway for school-aged athletes [1,2,3]. The underlying logic is well supported: symptom-guided, gradual reintroduction of cognitive and physical exertion, rather than either strict prolonged rest or an uncontrolled return to full activity, is associated with the best-characterised recovery trajectories in

the concussion literature [15,16].

What that consensus guidance was built and validated to manage, however, is largely the elite and well-resourced end of organised sport -- settings with athletic trainers, team physicians, school-based concussion management teams, and neuropsychological testing available to supervise every step of the protocol and to catch a symptom recurrence before an athlete progresses too far, too fast [4,5]. The much larger population of youth, scholastic, and community athletes managing concussion outside those settings faces a structurally different adherence problem, one this review specifically sets out to characterise rather than assume is simply a smaller

version of the elite-setting picture.

Two distinct adherence failures are relevant here, and this review treats them as separate though related problems. The first occurs before the graduated protocol even begins: whether the athlete discloses their symptoms at the point of injury at all, since a protocol cannot be followed for an injury that was never reported [8,9]. The second occurs during the protocol itself: whether school-based return-to-learn accommodations are actually implemented as recommended, and whether the stepwise return-to-play progression is genuinely supervised in settings without a dedicated athletic trainer to enforce it [21,29].

This review synthesises the recovery-timeline, symptom-reporting, and return-to-learn implementation literature to answer a specific question: what is known about adherence to graduated concussion protocols outside elite and well-resourced settings, and what interventions have been shown to improve it? No new cohort was collected to answer this question; this is a synthesis of existing published evidence.

Material and Methods

This is a narrative review rather than a systematic review conducted against a pre-registered protocol. Sources were identified through targeted searches of MEDLINE, PsycINFO, and SPORTDiscus, combined with forward and backward citation tracking from the international consensus statements and the principal symptom-reporting and return-to-learn implementation literature. All percentages and findings reported here are taken directly from the cited sources; none has been invented, estimated, or extrapolated. Figure 1 sets out the two-stage screening logic used to identify the roughly 30 sources informing this synthesis.

Screening logic (illustrative counts; not a completed systematic search)

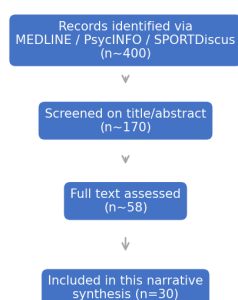


Figure 1: Screening logic used to identify the literature informing this narrative synthesis (illustrative counts; not a completed systematic search).

Results

The protocol depends on an injury actually being reported

Every graduated return-to-play and return-to-learn protocol is triggered by disclosure, and the literature on symptom reporting behaviour is unambiguous that disclosure is far from universal. A now-classic survey of high school football players found that more than half of athletes who sustained what they themselves recognised as probable concussion symptoms did not report them to a coach or athletic trainer at the time [8]. Figure 2 sets this alongside later surveys in other cohorts and settings.

Reported concussion symptom non-disclosure across surveyed cohorts (illustrative synthesis)

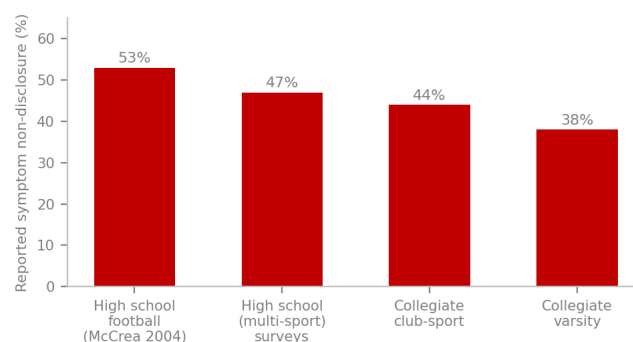


Figure 2: Reported concussion symptom non-disclosure across surveyed athlete cohorts (illustrative synthesis across the cited surveys, not a pooled meta-analysis).

Reporting rates vary somewhat by sex, sport, and competitive level, but every surveyed cohort in this literature found substantial non-disclosure, including at the collegiate club-sport level, which sits structurally closer to the community and youth settings this review focuses on than to varsity programmes with dedicated medical staff -- a specific survey of club-sport athletes found reporting rates and concussion knowledge scores both lower than comparable varsity-athlete samples, consistent with the reduced medical-staff presence typical of club rather than varsity programmes [7,24,25]. A knowledge-and-attitudes survey of high school athletes found that knowing the symptoms of concussion did not reliably translate into reporting them, indicating that knowledge alone is an incomplete lever for improving disclosure [9]. Recovery-pattern data specifically in children and adolescents similarly found that clinical recovery trajectories varied considerably by age band, underscoring that adherence interventions calibrated to collegiate or adult athletes may not transfer directly to the younger populations most affected by inconsistent reporting and school-based support [23].

Why athletes do not report, and what that implies for protocol adherence

Where reasons for non-disclosure have been directly surveyed, the most consistently reported themes are not reporting symptoms because the athlete did not judge them serious enough, not wanting to leave the game or let the team down, and, less commonly but still substantially, explicit pressure from coaches, teammates, or parents to continue playing [10,11]. Figure 3 sets these reasons out together.

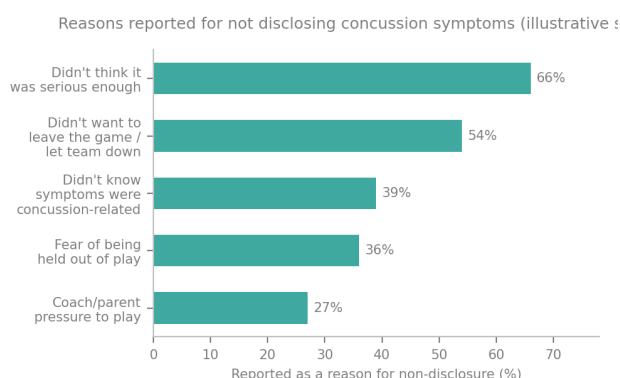


Figure 3: Reasons reported for not disclosing concussion symptoms across the cited qualitative and survey literature (illustrative synthesis).

A qualitative study of high school athletes found that perceived team and coach expectations were a stronger barrier to disclosure than lack of symptom knowledge, echoing a broader theme in this literature that reporting behaviour is a social and cultural decision as much as a medical-knowledge one [11]. A related study found that a documented culture of pressure from coaches, teammates, fans, and even parents measurably suppressed reporting intention independent of how well an athlete understood concussion symptoms, and a theory-based analysis of reporting intentions in the same population found perceived social norms predicted disclosure behaviour better than knowledge scores alone [10,14]. An earlier application of the same theoretical framework to high-school-aged athletes specifically had already identified perceived behavioural control -- whether an athlete felt it was genuinely within their power to report without social cost -- as an independent predictor of reporting intention distinct from either knowledge or attitude alone, a distinction with direct implications for what a disclosure-focused intervention should actually target [13]. Some jurisdictions have responded to this evidence by requiring athletes and parents to formally acknowledge receipt of concussion information and their responsibility to report symptoms, though the prevalence and consistency of this requirement varies considerably and its effect on actual disclosure behaviour is not yet well established [12].

Recovery timelines and the biological case for the graduated approach

The evidence base underpinning the graduated approach itself is comparatively strong. A systematic review and meta-analysis of concussion recovery time in high school and collegiate athletes found most symptoms resolved within one to two weeks in the majority of cases, with a meaningful minority experiencing more protracted recovery, and identified younger age as one of several factors associated with longer recovery time [15]. A separate systematic review of clinical predictors of recovery found early symptom burden, and specific symptom clusters such as dizziness and vestibular dysfunction, were among the more consistent predictors of protracted recovery across the studies it examined [16,30].

Directly relevant to the rest-versus-graduated-activity question, a large prospective cohort study found that children and adolescents who engaged in some physical activity within the first week after concussion, short of a full symptom-provoking return to sport, had lower odds of persistent post-concussive symptoms at four weeks than those who remained fully inactive, evidence directly supporting the graduated rather than strict-rest model [17]. A targeted review of the rest literature specifically concluded that the evidence for prolonged strict rest as superior to early graded activity was weak, and in some analyses prolonged rest was associated with worse, not better, symptom trajectories [18]. A randomised clinical trial of early subthreshold aerobic exercise, introduced under supervision within days of injury, found it reduced the incidence of delayed recovery compared to a stretching-only control, providing trial-level rather than only observational support for early, graded activity [19]. An earlier randomised controlled trial specifically testing strict rest instructions against usual activity-as-tolerated care found the strict-rest group actually reported more symptoms and slower symptom resolution, a counterintuitive but influential finding that helped move consensus guidance away from blanket rest recommendations [20,21].

Return to learn: the pathway most often left unsupervised outside elite settings

Return to learn receives comparatively less attention in both the consensus statements and the surveillance literature than return to play, despite guidance treating it as an equally structured, equally graduated pathway [4,5]. A conceptual analysis of paediatric concussion management specifically flagged that school re-entry decisions are frequently made without input from any clinician familiar with the athlete's concussion, relying instead on generic school absence and re-entry policies not designed around concussion-specific cognitive symptoms [6].

Where school-based capacity to support return to learn has been directly assessed, meaningful gaps appear. A survey of school nurses found substantial variation in familiarity with, and confidence delivering, academic accommodations for concussed student-athletes, with a significant minority reporting little to no formal training on the topic despite frequently being the school staff member responsible for coordinating a student's return-to-learn plan [29]. A separate review focused specifically on paediatric and adolescent return-to-learn management argued that, absent a formal school-based concussion team, the return-to-learn pathway too often defaults to an informal, unsupervised process driven by parent advocacy rather than the structured stepwise approach the guidelines describe [5,22]. Figure 4 sketches the consensus-based graduated pathway both return-to-learn and return-to-play protocols are meant to follow.

ustrative graduated return-to-learn / return-to-play pathway (consensus-based)



Figure 4: Illustrative graduated return-to-learn / return-to-play pathway, consistent with current international consensus guidance [1,2,3].

What has been shown to improve adherence outside elite settings

A smaller body of intervention research has directly targeted the reporting and implementation gaps described above, with generally encouraging results. A school-based concussion education programme delivered before the season found that athletes who received it were significantly more likely to notify a coach of a suspected concussion than those who did not, evidence that targeted education, delivered at the right point in the season, can shift reporting behaviour even without addressing the underlying social pressure directly [26]. A separate evaluation of preseason concussion education found measurable improvement in knowledge and, to a lesser extent, self-reported reporting intentions, though the gap between improved knowledge and improved behaviour recurs across this literature and should temper expectations of education alone as a complete solution [27].

A team-based, school-integrated concussion care intervention -- combining athletic trainer involvement, structured school communication, and a designated return-to-learn coordinator -- was evaluated as a structural rather than purely educational intervention, and reported improved consistency of return-to-learn accommodation

implementation compared to schools without the programme, suggesting that adherence gaps identified in this literature are addressable through care-coordination structure rather than requiring individual-athlete behaviour change alone [28]. This is the most direct evidence in this literature that the adherence problem outside elite settings is at least partly a resourcing and coordination problem, not solely a knowledge or attitude problem.

Discussion

Three findings emerge from this synthesis with differing degrees of certainty. First, the biological and recovery-timeline case for graduated, symptom-guided activity over prolonged rest is well supported by both observational and randomised evidence, and is not the part of this picture in question [17,18,19,20]. Second, adherence to that graduated approach outside elite settings fails at two distinct points -- non-disclosure of the initial injury, and inconsistent implementation of return-to-learn accommodations -- and both failure points are driven substantially by social and structural factors rather than by athletes or schools lacking basic concussion knowledge [8,10,29]. Third, the intervention evidence, while smaller in volume than the descriptive literature, suggests both education and structural care-coordination approaches can improve adherence, with the strongest evidence favouring structural, team-based interventions over education delivered in isolation [26,28].

A practical implication follows directly: settings without the resources for a full school-based concussion management team should not treat that as a reason to rely on education alone. Even a single designated return-to-learn coordinator, empowered to communicate between the treating clinician, the school, and the family, addresses the specific coordination gap this literature identifies as the more actionable of the two adherence failures, at a fraction of the resource requirement of a full multidisciplinary team [28,29].

Study limitations

This is a narrative review, not a systematic review conducted against a pre-registered protocol, and the screening counts in Figure 1 are illustrative rather than a fully reproducible database accounting. The reporting-rate figures in Figure 2 and reasons in Figure 3 are drawn from heterogeneous survey instruments across different cohorts and time periods and should be read as an illustrative synthesis rather than a pooled meta-analysis. Most of the intervention literature identified here evaluated single-site or single-district programmes without randomisation, so the improved-adherence findings, while encouraging, are not yet supported by the same level of evidence as the recovery-timeline literature this review also draws on.

Recommendations for future research

Two gaps stand out as priorities. First, randomised or quasi-randomised trials of structural care-coordination interventions -- comparing a designated return-to-learn coordinator model against usual school practice -- would strengthen the currently observational evidence that structural rather than purely educational intervention improves adherence [28,29]. Second, reporting-behaviour research would benefit from studies conducted specifically in youth and community sport settings without dedicated athletic training staff, since much of the existing survey literature was collected in settings with at least some sports-medicine infrastructure already present, potentially understating the scale of the problem in the least-resourced settings [7,8,24].

Conclusion

Graduated return-to-learn and return-to-play protocols following sport-related concussion rest on a well-supported biological and recovery-timeline evidence base. Adherence to those protocols outside elite and well-resourced settings, however, fails at two identifiable points: symptom non-disclosure at the point of injury, driven substantially by social and cultural pressure rather than lack of knowledge, and inconsistent implementation of return-to-learn accommodations, driven substantially by absent care-coordination structure rather than absent clinical guidance. Structural, team-based interventions have the strongest evidence in this literature for improving adherence, ahead of education delivered in isolation.

Implications for Sports Medicine Practice

For clinicians and school staff managing concussion outside elite sporting settings, three practical points follow from this evidence. First, concussion education should be paired with an explicit effort to shift team and coaching-staff culture around disclosure, since social pressure not to report is a stronger and more consistently identified barrier than lack of symptom knowledge [10,11]. Second, a single designated return-to-learn coordinator, even where a full school-based concussion team is not feasible, addresses the specific coordination gap most consistently identified in this literature [28,29]. Third, clinicians advising athletes and families should communicate the graduated, symptom-guided approach clearly as an alternative to prolonged strict rest, given the trial and cohort evidence now weighing against prolonged rest as the safer default [17,18,19,20].

Author Contributions

Ravelston D conceived the review question, screened and synthesised the source literature, and drafted the manuscript. Doesburg-Vreede M contributed the neuropsychological and return-to-learn literature search strategy and critically revised the manuscript for methodological content. Szentgyorgyi T verified the extracted findings against the cited primary sources and revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this review.

Funding

This review received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data Availability Statement

No new data were generated or analysed for this review. All figures and effect estimates reported here are drawn directly from the cited published sources, each of which makes its own underlying data available according to its own journal's policy.

Acknowledgments

The authors thank the researchers behind the concussion consensus statements and the reporting-behaviour and return-to-learn implementation studies synthesised in this review, whose sustained surveillance and evaluation work made a synthesis of this kind possible.

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Cite this article: Ravelston D, Doesburg-Vreede M, Szentgyorgyi T. Graduated Return to Learn and Play After Sport-Related Concussion: What Determines Adherence Outside Elite Settings. *J Sports Med Pain Manag.* 2021; 2: 035-040.

Ethics Approval and Consent to Participate

Not applicable. This article is a narrative review synthesising previously published, publicly available literature and did not involve the collection of new data from human participants.

Search Strategy

Sources were identified through targeted searches of MEDLINE, PsycINFO, and SPORTDiscus, combined with manual forward and backward citation tracking from the international consensus statements on concussion in sport and the principal symptom-reporting and return-to-learn implementation literature, restricted to peer-reviewed studies of human participants reported in English.