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How injury registration and preseason assessment are being delivered: An international survey of sports physical therapists

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ABSTRACT

Objective: To identify the role of sports physical therapists (PT) in the organization of injury registration and preseason assessment, applied in athletic organizations and sports teams of different gender and level world-wide.
Design: cross-sectional study.
Setting: *LimeSurvey* platform.
Participants: Sports PTs working with athletes invited through International Federation of Sports Physical Therapy.
Main outcome measures: injury registration and athlete's screening.
Results: 414 sports PTs participated in this international survey (mean age of 37.66 (SD = 9.38) years). 340 participants indicated that the PT as the responsible for injury registration. Barriers to properly register injury throughout the season were indicated by 157 sports PT and 86 (54.77%) indicated a lack of time on their routine as the main factor. 93 participants (30.09%) indicated that they customize the prevention program based on the preseason assessment. Sports PTs who reported not performing a preseason assessment (92 participants - 22.22%) mainly indicated this to be consequence of lack of structure in the organization (44 participants – 47.82%).
Conclusion: The majority of the sports PTs participate on injury registration and perform preseason assessment in athletes. However, lack of time in their routine and structure in the organization were recognized as the most important barriers to organize these properly.

1. Introduction

According to Van Mechelen's sequence of prevention, a standardized injury registration system is mandatory for an evidence-based injury prevention approach (Bolling et al., 2018; van Mechelen et al., 1992), since the injury incidence and/or prevalence is the initial step for any preventive action. However, Ekegren et al. (Ekegren et al., 2014) found that the majority of clubs in Australian football league do not even keep track of the injury incidence through the season (Ekegren et al., 2014). This finding raises the question whether this might be a world-wide phenomenon rather than just a coincidental finding. Remarkable is the fact that such information is not available at present in the literature, although these insights could improve our implementation and adhesion strategies as regards sports injury prevention, as such contributing to athletes' health and safety world-wide.

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The second step of Van Mechelen's sequence of prevention state is that we should understand injury etiology to be able to prevent injuries (van Mechelen et al., 1992). For example, screening for sudden cardiac dead in sports practice is recommended by important sport organizations such as the American College of Sports Medicine, the European Society of Cardiology and International Olympic Committee (Corrado et al., 2005; Riebe et al., 2015). Following some Physical Therapy guidelines, we should assess our client to make a decision about any clinical action (Teo et al., 2019; van Melick et al., 2016). Preseason assessment is commonly performed in athletic organizations and sport-teams, aiming to (1) screen the athletes on potentially increased sports-related injury risks, (2) deliver outcome-based prevention training and (3) be a benchmark of performance and to provide markers for later comparison if needed (Bahr, 2016)· (Bonazza et al., 2017)· (Dallinga et al., 2012)· (Hughes et al., 2020). For example, Dallinga et al. (Dallinga et al., 2012) indicated that screening test (such as star excursion balance test, hamstrings:quadriceps ratio and decreased hip abduction ROM) could be recommended to medical staff since some evidence is available stating these to be valid and clinically helpful in identifying athletes at increased risk of sustaining future knee, hamstring, groin and ankle injuries. However, the necessity of performing this preseason screening has been questioned when dealing with musculoskeletal injury prevention, mainly because of lack of strong evidence as regards the validity of the assessment outcome for the identification of increased injury risk in athletes (Bahr, 2016). While it remains undefined how preseason screening can contribute to injury prediction, it is clear that preseason screening is important in identifying the (health and performance) status of each individual player prior to the start of the season.

Despite the recognition that injury registration and preseason assessment should be performed by sport-teams, research investigating contemporary injury prevention practices in sports organizations world-wide, on different gender or level, is non-existent to date. The literature indicates association of gender and level to injury risk (Pfirrmann et al., 2016; Post et al., 2020; van der Worp et al., 2015a). For example, Post et al. (Post et al., 2020) found that gender was associated with overuse injury among basketball athletes, with female basketball athletes nearly 4 times more likely to report an overuse injury compared with male basketball athletes (odds ratio = 3.7; 95% confidence interval = 2.1–6.6; $P < 0.001$). Therefore, makes sense to incorporate gender and level on sport injury prevention investigations.

Finally, it is not always clear which role the physical therapist (PT) plays in a team's injury registration and preseason assessment routines, let alone the conditions/circumstances under/in which PTs are working in athletic organizations or sports teams and how these influences the injury prevention policy in respective organizations. No previous study ever aimed to identify the role of the PT in injury registration processes and in preseason assessment conduction at an international level. Therefore, the purpose of this international survey was to identify the role of sports PTs in injury registration and preseason assessment applied in athletic organizations and sports teams of different gender and level world-wide.

2. Materials and methods

This international survey was reported in accordance with the ‘‘strengthening the reporting of observational studies in epidemiology (STROBE) statement‘‘. This study was approved by the Ethics Committee of Ghent University (Ghent, Belgium) (#B6702020000151).

Physical therapists were invited to participate in this study through the International Federation of Sports Physical Therapy (IFSPT) database (electronic address and social media). IFSPT is a sub-group of the World Physiotherapy (WP) and has 34 member-affiliated organizations representing different countries. The participants were invited by means of emails departing from the IFSPT's secretary. These emails included (i) the study purpose and inclusion criteria, (ii) the consent form and (iii) the structured questionnaire (accessible by clicking on a link).

When a participant answered the entire questionnaire using the link, an automatic electronic message was sent to the examiner (L.D.M.), who was responsible for organizing the datasheet and analysing it. A reminder was sent by the IFSPT secretary to all members requesting to forward the survey to their sport physical therapists every 15 days. Potential participants had 4 months to fill in the questionnaire. In order to be part of this study, physical therapists had to meet the following criteria: (i) be a registered physical therapist at a Sports Physical Therapy Association member of the IFSPT, (ii) working in athletic organizations or sports teams and (iii) have experience with injury prevention in athletes (a minimum time of experience was not established). All participants consent to participate and all collected data was guaranteed to be kept confidential as everything was acquired and analysed anonymously.

The online survey was built using the *LimeSurvey* platform. The questionnaire consisted of 3 parts: (1) a ‘Demographics’ section, containing 15 questions, (2) an ‘Injury registration’ section, containing 5 questions and (3) an ‘Athlete's screening’ section, containing 4 questions. These questions were constructed such that the majority could easily be answered by simply checking boxes. The survey can be consulted in APPENDIX A.

All data collected within *LimeSurvey* were exported to Excel for consecutive analysis. Descriptive statistical analysis was performed to define the characteristics of the participants and estimate the absolute and relative frequency of responses related to Injury registration and Athlete's screening. We categorized the continuous variables ‘age’ and ‘work experience’ into two categories, considering the variables' median as the cut-off point.

The Independent *t*-test and Pearson chi-square test were used to compare the answers based on respondent's age, gender, amount of experience, and gender composition of their athletic teams. These analyses were performed on the entire selection of continuous and categorical variables collected in the present study. Odds Ratios (OR) were used to establish associations between categorical variables in case of Pearson chi-square statistical significance. All statistical analyses were performed using the Statistical Package of the Social Sciences, Version 26 (SPSS 26). The level of significance was set at 0.05.

3. Results

Ultimately, 414 active sports PTs participated in this study's survey filling at least 50% of the survey (a total of 821 accessed the survey link, 698 accessed the link and consented but only 414 filled at least 50% of the survey), as indicated in Fig. 1.

Demographic characteristics of this study's participating sports PTs are presented in Table 1. Age, experience, gender information and academic degree are shown. We created sports PT groups of young age (<36 years old), old age (>36 years old), low work experience (<6 years) and high work experience (>6 years) with the median value as cut off points (Table 2).

APPENDIX B displays the distribution of sports PTs per IFSPT member organization (countries). The countries with higher participation were Japan (64 participants, 15,45%), Brazil (63 participants, 15,21%) and Canada (40 participants, 9,90%). The top 3 sports the sports PTs reported being involved with were (1) soccer (194 participants – 46.85%), (2) basketball (49 participants – 11.83%) and (3) volleyball (30 participants – 7.24%). Almost one

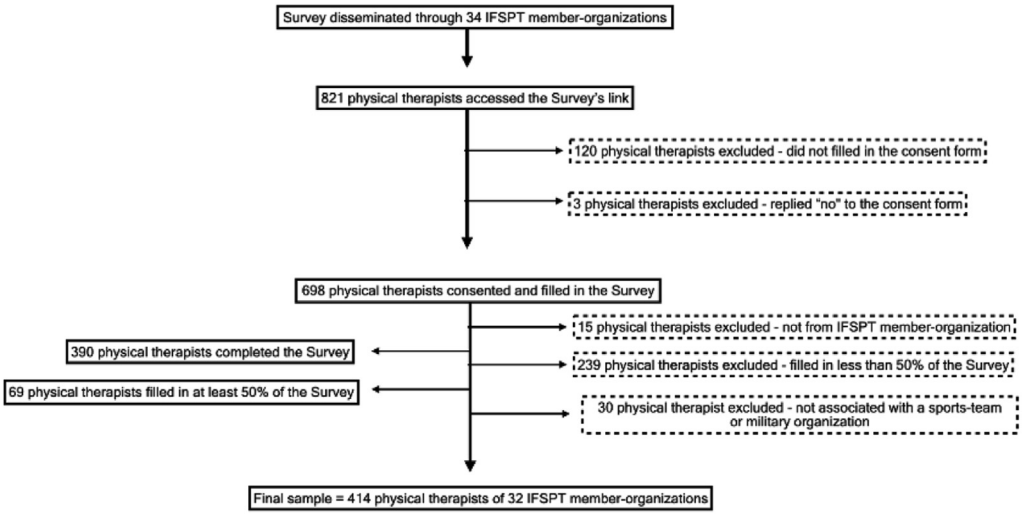

Fig. 1. Flow diagram of the participants.

Table 1
Demographics of the participants (n = 414).

Age and experience					
	Mean	Standard Deviation	Minimum	Maximum	
Age (years)	37.66	9.3	24	80	
Work (years)	8.31	7.0	1	50	
Gender					
	Mean	**Standard Deviation**	**Minimum**	**Maximum**	**Frequency**
Female					96 (23.18%)
Age (years)	38.91	9.34	24	63	
Work (years)	8.33	6.99	1	38	
Male					318 (76.81%)
Age (years)	37.29	9.37	24	80	
Work (years)	8.30	7.01	1	50	
Academic degree					
	Female	**Male**		**Sample**	
PhD	13	37		50 (12.07%)	
Master (research)	12	47		59 (14.25%)	
Master (professional)	40	96		136 (32.85%)	
Graduation	31	138		169 (40.83%)	

Table 2
Sports PT groups of young and old age, low and high work experience.

Age category		
	Younger	Older
Age (years)	30.26 (3.27)	44.93 (7.55)
Work (years)	7.77 (3.77)	8.83 (7.19)
Female	38 (18.53%)	58 (27.75%)
Male	167 (81.47%)	151 (72.25%)
Experience category		
	Less exp	**More exp**
Age (years)	36.64 (9.14)	38.56 (9.51)
Work (years)	3.22 (1.43)	12.74 (6.91)
Female	46 (23.83%)	50 (22.62%)
Male	147 (76.17%)	171 (77.38%)

third of the PTs work with different sports (n = 125; 30.19%).

Fig. 2 presents the age and gender of the athletes of the responding sports PTs, as well as their competition levels.

Only 156 (37.68%) sports PTs worked full-time in their athletic organizations/sports teams. We found a significant difference (p = 0.005) between sports PT's working with female and male teams as regards full time employment. Sports PT's working with male teams were significantly more likely to work full-time compared to PT's working with female teams (OR = 2.463, 95%CI 1.166–5.204). No differences were found for full time employment based on the sports PT's gender, experience or age.

More than a half of the sports PTs (272 participants, 65.70%) have sufficient financial resources in their athletic organizations/sports teams to support a good work environment. We found a correlation between financial resources and the sports PT's employment status (p < 0.0004). Sports PTs working half-time were found to have an increased likelihood having no sufficient financial resources to support a good working environment (OR = 1.716, 95%CI 1.249–2.35). No differences were found for financial resources based on the sports PT's gender, experience and age and gender of their associated athletic teams.

Based on the answers of 408 sports PTs (98.55%) indicating injury registration to be conducted in their organization, 340 participants (83.33%) reported that the PT is the one primarily responsible for injury registration (Fig. 3). Only 6 (1.44%) indicated that their organization did not engage in any type of injury

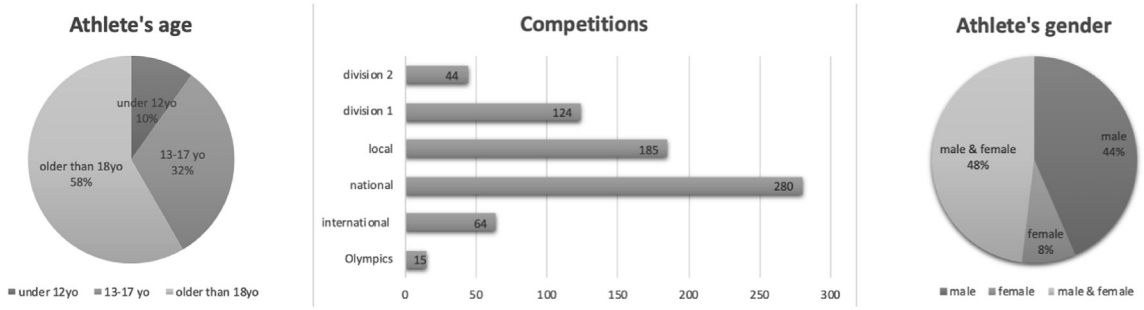

Fig. 2. Athlete's age, gender and competition level who the sports PTs work with.

Fig. 3. The responsible for injury registration and rationale to build the preseason assessment.

registration. No differences were found on injury registration based on sports PT's experience, age and gender of their associated athletic teams.

The presence of barriers to properly register injuries (systematically and individually) throughout the season were indicated by 157 sports PTs (37.92%). When asked about the reasons behind these barriers, 86 participants (54.77%) indicated a lack of time on their routine as the main factor (Table 3). 23 sports PT (14.65%) indicated not knowing whether and how their organization performs (any type of) injury registration and 4 participants (2.54%) indicated that injury registration was not important and they did not perform it.

The majority of the sports PTs indicated performing preseason assessment (309 participants, 74.63%) on their athletes and 93 (30.09%) indicated customizing prevention training programs based on the preseason assessment results, albeit generically for the entire team/group. 186 sports PTs (60.19%) stated customizing preseason assessment-based prevention programs on an individual basis, but only for the high-risk athletes. Only 25 (8.09%) reported to apply both strategies depending on the athlete's level and 5 sports PTs (1.61%) indicated implementing the prevention strategy tailored to each individual athlete. Fig. 4 indicates the rationale used to build the preseason assessment, being clinical reasoning/biomechanics the most chosen one. No differences were found in terms of preseason assessment organization/content based on sports PT's gender, experience, age and gender of their associated athletic teams.

Sports PTs who reported not performing a preseason assessment (92 participants - 22.22%) mainly indicated this to be a consequence of lack of structure in the organization (i.e. space and materials – 44 participants – 47.82%). Table 4 indicates the other reasons mentioned additionally. Only 2 sports PTs (2.17%) indicated not to engage in preseason screening since they do not consider it to be important.

4. Discussion

The purpose of this study was to identify the sports PT's role in injury registration and prevention-associated preseason screening procedures that are being applied in athletic organizations and sports teams regardless of competition level and gender worldwide. Our results revealed that the sports PT is the main

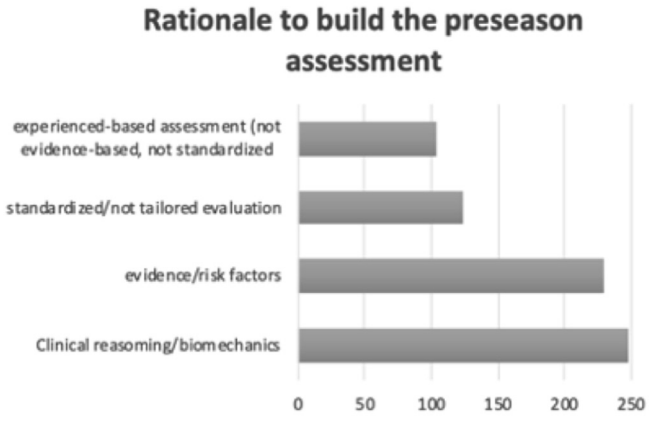

Fig. 4. The rationale to build the preseason assessment.

Table 3
Barriers to injury registration.

Barriers to perform injury registration (n = 157)		
	Participants	Frequency
Lack of time in sports PT's routine	86	54.77%
Lack of organization/standardization	24	15.29%
Lack of resources/interest	9	5.74%
Not answered	38	24.20%

Table 4
Barriers to preseason assessment.

Barriers to perform preseason assessment (n = 92)		
	Participants	Frequency
lack of structure in the organization	44	47.82%
lack of time on sports PTs	42	45.65%
lack of time on athlete's routine	34	36.95%
lack of support from the head coach	15	16.30%
lack of support from other PTs	11	11.95%

responsible person for injury registration and only 6 participants indicated that their organization did not engage in any type of injury registration. The main barrier to systematically register injury occurrence throughout the season was mentioned to be lack of time on their routine. The majority of participants performed preseason assessment in their athletes and 60.19% of the participants customized preseason assessment-based prevention programs on an individual basis for the high-risk athletes. Ninety-two PTs do not perform preseason assessment and the main underlying reason appeared to be lack of structure in the organization. These results could help sports PTs with organizing their injury prevention policy and strategies once they properly establish injury registration and preseason assessment routines.

Almost all participants indicated that there is a person responsible for injury registration in their organization, the sports PT being the most frequently responsible. Systematic injury registration is key in injury prevention, since numerous studies identified injury history as one of the most important risk factors for sustaining a new injury, both as regards re-injuries and index injuries involving other body regions and musculoskeletal structures (Green et al., 2020), (Toohey et al., 2017), (van der Worp et al., 2015b). Moreover, reported injuries guide the implementation of preventive strategies as well as the development of new training-protocols which could promote sport performance without increasing athletes' injury risk (Faigenbaum & Myer, 2010)· (Bizzini & Dvorak, 2015)· (Gabbett, 2016). For example, Australian football players having cumulative loads of 3-weekly distance (OR = 5.489) and of 3-weekly sprint distance (OR = 3.667) had an increased likelihood of injury risk (Colby et al., 2014). Unfortunately, the results of the present study indicated that not all organizations keep tracking their athletes' injury history. Given the fact that the evidence demonstrates that injury history and/or a higher workload increases the risk to sustain a new injury and that injuries guide the development to more adequate training-protocols, systematic injury registration is imperative in an athletic organization in order to effectively contribute to injury risk identification. Moreover, as we established that the PT is primarily engaging in the process of injury registration, he/she has an essential role in promoting and performing the necessity of standardized injury registry in his/her athletic organization/sports team.

One common justification used not to register injuries is the lack of time and some researchers explore methods to optimize this process in order to improve effectiveness (Møller et al., 2018; Olsen et al., 2006). One factor which could contribute to this lack of time is the sports PT's availability at the sport-team work-regimen. Actions to improve effectiveness and to help on PT's "lack of time" could be adopted, such as 1) improve PT's time-expend in all data registering adopting software/application instead of paper forms, 2) treat athletes who have complains before or after training sessions based on priority (meaning that low-priority could be managed alternatively by other professionals or even through education), 3) increase education among athletes to improve preventive actions and decrease sports PT's unnecessary demand. If PTs would systematically/more frequently engage in full-time occupations, the load might be distributed more properly and each sport PT would need to cover less athletes, potentially also facilitating injury registration. Given the importance and the workloads associated with the organization of injury prevention strategies in sports, the sport PT should not be the only one engaging in respective injury registry. Olsen et al. (Olsen et al., 2006) investigated the injury incidence in youth handball comparing standardized match reports and coach reports. They found these injury reports to be very similar and concluded that the coach report seems to be the best method to register injuries in youth team handball to provide data on the full spectrum of injuries according to their type, incidence and severity. It is important to stress that the coaches were trained to fill in a questionnaire regarding every injured player and, in case of doubt about the diagnosis, the player was referred to a physician or sports medicine centre for follow-up. Therefore, in case of sport PT overload and/or lack of time for systematic injury registration within organizations, other associated professionals should be responsible for injury registration in the athletic organization/sports team. as well.

Despite the need of more high-quality research to investigate the role of preseason assessment results to build preventive programs (Whittaker et al., 2017), preseason assessment was conducted by the majority of participating PTs in this study. Since assessment is considered mandatory for a clinical decision-making process in Physical Therapy, it is expected to find a high frequency of preseason screening in our sample, especially considering its importance to identify athletes' health and performance status (Toresdahl et al., 2018). In fact, more investigations should be delivered about the role of preseason assessment and its predictive value, considering that injury is a complex phenomenon that emerges from non-linear interactions among multi-factors (Fonseca et al., 2020). FIFA 11+, probably the most disseminated prevention program, was based on the injuries more common in soccer (i.e. ankle and knee sprain, muscle strain) associated to the sport action (i.e. running, kicking, cutting) (Bizzini & Dvorak, 2015). It seems reasonable that similar information would be used to build assessment and intervention processes in a profession. The literature supports our participants' answers that injury epidemiology, clinical reasoning and biomechanics were considered important factors to assess in the preseason assessment (Bonazza et al., 2017; Dallinga et al., 2012; Lehr et al., 2013). Especially in the absence of evidence-based guidelines on how to build the preseason assessment, this information could guide properly this process.

Typically, pre-competition season is characterized by athletes being exposed to a high frequency of training sessions and friendly matches after a short-period of 1) complete cessation of training in the transition period and 2) returning to training (Silva et al., 2016). Limiting structured training and recovery opportunities could contribute to increased psychological and physiological stress and injury risk in this specific time of season (Nedelec et al., 2015; Silva et al., 2016). In our study, the main reasons not to perform preseason assessment were lack of structure in the organization and

overload of the physical therapy service. The absence of proper screening facilities, but also planning, could contribute to overload reported by participating sports PTs, disabling them to perform regular injury prevention screening due to lack of time, willingness and motivation. Considering that respective screening procedures could be performed on the field using low-cost equipment (Lehr et al., 2013), these regimens should be promoted and facilitated in sports organizations world-wide, by means of shared consensus amongst the organization's medical and technical staffs.

The minority of the participants reported working exclusively with female teams/athletes. These sports PTs demonstrated an increased likelihood to work only half-time, compared to PTs working exclusively with male teams. Although no significant differences were found, this finding is most probably primarily related to the issue of financial resources, rather than it is related to gender, since sports PTs who reported working half-time (which were female in the majority of cases) had an increased likelihood to not have sufficient financial resources to build prevention programs in their organizations. Interestingly, no differences were found in work experience when we compared younger and older PTs. Probably, prevention might not have been so popular among sports PTs in the past and it became more and more an important part of the PTs' weekly routine during the last years, most probably stimulated by the release of FIFA 11+ in 2006 (Sadigursky et al., 2017).

This study has limitations that should be considered. First, the results are susceptible to reporting bias, since each participating sports PT answered the questions based on his/her personal beliefs, perceptions, income and contacts with their colleagues and athletes. Moreover, the dissemination of the survey depended on the IFSPT members' engagement. Therefore, even with the reminders sent by IFSPT, after 3 months we could not see much progress in the number of participants. Nevertheless, this was the first study to report how sports PTs participate in injury registration and preseason assessment world-wide and which barriers they commonly find to develop each action. Therefore, its results raise new insights regarding injury registration and preseason screening research, for example the impact of working with male or female teams, or the importance of the sports PT's occupational status (working half- or full-time for the athletic organization). These new insights into contemporary injury prevention approaches applied across the world could provide a starting platform on the basis of which future essential steps towards internationally uniform and evidence-based injury prevention could be implemented in sports organizations of varying levels.

5. Conclusion

Our survey results identified the most commonly used injury registration and screening practices, as well as existing barriers to organize respective registration and screening protocols on an international level. The overwhelming majority of the sports PTs participate on injury registration and perform preseason assessment in athletes. However, lack of time in their routine and structure in the organization were recognized as the most important barriers to organize these properly. This information could be used by clubs and sports PTs to implement a more effective injury registration and preseason injury risk assessment routines in athletic organizations and sport-teams world-wide.

Confirmation of ethics compliance

We confirm that the Ethics Committee of the Ghent University approved this study (report number B6702020000151).

Declaration of interest

The authors also declare that they do not have any conflict of interest.

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Appendix ASupplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ptsp.2021.08.014.

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