RESEARCH DIRECTS in STRENGTH and PERFORMANCE

CSCCa

2022, Volume 2 (Issue 1): 5
OPEN ACCESS

Considerations for the Utilization of Questionnaires in Collegiate Team Environments

Technical Report

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Open Access

Published: September 27, 2022

Research Directs in Strength and Performance: *2022, Volume 2 (Issue 1): 5*

ISSN: 2768-5187

Abstract

Questionnaires are commonplace in both team and individual sports as a subjective tool to assess an athlete's psychological perception and behavioral practices towards their performance and physical preparation. A consistent and systematic approach is required when administering questionnaires to an athlete or group of athletes. Proper questionnaire design and administration methods allow a strength and conditioning coach to effectively analyze the data and make actionable interventions when necessary. There are challenges in sports, especially team environments, which strength and conditioning professionals must maneuver to better help athletes. These challenges include sudden changes in practice or travel, coaching changes, administrative technicalities, athlete cooperation, and many more factors. When challenges arise, questionnaires are useful tool to gauge how an athlete responds to such changes. The purpose of this report is to outline strategies and considerations for strength and conditioning professionals to effectively implement questionnaires in the collegiate environment.

Key Words: Data, Tracking, Subjective Monitoring

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Introduction

The widespread use of questionnaires within team and individual sports acts as an analytical tool to assess subjective perceptions from individual athletes. Athlete self-reported measures utilizing wellness questionnaires and various survey tools provide low-budget means of evaluating training load and gauging athlete's psychological perceptions and behavioral practices throughout the training year. Questionnaires can help identify an individual athlete's awareness of the physical and psychological difficulty of their training on a day-to-day basis[6]. Additionally, evidence supports that the utilization of subjective ratings of perceived exertion (RPE) in questionnaires may provide more accurate measures of an athlete's internal training load, a variable that is typically measured objectively through heart rate monitoring[4]. An additional but unique aspect to questionnaires implemented in a collegiate environment is that strength and conditioning professionals often develop questions that are specific to the team or athlete at any given moment. Due to sudden changes in assessment needs based on coaches, players and the competitive environment, it is not always feasible to utilize well-researched questionnaires that have been externally and internally validated.

Strength and conditioning professionals frequently face the challenge of designing training programs that maximize performance, meet the demands of the sport, and maintain the health and wellbeing of their athletes[7]. Research has shown the ability to enhance performance, given that workload data is assessed properly and disseminated effectively[7]. More specifically, internal workloads is defined as the physiological and/or psychological stress an athlete experiences in response to a given amount of work (external workload) completed within a training session or competition. Assessing internal workloads allow strength and conditioning professionals to analyze the relationships between objective external workloads and internal workloads[3]. While monitoring heart rate is an objective method to assess internal stress, questionnaires can be an optimal way to assess athletes' psychological internal stress by gauging their opinions and perceptions to training and other environmental stressors[3]. Utilizing questionnaires is a cost-effective monitoring strategy that can be implemented by any strength and conditioning professional. Therefore, the purpose of this report is to provide insight and considerations when creating and implementing questionnaires and surveys in a collegiate environment. Additionally, this report aims to highlight challenges, obstacles, and strategies to successfully collect survey data from athletes and reporting methods to optimize a small component of a larger monitoring program.

Challenges for Practitioners

Successful athlete monitoring via questionnaires requires a concerted effort from well-connected strength and conditioning professionals on a daily basis. Regardless of questionnaire design or response flexibility, there are a number of common challenges and barriers that affect the implementation and continuation of a successful subjective athlete monitoring program.

The questions below characterize some of the most common challenges strength and conditioning professionals encounter when establishing an athlete monitoring program:

- How do I convince my coaches and athletes to begin monitoring in the first place?
- How do I generate buy-in and encourage honest and consistent feedback?
- What questions should I ask? How many and how often?
- How do I know if my questions are valid, reliable and unbiased?
- What's the best way for me to gather and store data in the long term?
- Once I have gathered the data, how do I analyze it?
- How will I know if a meaningful change has occurred or if an intervention is required?
- What's the best way for me to communicate these findings with my staff?
- What if my staff and athletes are not open to changing plans, habits or routines?

Small strength and conditioning staffs at universities with a large array of varsity sports may have significant barriers when implementing a questionnaire on a daily basis. The demands of training a large number of athletes with a minimal staff takes an exorbitant amount of time and can limit coaches ability to implement monitoring programs, especially subjective questionnaires. Even among well-staffed departments that may be in a good position to implement a monitoring program, the notion of interpreting or managing a continuous influx of data (internal and external) is often overwhelming. To manage robust data sets from different sources, athlete management systems can be utilized to alleviate the workload of low-staffed strength and conditioning staffs. However, these solutions can be cost prohibitive, especially at colleges where departmental budgets cover only necessary operating expenses. Many of the above challenges surround a real or perceived lack of time, people, resources, and expertise in designing, implementing, and leveraging the insights generated from an effective monitoring program.

Subjective Data Collection with Questionnaires

Questionnaires should consist of brief questions designed to gauge the knowledge, opinion, and behavior of a population (i.e., athletes)[19]. Questionnaires can provide strength and conditioning professionals with subjective data that can be used for further research and analysis, administration or policymaking. For example, an athlete could report low fuel or low hydration for several days in a row, which may prompt strength and conditioning professionals to take that information and look for ways to enhance fueling or improve their accessibility to fuel and hydration. Questionnaires are widely used because they easy to interpret and economical to implement. When questionnaires are efficiently implemented, they can be administered to a large population in a brief period of time. Therefore, questionnaires can be very useful when working with numerous teams composed of diverse athletes with highly variable daily schedules. Additionally, they are non-interventional, nor invasive, and thus have minimal ethical

concerns, especially when respondents are informed of risks and voluntarily consent to their participation[19]. It is important that strength and conditioning professionals exercise caution when analyzing data from questionnaires as low response rates and selection bias can likely frequently occur. It may be relevant to note that the quality of a questionnaire is greatly dependent on the strategic choice of words, volume of questions and design of the questions utilized. These factors make it critical that the questionnaire is meticulously designed and, if possible, internally validated before implemented on a large scale. A primary consideration for coaches is to ensure the questions ask a specific question that attempts to answer key questions that help improve field performance and reduce the likelihood of injury.

Anecdotally, a mix of closed-ended and open-ended questions are likely to keep the respondent interested and attract a high response rate. Closed-ended questions are easily answered with a yes or no, or perhaps a numerical rating, while open-ended questions commonly involve more in-depth thought and may consist of a few sentences as an appropriate response. When both types of questions are incorporated into a survey, it is recommended to begin with closed-ended questions[19]. The quantity of questions can be best determined by the strength and conditioning professional's ability to manage the information. Although fewer questions may be the best place to start to gain an initial sense of buy-in, questionnaires that can be completed quickly have the highest response rate[14]. Depending on the complexity of the questions, this may include up to 5-10 questions. If a lengthier questionnaire is necessary, research suggest to limit it to 25-30 questions, aim for it to be completed in less than thirty minutes, and consider administering it very infrequently[14].

How to Administer Questionnaires

Questionnaires can enhance communication and may boost athlete buy-in. When implementing questionnaires, one should consider the number of questions asked and the order of specific questions. Proper question volume and order increase effectiveness and prevent poor response rates[13]. A beneficial approach is to administer athlete questionnaires at a designated time, whether first opportunity in the morning, post-lift, or at the end of the day[13]. However, the most successful approach may be allowing the athlete to complete the questionnaire at their convenience. When administering a questionnaire daily a sound recommendation is to limit questions to five concise questions, which ensures the athlete receives timely feedback and it fosters positive relationships between the athlete and strength and conditioning professionals[13]. Consequently, this also will strengthen communication with the sport's coaching staff and additional support staff members such as the dietitians, athletic trainers, and sports psychologists.

Athlete Responses

When considering athlete responses on questionnaires, there are a multitude of factors that must be considered. First, it is important to make sure the questionnaires are administered to encourage consistent and truthful responses. The strength and conditioning professional should discuss the importance of answering all questions honestly in order to have the most accurate data to best help the athlete[11]. Individually administering questionnaires promotes truthful responses and avoids group-based responses. Individualized questionnaires specific to each athlete can also strengthen the bond between them and the strength and conditioning professional, for this promotes the idea that the strength and conditioning professional has a specific interest in the health and well-being of each athlete and is invested in them on a personal level.

Another factor strength and conditioning professionals must consider when analyzing athlete responses is that an athlete's perception of their workload may vary strongly based on their individual training experience[13]. When considering a freshmen athlete versus a senior athlete, the senior athlete will most likely have a higher training age. More often than not, older athletes have been exposed to a more vigorous collegiate strength and conditioning programming than younger athletes and have a more accurate perception of exercise intensity. Further, training age may be related to more accurate perception of training intensity[11].

When reviewing athlete response data, the strength and conditioning professional must actively look for outliers. An outlier is a data value that is extremely high or low and far outside an athlete's normal state, typically greater than 1-2 standard deviations away from the mean. For example, extremely high RPE during a light practice or a very drastically low hydration status may be important to consider when it comes to the recovery and rehabilitation of an individual athlete[12]. Outliers may warrant additional questions and probing of the staff to identify if a real problem exist.

Types of Questionnaires

Wellness questionnaires and ratings of perceived exertion (RPE) scales can be used to answer a multitude of performance questions such as how many hours of sleep an athlete has had, how hydrated or fueled the athlete might be, the amount of stress they may be under, or how much general fatigue and soreness they may be feeling. As a coach designs a questionnaire, it is important to first determine the goal and what insight is critical for the coaching staff. A practitioner must assess if the survey questions should help identify specific types of psychological and emotional stress an athlete may encounter daily[15]. Athletes can encounter eustress (positive) and distress (negative) from their daily environments. Strength and conditioning professionals should be aware of sources of stress athletes encounter on a daily basis that include academic stress, relational stress, stress from coaches, professor, family members, etc. Using a questionnaire can help, determine the athlete's perception of their physical response to various sources of stress in addition to their training and sports performance.

Questionnaires can be organized in a variety of ways when seeking the information above. Strength and conditioning professionals may utilize RPE scales, such as the Borg Rating of Perceived Exertion scale, which consists of a quantitative value from 6-20[17]. Hydration can be collected by asking an athlete how many bottles of water they drank the prior day, or by using a color scale in which the athlete selects the answer which most closely mimics the color of their urine. Fueling questions can be written in pursuit of specific numbers of meals "How many meals (or snacks) did you eat yesterday" with a selector button or fill-in-the-blank, or they can be written as simple yes/no questions like "Did you eat at least three complete meals yesterday, and breakfast prior to training today?"[9].

Methods for In-season Data Collection

When it comes to in-season data collection, the timing of data collection is considered crucial. Depending on the athlete, it may or may not be beneficial to collect data through questionnaire administration on the day of the performance. Some athletes may have a tendency to become over stimulated or start overthinking, which is not an ideal mental state going into a performance. Therefore, it is not recommended to administer a questionnaire too close to a performance. However, with regards to post-performance, most athletes will greatly benefit from the administration of a questionnaire, for it may give an inside look at how an athlete is feeling allowing the strength and conditioning professional to see what needs to be done to aid the athlete's recovery process[12].

Once the collection of these data occurs, it is now time to apply the individual-level data to the team, and begin using the information as a catalyst to drive conversations. These specific conversations may be prospective with regards to the training you are preparing or retrospective as an evaluation of your program's efficacy. They may also be a foundational component of the strength and conditioning professional's bond with their athletes as well as an opportunity to discuss why their perception may or may have not aligned with given expectations. Examples of team-level questions to analyze include:

- Did the training stimulus imposed yesterday accomplish the specific athlete's goal, or was the result an example of underachievement or overachievement?
- Do strength and conditioning professionals need to provide their athletes with more education on topics like sleep hygiene, nutrition, hydration, time management, recovery modalities, etc.[12]?
- Across multiple semesters, is there a team-wide trend regarding stress, academic calendars, and competitive schedules?
- Are there more apparent trends that may need to be given a closer look?

Questions like these may also prompt the strength and conditioning coach to dig deeper, for a simple change or behavioral adjustment. For example, the strength and conditioning coach might conclude a simple adjustment would be to increase the quality of an athlete's recovery thus positively influencing their athletic performance[12].

Tools for Questionnaires

Ratings of Perceived Exertion (RPE): The RPE scale is a common method for determining exercise intensity through the athlete's perception of how easy it is to breathe, or contract the working limbs during physical tasks[5]. Because of this, it is considered to be a subjective measurement. Two scales commonly used to express RPE are the 0-10 scale and the Borg's 6-20 scale. The 0-10 scale starts at 0 (no exertion at all) and ends at 10 (very heavy exertion)[2]. The Borg's RPE scale, developed by Swedish researcher Gunnar Borg is similar to the 1-10 scale, but starts at 6 (no exertion at all) and ends at 20 (maximal exertion), leaving more specific numbers for athletes to quantitatively rank their efforts[17]. Additional variations of RPE scales may utilize quantitative variables while including a red-yellow-green color gradient

and/or various "emoji" faces relating to the emotions that training induced. The 0-10 scale is typically better to use for athlete questionnaires because of its greater ease of comprehension, while the Borgs 6-20 scale is primarily utilized in scientific laboratory settings. Any RPE scale with a color gradient or various emoji faces violates many optimal psychometric principles, and therefore should be avoided when monitoring an athlete through the use of questionnaires[5]. RPE is used in research studies because it has been quantitatively linked to markers of respiration, circulation, and physical output during exercise. It is often used within training programs to describe the intensity of a particular session, for it acts as a temporal phenomenon that is instantaneous to any given point during the athlete's training or competition. This has an important role in the self-regulation of behavior, such as autoregulation of external load and pacing[5].

Session-RPE (sRPE): When athletes recall their RPE for the entire training session or competition it represents the session RPE, otherwise known as sRPE. The session's duration refers to the length of the session expressed in minutes. A nominal score is given by an athlete to describe his RPE of "mean training intensity" during that training session or competition. Training load or competition load can be calculated by multiplying the session's duration in minutes by the quantitative RPE measurement[8]. For example, if an athlete reports an RPE of 7 on an RPE 0-10 scale throughout a 45-minute training session, this would lead to a training load of 315. When analyzing sRPE and training load variables it is best to choose only one RPE scale for athletes to use so numbers can be compared across the board. Session-RPE methodology has been shown to be valid, reliable, and very useful in the performance arena. Additionally, other subjective measures may also prove to be highly valuable too. Coaches and strength and conditioning professionals cannot always exclude the possibility of adding objective measures (HR measures adapted for endurance sports, and/or GPS measures adapted for team sports) to subjective measures. These objective measures have the potential to further complement data obtained from subjective measures[8].

Wellness Questionnaire – A wellness questionnaire is described as a general questionnaire distributed to athletes regarding their health, wellness, and performance. This kind of questionnaire works to gauge the general health and well-being of an athlete at a specific time[16]. Because of this, it may be valuable to administer wellness surveys on a consistent basis, numerous times throughout each semester[16]. Common areas that wellness surveys assess may include nutrition, hydration, stress, and sleep, all of which are further expanded on below.

- Nutrition: Nutritional components may be assessed which may include questions regarding the level of intake of macronutrients such as protein, carbohydrates, and fats. In instances where the athlete is not expected to know their macronutrient values off hand, a wellness questionnaire may ask them to describe their meals. Meal frequency or meal timing components may be assessed as well, with questions such as "How many meals did you eat today?" "How many times did you have a snack?" and "What times did you eat each one of your meals or snacks?"[9]
- Hydration: Hydration components may be assessed through questions about hydration amount or method such as "How many ounces of water did you drink today?" or "Did you have any electrolyte-rich sports drinks today? If so, which ones?"
- Stress: The athlete's stress components may be included within a wellness survey in a multitude of ways, but common questions may be along the lines of "How stressed do you feel today?" "What is the source of the stress you are experiencing (athletic, academic, etc.)?"[16]
- Sleep: Various sleep components may also be analyzed within a wellness survey such as the amount or quality of sleep the athlete got, or the time they went to bed. This may include questions such as "How long did you sleep last night" and "How well-rested do you feel?" Sleep variables may also be measured through wearables so it may be important to consider that data too[10].

It is imperative for strength and conditioning professionals to assess factors affecting student-athlete wellbeing. A brief daily assessment can help in this mission, by asking better questions directly to the athletes in order to help their physical and mental performance. In a study seeking to underscore the reciprocal connection between the body and mind, authors suggest measuring health behaviors, such as diet, sleep, exercise, and alcohol use[15]. The measurement of these specific behaviors may circumvent the need to directly measure mental health symptoms, which many athletes may be hesitant to do[15].

Data Storage and Preservation Strategies

Physical data that includes any information or written forms about the athletes should be stored in a locked file cabinet in the performance office. Electronic data should always be stored in an encrypted and password protected file on the

head strength and conditioning professional's computer or the university's cloud drive. Most athlete management software (AMS) that are utilized in these settings are encrypted and meet Health Insurance Portability and Accountability Act of 1996 (HIPAA) standards[18]. However, it still remains important that strength and conditioning professionals thoroughly understand all HIPAA requirements to adequately store and preserve athlete data. As technology improves alongside the growing data storage and collection market, one's ability to analyze data is changing to be within the palm of their hand via cell phone applications. There are numerous websites and applications that automatically create questionnaires, which can be administered to a team on a daily basis. Widely used applications allow strength and conditioning professionals to create assessment polls/questionnaires within the application and the data and information is then stored on a cloud or integrated in to AMS. A very good rule of thumb for strength and conditioning professionals to consider is if it is measured, it must also be managed.

Questions for the university prior to beginning data collection:

- Does the university consider this data as medical documentation? If so, what is the policy on the number of years that data must be stored or the "data retention policy"? Due to the Personal Health Information, records must be stored for 10 years. The HIPAA Privacy Rule also contains standards for individuals' rights to understand and control how their health information is used[18].
- Does the strength and conditioning professional have the ability to keep the data electronically or do the original documents need to be stored? This may depend on how the strength and conditioning professional is collecting the data. This subset regards individually identifiable health information a covered entity creates, receives, maintains, or transmits in electronic form. This information is called electronically protected health information, or e-PHI. The Security Rule does not apply to PHI transmitted orally or in writing.
- Determine that any folders that are owned by the individual are institutional property and therefore the university must have the ability to access those folders even if the individual leaves the university. As a strength and conditioning professional, it is important to understand the specific university's Institutional Data Policy.
- Will athletes be voluntarily providing information or will it be mandatory? If data collection is mandatory, what will the potential consequences be for not completing their survey?
- Which individuals will be provided with the information after data collection?
- Which individuals will be managing the data and be responsible for any interventions? For example, if an athlete records feeling sore for 3 days, will the athletic trainer or strength and conditioning professional be responsible for prescribing an intervention to address the soreness.

Athlete and Coach Buy In

Prior to questionnaire administration, it is important that a strength and conditioning coach ensures it will be taken seriously by athletes and coaches, and accountability will be maintained in order to consistently collect data over time. In other words, the questionnaire must lead to both athlete and coach buy-in[4]. It is the responsibility of strength and conditioning professionals to get athletes to not only buy-in to their overall performance program, but to welcome the program-specific methodologies of athletic performance monitoring as well. A primary purpose for questionnaire uses within a larger performance program is to provide a wealth of information that will allow strength and conditioning professionals to help athletes develop on both a physical and psychological level. Encouraging athlete buy-in can be done through weekly education methods, such as "90 Seconds of Why," a series utilized by Greg Adamson, Associate Director of Olympic Sports Performance at the University of Tennessee. 90 Seconds of Why features a short video or teaching explanation that helps athletes become educated on the importance of performance components such as these daily questionnaires. Additionally, it is vital that strength and conditioning professionals actively seek out ways to include athletes in what is known as the journey of the questionnaire. On a season-by-season basis, it is valuable to conduct a quick survey to see which questions athletes believe they should or should not be asked. This does not mean that athletes have the final say over a questionnaire's content, but rather gauging their opinions can be considered valuable feedback. Ultimately, questionnaire content should be a collaboration between sports coaches and strength and conditioning professionals, as they can help prioritize what must be analyzed. The inclusion of athletes' feedback in this realm can further accelerate buy-in, as well as help develop meaningful athlete-coach relationships built on communication and trust[4]. Through the growth of these positive relationships, education can be shared on a more intimate level, allowing a higher level of ownership regarding an athlete's questionnaire responses and day-to-day performance. Yet another way to increase athletes' accountability is to encourage them that it is impossible to manage what is not measured. Collecting data over time directly involves the athletes in a positive management cycle, allowing the creation and enhancement of positive habits, which in turn can lead to greater cumulative outcomes.

Taking ownership and exercising personal responsibility is not always easy and can inevitably lead to hardship at times. However, this hardship allows the athlete to work on their ability to be consistent, inciting them on their journey to become better leaders. This shift in mentality allows athletes to progress in their ability to win championships. Although all this stems from a questionnaire, it can be so much more than that. The pivotal concept of athlete buy-in is indeed a direct path to a significant advantage in the competition arena.

Reporting Data to Coaches

When reporting data to sport coaches, it is imperative to explain the purpose of the questionnaire as it corresponds to both the individual athletes as well as the team environment and culture. Student-athletes must understand the value of honest information and consequently how it can affect training, recovery recommendations, or education[12]. This can be achieved through the inclusion of specific examples of the data's positive effect on sports performance. It is also important that sport coaches understand that through the delivery of this data, the strength and conditioning professional is not trying to tell them how to do their jobs, or how to operate practices, but instead provide information that can lead to achieving high-level success for the team. Informing the coaches that these are tools to create conversation is key. Conversations with sport coaches may lead to introspection of strength and conditioning professionals, which may be helpful to consider as they engage in conversations with athletes. Acute spikes in stress (physical, emotional, psychological, etc.) may lead to less desirable training outcomes and therefore an athlete falling short of their maximal potential. Sports coaches may not be able to comprehend data-driven concepts without a collection of comparison data being presented in an understand format.

Every sports coach is different when it comes understanding and comprehending data. This may be a bar graph, table, radar chart, or one of many other ways to present data. As a strength and conditioning professional, exercising flexibility and adapting to whichever presentation style is necessary is a vital skill. In an instance like this, once the sports coach is able to receive data in a manner that is digestible to them, it is the responsibility of strength and conditioning professionals to be able to accurately explain the positive and negative effects of undulations in various stressors.

To optimize reporting, a sound recommendation for strength and conditioning professionals is to establish a standardized framework allowing efficient collection and centralization of data. More specifically, it should be agreed upon how and when data should be collected, formatted, processed, and stored. The importance of the strength and conditioning professionals working synchronously when collecting data should not be understated. The goal for data collection should mimic standardized methods, similar to any research setting, in order to ensure extraneous variables and sources of error are not influencing the outcome manipulation. Ensuring the data is clean, consistent, and free from error markedly improves efficiency and confidence when it comes time to interpret results.

One of the most common ways for practitioners to aggregate data in spreadsheets is through a format referred to as wide format. Using this format, each row is representative of a single athlete's data over time, growing in width as more and more data is added (Table 1). This is a natural format to use since changes within an individual athlete can be easily viewed from left to right. However, a downside to using this format is that post-processing of data by visualization software becomes challenging due to columns not being discernable by a categorical heading.

Table 1. Example data in a wide format with 'Fatigue' as the variable of interest.

	Fatigue		
	2022_09_19	2022_09_20	2022_09_21
Athlete_1	3	2	4
Athlete_2	5	3	5
Athlete_3	5	2	5

A simple method for combatting this is to format datasets in what is known as the long format. When using the long format each column is labeled with a specific variable of interest, such as "Date" or "Fatigue," while each row is a distinct instance of an athlete's entry of this variable (Table 2). Alternatively, variable names can be aggregated in a single column known as an 'ID' or a 'Key' field (Table 3) with an adjacent column noting the 'Result' or value. The long format is more favorable from a software-handling perspective since individual column entries can now be sliced (meaning included or excluded) according to if they match specific criteria. For example, a query such as "on which

[Date]s did [Athlete_1] from [MSOC] record a [Soreness] score of 4 or more?" can be most easily answered utilizing the long format versus the wide format.

Table 2. Example data in the long format.

Date	Athlete_ID	Team_ID	Fatigue	Soreness	Stress
2022_09_19	Athlete_1	MSOC	3	5	1
2022_09_19	Athlete_2	MTEN	5	6	6
2022_09_19	Athlete_3	WBB	5	4	1
2022_09_20	Athlete_1	MSOC	2	3	2
2022_09_20	Athlete_2	MTEN	3	3	6
2022_09_20	Athlete_3	WBB	2	4	1
2022_09_21	Athlete_1	MSOC	4	3	4
2022_09_21	Athlete_2	MTEN	5	6	2
2022_09_21	Athlete_3	WBB	5	7	5

Table 3. Example data in the long format with aggregated variable columns.

Date	Athlete_ID	Team_ID	KPI_ID	Result
2022_09_19	Athlete_1	MSOC	Fatigue	3
2022_09_19	Athlete_2	MTEN	Fatigue	5
2022_09_19	Athlete_3	WBB	Fatigue	5
2022_09_19	Athlete_1	MSOC	Soreness	5
2022_09_19	Athlete_2	MTEN	Soreness	6
2022_09_19	Athlete_3	WBB	Soreness	4
2022_09_19	Athlete_1	MSOC	Stress	1
2022_09_19	Athlete_2	MTEN	Stress	6
2022_09_19	Athlete_3	WBB	Stress	1

When considering which platform to utilize for managing and visualizing information, Excel is the most familiar and generally has the lowest barrier to entry, making it ideal to achieve the greatest reporting outcomes. However, it is important that the strength and conditioning professional understands as the dataset continues to grow, or become more complex, cell-referenced software may struggle to deal with the processing requirements and can easily 'break' if the reference pathways are compromised. Considering this, it is recommended that practitioners consider alternative software that is better designed to manage, manipulate and visualize large volumes of data early on so as not to become overwhelmed in the transition at later stages. PowerBI is often a good solution since most colleges with Office365 as their primary campus platform will inherently have a license for PowerBI usage within their athletic department. Utilizing new software for data management will require some upskilling, as strength and conditioning professionals must become comfortable with using it effectively. In a situation where there may be time restraints, an athlete management solution may prove to be more effective.

Recommendations for Structuring and Delivering the Report

After the initial data has been collected and interpreted, data visualization is a critical part of the process to display the results in a meaningful way. Effectively communicating the results to sports coaches can make or break if the coach will utilize the data. Properly utilizing the data will influence the perceived value that monitoring and data collection brings to the team and organization.

It is important to understand the goal of athlete questionnaires is to convey data in a simple way to a coaching staff and athletes prior to intervention recommendations. It should be acknowledged that few coaches or athletes have high graphical literacy, otherwise known as 'graphicacy' [1]. Therefore, it is critical that sports coaches and athletes are not tasked with interpreting complex and multi-variate plots laden with statistical symbols and mathematical jargon[1]. More often, coaches and athletes are familiar with tabular box scores containing integers and percentage values in rows and columns. Where possible, strength and conditioning professionals should aim to highlight the most important information first through electing the use of visual tools that are familiar and easily interpretable by key stakeholders. The format and style of any report are dependent on contextual interest and the relationship that exists between the strength and conditioning professionals and the sports coaching staff. In general, reports can be presented in a visual or text-based format and can be delivered formally either during staff meetings or informally via dispersed dashboards

with web-accessible reports (Figure 1), printouts, and digital messaging. Visual formats containing graphs, charts, and figures benefit from being information-rich. This allows them to make the most of the real estate available in order to convey meaning. Conversely, text-based formats such as written player reports allow the strength and conditioning professional to be more descriptive about the wider context of what the data is concluding. A combined approach of text and visual presentation of the data is likely the optimal approach to enhance data comprehension.

Figure 1. Example of a wellness dashboard.

Slow turnaround of data-related insights has the potential to overturn an otherwise sound monitoring program and could be considered negligent if the athlete has an illness or is injured. It should be the priority of the strength and conditioning coach to act on the data as soon as it becomes available, given that it has been efficiently processed and interpreted.

Lastly, when it comes to conveying the inferred meaning of questionnaire data, a strength and conditioning coach should avoid deterministic or predictive language. Phrasing such as 'Caroline is 1.5 standard deviations below her typical wellness score so if she practices today, she is going to get injured' can be viewed negatively by sports coaches and may be considered as weaponizing of the data. Instead, consider introducing the magnitude of the change with stats or z-scores and how it may warrant modification following a collaborative conversation with the athlete and support personnel. A better way to approach this finding might be, 'Caroline is 1.5 standard deviations below her typical wellness score and this is quite a large change for her. The sports medicine report shows the athlete has not been coming in for treatment lately either. I suggest Coach Cain contact her to gather more detail and that we add her to the pre-practice meeting regarding options for practice adjustment.'

Conclusion

In summary, strength and conditioning professionals can effectively utilize questionnaires as part of a larger monitoring program to gauge athletes' perception of practice, training, competition, and other aspects of their life. Questionnaires add a necessary component to a monitoring program as strength and conditioning professionals are tasked with minimizing injury risk, maximizing performance, and maintaining an optimal level of health and well-being for all student-athletes. Questionnaires are a single, albeit important component of a high-performance program, allowing strength and conditioning professionals to improve athlete-to-coach communication, education, and potentially sports performance.

Challenges in the collegiate sports setting include, sudden changes in practice or travel, coaching changes, administrative technicalities, and athlete cooperation to name a few. It is advisable when introducing questionnaires into a collegiate team setting that strength and conditioning professional consider the following:

1. use close-ended questions to build buy-in and minimize time to complete,
2. begin with 10 questions or less,
3. questionnaires should take less than five minutes to complete,
4. administer the questionnaire at a designated time,
5. consider administering daily and keeping it to a concise five questions,
6. do not administer questionnaires prior to competition and/or performance dates,
7. consider formulating questions which measure health behaviors, such as diet, sleep, exercise, and alcohol consumption,
8. follow HIPPA requirements and adequately store and preserve athlete data appropriately,
9. establish a standardized framework allowing for efficient collection and centralization of data, and
10. when conveying data to coaching staff and/or athletes do so in a simplified manner prior to the recommendation of necessary interventions.

Through experience and research, the aforementioned recommendations have been found to be the most attainable strategies and common considerations for strength and conditioning professionals to effectively implement questionnaires in the collegiate environment.

References

1. Balchin, W.G.V. Graphicacy. *Geography*. 1972; 57(3):185-195. Accessed 12 Aug. 2022. http://www.jstor.org/stable/40567805.
2. Cleveland Clinic. Rated Perceived Exertion (RPE) Scale. Cleveland Clinic. 2022. Accessed 21 Aug. 2022. https://my.clevelandclinic.org/health/articles/17450-rated-perceived-exertion-rpe-scale.
3. Drew, M.K. & Finch, C.F. The relationship between training load and injury, illness and soreness: a systematic and literature review. *Sports Medicine Journal*. 2016;(46):861-883. doi:10.1007/s40279015-0459-8.
4. Duignan, C., Slevin, P., Caulfield, B., Blake, C. Mobile Athlete Self-Report Measures and the Complexities of Implementation. *Journal of Sports Science and Medicine*. 2019;18(3):405-412. Accessed 12 Aug. 2022. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6683625/.
5. French, D. & Torres Ronda, L. *NCSA's Essentials of Sport Science*. National Strength and Conditioning Association; 2022.
6. Forsdyke, D., Gledhill, A., & Adern, C. Psychological readiness to return to sport: three key elements to help the practitioner decide whether the athlete is really ready? *British Journal of Sports Medicine*. 2016;51(7)555-556. doi:10.1136/bjsports-2016-09770.
7. Gabbett, T.J. The training-injury prevention paradox: should athletes be training smarter and harder? *British Journal of Sports Medicine*. 2016;50(5):273-280. doi:10.1136/bjsports-2015-095788.
8. Haddad, M., Stylianides, G., Djaoui, L., Dellal, A., & Chamari, K. Session-RPE method for training load monitoring: validity, ecological usefulness, and influencing factors. *Frontiers*. 2017;(11):612. doi:10.3389/fnins.2017.00612.
9. Kreider, R.B. Strength, conditioning, and nutritional considerations for high-level performers. *Human Kinetics*. 2020;9(1):31-40. doi:10.1123/kr.2019-0062.
10. Luczak, T., Burch, R., Lewis, E., Chander, H., & Ball, J. State-of-the-art review of athletic wearable technology: what 113 strength and conditioning coaches and athletic trainers from the USA said about technology in sports. *International Journal of Sports Science & Coaching*. 2019;15(1):26-40. doi:10.1177/1747954119885244.
11. Jalilvand, F., Chapman, D. W., & Lockie, R. G. Strength and conditioning considerations for collegiate American football. *Journal of Australian Strength and Conditioning*. 2019;27(2):72-85. Accessed 23 Jun. 2022. https://www.researchgate.net/publication/332728308_Strength_and_Conditioning_Considerations_for_Collegiate_American_Football.
12. Reiman, M.P., & Lorenz, D.S. Integration of strength and conditioning principles into a rehabilitation program. *International Journal of Sports Physical Therapy*. 2011;6(3):241-253. Accessed 12 Aug. 2022. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3164002/.
13. Saw, A.E., Main, L.C., & Gastin, P.B., Monitoring athletes through self-report: factors influencing implementation. *Journal of Sports Science and Medicine*. 2015;(14):137-146. Accessed 12 Aug. 2022. https://www.jssm.org/jssm14-137.xml%3EFulltext.

14. Sharma, H. How short or long should be a questionnaire for any research? Researchers dilemma in deciding the appropriate questionnaire length. *Saudi Journal of Anesthesia.* 2022;16(1):65-68. doi:10.4103/sja.sja_163_21.
15. Souza, N.L., Esopenko, C., Conway, F.N., Todaro, S.M., & Buckman, J.F. Patterns of health behaviors affecting mental health in collegiate athletes. *Journal of American College Health.* 2019;69(5):495-502. doi: 10.1080/07448481.2019.1682591.
16. Williams, C. Creating a wellness survey for student athletes. National Athletic Trainers Association. [19 May 2020]. Accessed 23 Jun. 2022. https://www.nata.org/blog/claire-higgins/creating-wellness-survey-student-athletes
17. Williams, N. The Borgs rating of perceived exertion (RPE) scale. *Occupational Medicine.* 2017;67(5):404-405. doi:10.1093/occmed/kqx063.
18. US Department of Health and Human Services. Health Insurance Portability and Accountability Act of 1996 (HIPAA). Centers for Disease Control and Prevention. 27 Jul. 2022. Accessed 13 Aug. 2022.
19. Yaddanapudi, S., & Yaddanapudi, L. N. How to design a questionnaire. *Indian Journal of Anesthesia.* 2019; 63(5):335-337. doi:10.4103/ija.IJA_334_19.