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ORIGINAL ARTICLE

Adaptive sports in Physical and Rehabilitation Medicine across Europe: the forgotten therapeutic ally

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ABSTRACT

BACKGROUND: Physical and rehabilitation medicine (PRM) units promote health and autonomy. One way to achieve this is through physical activity (PA), yet research shows that individuals with physical impairments are not physically active. One way to motivate them is through adaptive sports (also named para sports), as this allows for a more enjoyable experience. Yet, it is unknown whether such activities are offered in PRM across Europe. The Special Interest Scientific Committees "Sports Affairs" of the European Society of PRM set out to fill this gap of knowledge.
AIM: To explore the use of adaptive sports within PRM units in European countries, to collect information on these practices, and to identify any barriers limiting the development of this offer. To investigate how PRM health care professionals view and promote adaptive sports to their patients.
DESIGN: Cross-sectional survey.
SETTING: European PRM units.
POPULATION: PRM health care professionals.
METHODS: An online questionnaire was developed and disseminated across Europe. Healthcare professionals working in PRM were invited to respond anonymously. Their views on adaptive sports, as well as the actions they undertook to promote it, were scored, and statistical analyses were performed on these scores.
RESULTS: A total of 190 health care professionals, from 31 different European countries, participated. Only 8 of the 31 countries seem to have adopted adaptive sports as a tool in PRM. The main barrier which limited the development of this across Europe was lack of infrastructure. Yet, the majority of health care professionals acknowledge that their patients would largely benefit from such activities.
CONCLUSIONS: The offer of adaptive sports in European PRM is poor. Such activities are not systematically presented to patients with physical impairments. There is a need to improve the situation through structural and legislative changes on one end, but also by providing PRM professionals with adequate tools, resources and networks.
CLINICAL REHABILITATION IMPACT: By identifying barriers which limit the use of adaptive sports as a therapeutic tool, this study suggests several strategies to develop this in the European field of PRM, as it may be a way to enhance its effectiveness.

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KEY WORDS: Sports for persons with disabilities; Physical activity; Health promotion; Physical and rehabilitation medicine.

The World Health Organization (WHO) has recognized the importance of physical activity (PA) in physical and mental wellbeing for all populations, regardless of age, gender or presence of disability.[1] Their recommendations state that all adults should do 150-300 minutes of moderately-intense PA, or 75-150 minutes of vigorously-intense PA, on a weekly basis. as Muscle-strengthening exercises should also be performed at least twice per week. Finally, for older adults (65 years old and above) and individuals living with chronic conditions or disabilities, it is recommended to add another three sessions of multimodal PA aiming at improving functional capacity.[1] However, reaching these recommendations remains problematic as more than a quarter of the adult population was physical inactive according to the latest study of global surveillance.[2] Levels of physical inactivity are specifically high among individuals presenting with disabilities, and especially for those with physical impairments.[3]

One way to increase adherence to PA is by making it enjoyable and provide novelty, in order to maintain motivation to participate.[4] Positive social interactions also play a key role.[5] In that sense, sports, which involve elements of performance, skill and competition, and are usually practiced within a team and with a coach;[6] could be a solution. While opportunities for sports have been extensively developed and are largely available in the community for adults without disabilities, this is not the case for their peers presenting with physical impairments.[7] This goes against the United Nation's Convention on the Rights of Persons with Disabilities,[8] which advocates for equality in leisure and sporting activities.[9] In order to promote this ideal, the European Commission published a report named "Develop the European Dimension in Sport" in 2011.[10] However, 14 years later, the situation still remains poorly understood.

While efforts have been made to assess adaptive sports in European community settings,[11] no research has thus far investigated the development of such activities within health care settings. Yet, physical and rehabilitation medicine (PRM) units in hospitals and rehabilitation centers, which promote health and autonomy of individuals with impairments, hold great potential in creating environments that encourage PA and adaptive sports. A systematic review has shown that integrating adaptive sports into conventional rehabilitation induces significant health benefits.[12] However; it remains unknown whether such activities are organized and offered as part of health care, to individuals with impairments in Europe.

Therefore, the primary aim of this research was to explore the use of adaptive sports in the field of PRM across different European countries, to collect information on these practices, and to identify barriers standing in the way of the development of such programs. Secondary aims included analyzing the beliefs healthcare care professionals have of adaptive sports as a rehabilitative tool, and to assess the actions they undertake to promote such activities. Differences in beliefs and actions between different countries were explored. Finally, this study aimed to identify health care takers' demographic parameters which influence their beliefs and actions related to adaptive sports.

Materials and methods

This online, cross-sectional survey respects the STROBE guidelines for cross-sectional studies, as well as the guidelines emitted by the "Checklist for Reporting Results of Internet E-surveys" (CHERRIES).[13] The completed CHERRIES can be found in the Supplementary Digital Material 1, Supplementary Table I. Ethical clearance was given by the Ethical Committee of the University of Liège, Belgium (reference 2023/87) on the 4th of April 2023. Its President, who signed the letter of approval, was Professor V Seutin. The study was conducted in accordance with the principles set forth in the Helsinki Declaration. Participants gave their informed consent in the first question of the survey, and remained anonymous. Participation was voluntary, and no incentives (monetary or others) were proposed. Collected data was stored and analyzed according to European General Data Protection Regulations. The survey followed an open design, and was directed towards all European health care professionals working within rehabilitation units of hospital and rehabilitation centers.

A questionnaire was developed by the team, composed of this paper's authors, to fulfill the objectives of the study. The initial version of the questionnaire was created on Microsoft word, by one Belgian researcher with a background in physical therapy in rehabilitation, and with knowledge and experience on online surveys. It contained 36 questions divided in 7 sections, namely: participant eligibility criteria, information on occupation within PRM, beliefs and awareness of adaptive sports, promotion of adaptive sports, development of adaptive sports initiatives in the hospital or rehabilitation center, development of adaptive sports initiative outside of the hospital or rehabilitation center, and demographics.

The questionnaire was subsequently revised by the team made up of 5 medical doctors in PRM working in different European countries (Belgium, Greece, Lithuania,

Slovakia, and Cyprus), all of which also have experience in research and are key members of the Special Interest Scientific Committees (SISC) "Sports Affairs" of the European Society of Physical and Rehabilitation Medicine (ESPRM). During an online meeting, modifications were brought to the questionnaire, mainly to the wording and order of questions. Of note, the team decided to use both the terms adaptive sports and parasports, in order to remain large. Two questions were added: one in the section regarding adaptive sports initiatives outside of the hospital or rehabilitation center, and the other in the section on demographics.

The second version was revised one last time by the team, and two final modifications were made to wording of items. The questionnaire was then reviewed and corrected by a native-English speaking medical doctor in PRM who was not aware of past versions.

The final questionnaire, composed of maximum 38 questions distributed over 7 sections, was then plugged into online format, using the institution's Microsoft Forms software. Microsoft Forms was chosen as it protects data from third-party usage, and allows for the creation of adaptive structures. Indeed, answers given to one question conditioned the appearance of the following questions. However, it does not block participants according to IP addresses or cookies. Therefore, in order to reduce the risk of duplicate answers, a question asked participants whether it was their first time answering the survey. Participants answering "no" were redirected to the end.

A 12-minute completion time was estimated by the software. All questions, but one, were closed with answer options being either binary, on a Likert scale going from 0 to 3, or a multiple-choice list (with an "other" option that participants could fill in). Only the last question was open-ended, and asked participants if they had any last comments or views on adaptive sports/parasports in European PRM. Most questions were mandatory, and a progression bar was added. Participants were free to return to previous sections and modify their answers.

A brief introduction message was added at the beginning of the questionnaire, which participants were invited to read before answering the questionnaire's first section regarding eligibility. This informed them on the study aim, survey length, research team, contact person, as well as anonymity. Moreover, participants were given a definition of adaptive sports/parasports, including some examples.

The questionnaire was diffused among health care professionals in Europe by email. The email contained general information of the study and its aim, and shared the URL link, and a QR-code, to access the questionnaire. Emails were sent to all members of the ESPRM, asking them to further diffuse the questionnaire amongst PRM in their country. Reminders were sent to these members on three occasions, with approximately 6 weeks between each reminder. Due to the exploratory nature of this survey, no sample size calculation was completed, but we aimed to obtain a minimum of 100 responses from 15 different European countries.

Collected data was exported from Microsoft Forms to Excel. Questionnaires that were incomplete (that is, not having answered all mandatory questions) were removed. Answers were summarized, first in a descriptive format, by computing absolute and relative frequencies. Second, scores were calculated to represent the beliefs and actions undertaken for promotion of adaptive sports/parasports reported by each of the participants. This was done by computing answers given on Likert scales (ie: "0: never/not important/not efficient" equaled 0, while "3: very frequently/very important/very efficient" equaled 3), as well as binary answers (ie: "no" equaled 0 and "yes" equaled 1). Belief scores from ranged from 0 to 12, and actions for promotion from 0 to 15, where greater scores represented more positive beliefs or more frequent actions.

Statistical analysis

Statistical analyses were performed on these scores using SPSS (IBM, version 27). First, the correlation between beliefs and actions scores was computed through Spearman's test. Correlation coefficient was interpreted as negligible (0-0.10), low (0.11-0.39), moderate (0.40-0.69), strong (0.70-0.89) or very strong (0.90-1).[14] Second, to evaluate influence of demographics on beliefs and actions, different tests were performed: Spearman's correlations, and median tests Krukall-Wallis Tests and Mann-Whitney Tests. For all analyses, a P value ≤ 0.05 was considered significant.

Results

A total of 204 individuals opened the survey's page from April 2023 to October 2023. Of these, 190 respected the inclusion criteria and participated in the survey (see flow chart in Supplementary Digital Material 2: Supplementary Figure 1). All answers were complete and analyzed.

The majority of the sample (74%) was made up of medical doctors in PRM. The number of years practicing their medical profession in PRM was well distributed between all categories. Similarly, the female to male proportion was almost even. Up to 69% of the participants

TABLE I.—*Demographic parameters of participants.*

Item	Categories	N.
Health care profession	Medical staff (medical doctor, neurologist, surgeon, rheumatologist)	140 (135, 1, 1, 1)
	Paramedical staff (physical therapist, occupational therapist, sports coach, psychologist, social worker, orthoprosthesist, osteopath, dietician, massage therapist)	50 (29, 9, 2, 2, 2, 1, 1, 1, 1)
Type of health care institution where practice PRM	University/state-owned hospital or clinic	136
	Private owned hospital or clinic	21
	Center specialized in PRM	38
	Private practice	20
	Within a sports federation/sports team	19
	Medical center specialized in disabilities	2
	Military hospital	1
	School for disabled children	1
Number of years practicing PRM	0-5 years	22
	6-10 years	23
	11-15 years	28
	16-20 years	18
	21-25 years	37
	26-30 years	30
	31 years and above	32
County where practice PRM	Belgium	34
	Bosnia	1
	Croatia	12
	Cyprus	1
	Czech Republic	1
	Denmark	4
	Finland	2
	France	19
	Germany	1
	Greece	2
	Hungary	1
	Ireland	1
	Israel	1
	Italy	24
	Lithuania	30
	Luxembourg	3
	Malta	1
	Montenegro	1
	Netherlands	16
	Norway	6
	Poland	2
	North Macedonia	7
	Romania	2
	Serbia	1
	Slovakia	5
	Slovenia	1
	Spain	2
	Sweden	1
	Switzerland	3
	Türkiye	1
	Ukraine	3
Sex	Woman	97
	Man	84
	Prefer not to answer	3
Self-reported physical activity level	Not physically active at all	4
	Somewhat physically activity	63
	Moderately physically active	100
	Highly physically active	17
Participation in past workshops, conferences or courses on adaptive sports or parasports	Yes	111
	No	73
Interested in receiving more information on adaptive sports/parasports	Yes	156
	No	26

practiced their profession at least partly in a university or state-owned hospital or clinic, and 23% reported practicing in multiple locations. The total sample of participants came from 31 different European countries. Participants per country varied from 1 to 34. More detailed data regarding the sample's demographics can be found in Table I.

Regarding the offer of adaptive sports/parasports within Europe, 116 participants stated that their institution does not organize adaptive sports/parasports sessions, while 74 stated that their institution does organize this for patients with physical impairments. Conflicting answers were found as health care takers from the same country did not agree on the presence of absence of such activities within their institution. Based on the major trends observed, 67% (or 21 out of 31) of the represented countries largely do not organize such activities within their health institutions (Figure 1). Only 25%, or 8 countries (namely Belgium, France, Germany, Hungary, Ireland, Luxembourg, Slovenia and the Netherlands), do mostly organize this. It is unsure whether Finland and Poland organize adaptive sports as proportions of "yes" and "no" answers were equivalent.

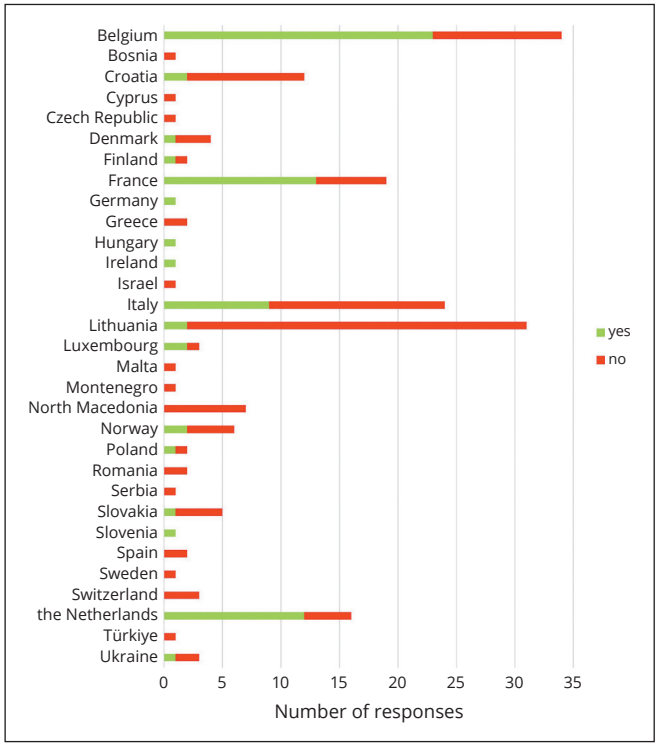


Figure 1.—Offer of adaptive sports/parasports in PRM institutions across Europe.
Yes/no answer when asked the question: Are adaptive sports/para sports organized for individuals with physical impairments within the health institution where you practice?

Among the institutions that do organize adaptive sports/parasports sessions, a majority, or 70%, offer these activities to both in and out-patients. The remaining 30% is equally divided between institutions who offer this exclusively to in-patients during their hospitalization, and those that offer this to out-patients only. The most frequently organized type of adaptive sports/parasports were swimming (N.=53 participants stated that their institution organized this), wheelchair basketball (N.=51) and table tennis (N.=44). Adaptive biking, including handbiking, was also popular as 42 participants reported their institutions offer this sport. Other adaptive sports/parasports were less common, such as boccia (N.=5), horse riding (N.=3), climbing (N.=1), pickleball (N.=1), etc. Moreover, 4 participants reported that did not know which type of adaptive sports were organized within their institutions. Adaptive sports/parasports sessions were frequently supervised by physical therapists (N.=54 participants stated this was the case in their institution) or sports coaches (N.=55). Of note, only participants from the Netherlands (N.=3) and France (N.=3) stated that such sessions were supervised by coaches with specific training in adapted physical activities.

The 116 participants stating that their institution did not organize adaptive sports/parasports were asked to identify barriers which could limit the development of such activities. By far, the most commonly reported barrier was the lack of infrastructure within the institution, as 75 participants believed this to be limiting their institution. Second and third most frequent barriers were lack of financial resources to develop adaptive sports/parasports (N.=62), and absence of equipment and material for such activities (N.=48). Risk of injury for the patients was the least reported barrier (N.=3), followed by the patients' lack of interest (N.=14). Two participants stated that the barriers which limited their institution's development of adaptive sports/parasports was the fact that they collaborated with an external organization (outside of the hospital) which provided such services to the patients. Figure 2 contains further details on these barriers.

In that regard, 49% of all participants reported that their institutions collaborated with external adaptive sports/parasports groups or clubs in order to redirect patients with physical impairments towards their services. Among the remaining 51%, 18% did not know whether such collaborations were established, and 33% reported there were no collaborations of this kind, mostly due to a lack of dedicated staff towards establishing relationships with external groups and clubs. Other barriers limiting collaborations between the health institutions and external adaptive

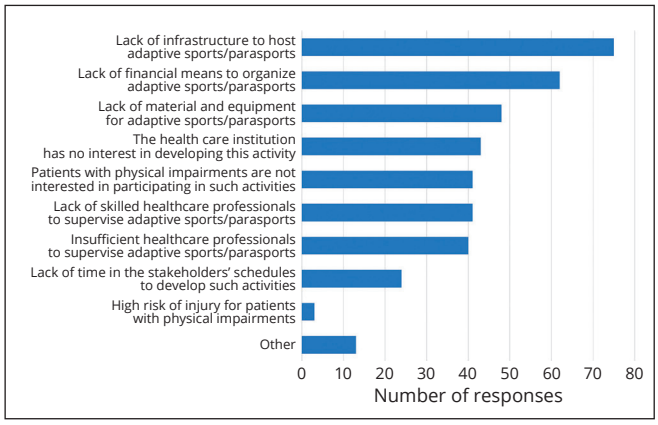


Figure 2.—Barriers limiting the development of adaptive sports/parasports in health institutions.
Caption: "Other" barriers reported by the participants were: working in a general hospital (N.=1), working in a University medical center (N.=1), lack of national regulations for parasports (N.=2), lack of reimbursement (N.=1), lack of space (N.=1), patients are only in acute stage (N.=1), collaborations with external clubs for such activities (N.=2), don't know (N.=4).

sports/parasports groups and clubs are detailed in Supplementary Digital Material 3, Supplementary Figure 2.

Up to 95% of the sample of PRM professionals agreed that practicing an adaptive sport/parasport was important or extremely important for the physical and psychological well-being of their patients with physical impairments. None reported is important at all. Similarly, up to 90% of the participants believed adaptive sports/parasports could be extremely efficient or efficient tool to improve motor function and functional independence of their patients. In consequence, belief scores were high, with a median of 10 for the total sample. These positive beliefs towards adaptive sports/parasports were observed in all the different participating countries, as medians ranged between 8 and 12. Countries with only one answer had single scores ranging from 6 to 12. Figure 3 displays this data.

Despite these positive beliefs, actions undertaken by the PRM professionals to promote adaptive sports/parasports among patients with physical impairments, remain infrequent. First of all, 42% and 37% encouraged their patients to participate in such activities frequently or very frequently, respectively. Another 18% encouraged them rarely, and 2% of the participants reported never doing this. The percentage of PRM professionals in the latter categories further increased when it came to discussing the possibilities of participating in adaptive sports/parasports with their patients. Indeed, 5% and 30% never or rarely did this, while 42% and 23% did this frequently or always. Moreover, up to 45% never prescribed adaptive sports/parasports to their patients with physical impairments. The remaining 55% prescribed such activities rarely (22%), frequently (28%) and very frequently (5%).

Participants were also asked to report whether they actively assisted their patients with patients with physical disabilities in getting involved in adaptive sports/parasports (for example: finding an adaptive sport/parasport they enjoyed and enrolling in a club or group). While a more than half of the sample reported never or rarely doing this (17 and 38%, respectively), 33% actively assisted their patients on a frequent basis, and 11% on a very frequent basis. Actions undertaken to assist their patients in

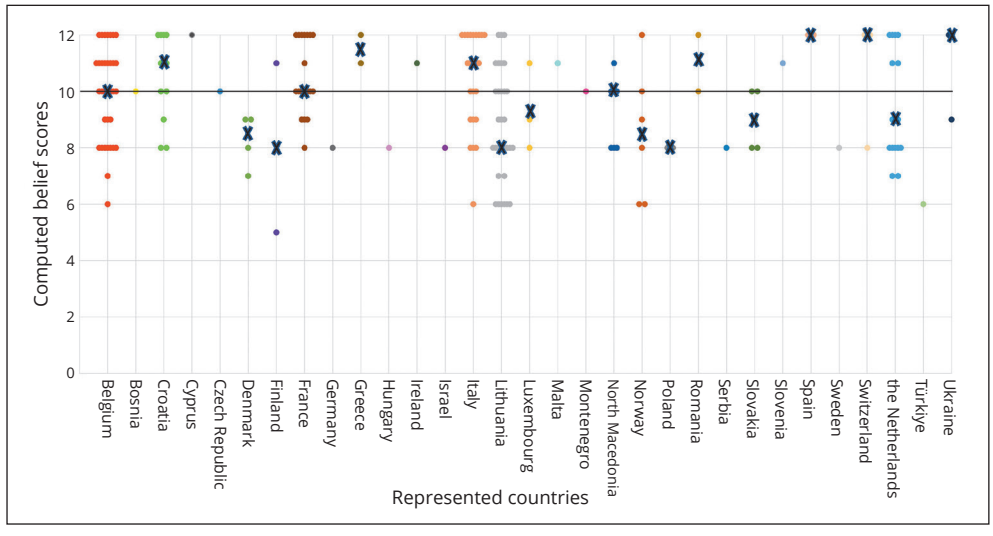


Figure 3.—PRM professionals' belief scores across Europe.
The line represents the total sample's median score. The X represent the median score per country. Dots represent individual answers. Horizontal lines of dots show that multiple participants obtained the same score. The denser the horizontal lines, the greater the number of participants with the same score.

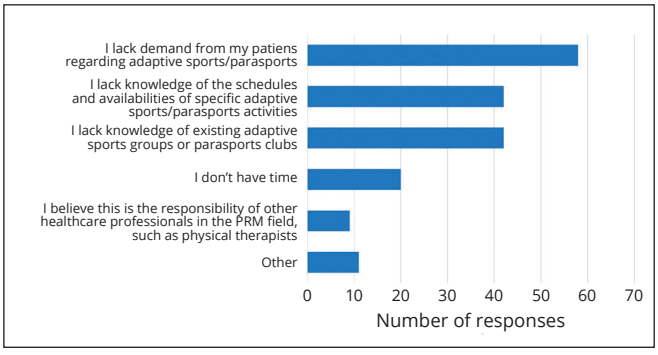


Figure 4.—Barriers limiting actions undertaken by PRM professionals to promote adaptive sports/parasports.
Caption: Other" barriers reported by the participants were: lack of prescription for such activities (N.=1), acute conditions (N.=1), lack of motivation from patients (N.=1), few patients who could practice such activities (N.=4), such topics are discussed among patients (N.=1), lack of transport towards such activities (N.=1), patients' financial limitations (N.=1), don't know (N.=1).

that way were generally to inquire about their preferences or to refer them to a person or resource that could help them in their pursuit. In both cases, 52 participants reported doing this. Only 33 participants frequently helped their patients enroll in a club or group.

Participants who never or rarely undertook such actions were asked to identify barriers limiting this assistance. The most common barriers were lack of patient demand regarding these activities, as well as lack of knowledge of existing adaptive sports/parasports clubs, as well as their schedules and availability. These barriers are displayed in Figure 4.

Finally, a little less than half of the sample of PRM professionals reported monitoring the PA levels of their patients with physical impairments frequently (37%) or very frequently (11%), mostly through general questions on their habits around PA (N.=110 participants did this). Only 40 participants used objective data from devices such as actimeters, and 25 participants used self-reported questionnaires. The remaining 28% and 24% of the total sample never or rarely monitored PA-level.

Altogether, action scores remained mediocre, with the total sample obtaining a median score of 7. France, Greece, Italy, the Netherlands and Ukraine had the highest median scores, while Lithuania, Poland and Romania had the lowest ones (Figure 5).

Statistical analyses demonstrate that belief and action scores of the total sample were significantly correlated to one another (P=0.001, Spearman's Rho=0.373), and that sex of the PRM professionals, as well as the number of years practicing as a healthcare professional, did not influence beliefs nor actions significantly. Type of healthcare profession (medical *versus* paramedical) did not influence beliefs, but did have an impact on action scores as the medical group obtained a median action score of 8, and the paramedical group, a median of 5. This difference was statistically significant (P=0.006). Similar results were found for participation in previous workshops or courses on adaptive sports/parasports, as this did not impact their beliefs scores, but did impact actions. PRM professionals who had participated in this type of workshops or course had a median of 8, while their peers who did not had a median of 5, which was significantly lower (P=0.001).

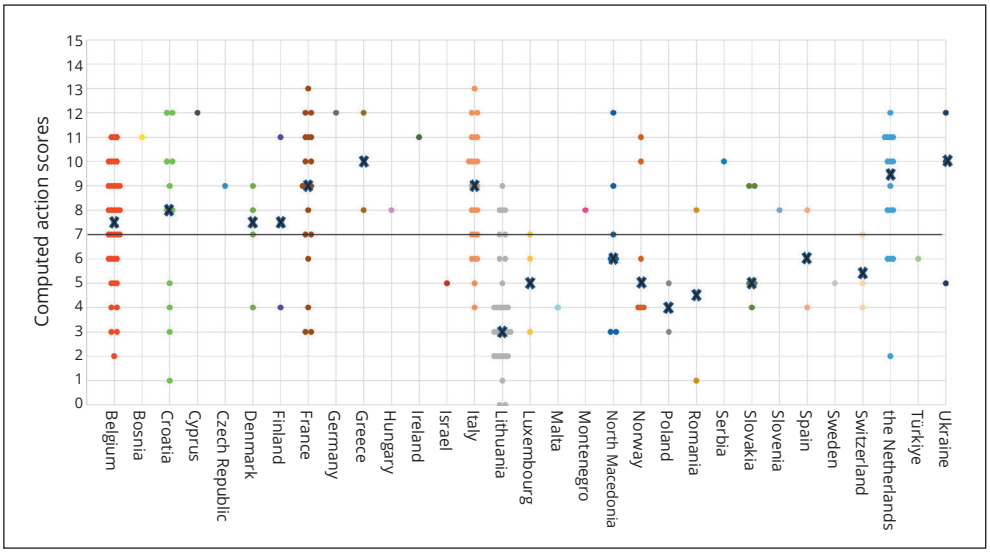


Figure 5.—PRM professionals' action scores across Europe.
Caption: The line represents the total sample's median score. The X represent the median score per country. Dots represent individual answers. Horizontal lines of dots show that multiple participants obtained the same score. The denser the horizontal lines, the greater the number of participants with the same score.

On the other hand, the participants' self-reported PA level did not significantly influence the actions they undertake to promote adaptive sports/parasports to their patients with physical impairments, but did significantly impact their beliefs (P=0.029). Specifically, the group with low PA levels had significantly poorer beliefs than the group of highly active PRM professionals (Supplementary Digital Material 4: Supplementary Figure 3).

Discussion

The main objective of this cross-sectional study was to explore the use of adaptive sports/parasports in the field of PRM in Europe, how this use differed among different European countries, and what barriers remained in the way of the development of these activities in health institutions like hospitals or rehabilitation centers. The secondary objective was to evaluate the beliefs PRM professionals had regarding the effects of adaptive sports/parasports, and to explore the actions these professionals undertook in order to promote PA to their patients with physical impairments. Finally, we assessed which demographic parameters affected the PRM professionals' beliefs and actions related to adaptive sports/parasports.

The results suggest that adaptive sports/parasports remains largely absent from the PRM field in Europe and only a minority of European countries seem to implement such activities during the rehabilitation of individuals with physical impairments. The use of adaptive sports/parasports differed among the different countries, but also within them, showing that there is no clear consensus yet. Main barriers limiting the development of these activities within health institutions were lack of resources such as infrastructure and equipment. Financial limitations also seemed to play a role. Furthermore, PRM professionals had positive beliefs regarding the benefits that adaptive sports/parasports could have on their patients with physical impairments, though actions related to the promotion of such activities were infrequent. This paradox was observed in all European countries. Finally, our data suggests that physically active PRM professionals will have more positive beliefs towards adaptive sports/parasports. Concerning actions, PRM professionals who followed a workshop or course on adaptive sports/parasports, as well as PRM professionals who are medical doctors, seem to promote these activities more frequently than their peers.

The observed lack of offer of adaptive sports/parasports across the European PRM field is disconcerting and needs urgent attention. PRM aims to optimize function among individuals with acute and chronic health conditions[15] and it is vital to provide patients who benefit from its services with appropriate, effective and cost-effective care.[16] In that sense, including adaptive sports/parasports in rehabilitation has shown to induce significant physical and mental health benefits, which enhance the effects of conventional therapies,[12] and is an excellent opportunity to create continuity from the inpatient phase to a return to the community after discharge, where patients maintain their sporting activities.[17] Moreover, adaptive sports/parasports can be safely performed in larger groups, thereby shifting from the conventional 1:1 patient to therapist ratio,[12] which plays a role in improving social participation and reducing isolation,[17, 18] and also has interesting economic implications. It is therefore of great clinical relevance to implement adaptive sports/parasports in the rehabilitation trajectory of individuals with physical impairments.

The collected data further demonstrates that the offer of adaptive sports/parasports in PRM institutions differs greatly from one European country to another. Stucki *et al.* have previously observed a significant variety in the rehabilitation services provided by different European countries.[16] These differences can be linked to the countries' specificities in terms of policies and legislations[17] as well as workforce (or number of PRM specialists available).[19] However, more surprisingly, the data collected also suggests that within a country, the offer of adaptive sports/parasports differs from one health institution to another as well. The presence of such activities remains uncommon and inferior to conventional therapies, such as physical and occupational therapy. Moreover, Verellen *et al.* further state that when health institutions do propose programs such as adaptive sports/parasports or adapted PA, that these are mostly optional for patients, and are not classified as a separate and definite therapy within the multidisciplinary approach.[17] In light of the potential added benefits that adaptive sports/parasports could conjure, which are complementary to the benefits of conventional therapies, there is a need to officialize its place with an appropriate legislative structure and nomenclature.

Aside from the lack of legislative aspects of adaptive sports/parasports in PRM, participants in the study reported that the development of activities is limited by restricted resources including equipment, and a more general lack of finances to fund this. These barriers have previously been cited as barriers towards accessing rehabilitation in Europe.[20] Adaptive sports/parasports equipment is indeed costly and not readily available, which has also been identified as a barrier towards participation by patients with

physical impairments.[21] Yet certain solutions exist, such as setting up a design team in the hospital for creating tailored adaptive equipment,[22] securing sponsorships[23] or investigating into governmental help. In Belgium, for example, the "Ligue Handisport Francophone" (LHF- the federation governing adaptive sports in French-speaking Belgium) provides, free of charge equipment and sports wheelchairs available to any organization wishing to implement adaptive sports/parasports activities.[24] Funding for such equipment may also be obtained by applying to certain foundations.[25] However, health institutions are often not aware of the existing help at hand. Getting this information to them could be facilitated by summarizing it in a pamphlet or on a publicly-available website. The International Paralympic Committee (IPC), through its "Agitos Foundation" who seeks to develop parasports at all levels, and provide sporting opportunities for individuals with disabilities,[26] could be ideally placed to initiate such a project. It should be noted that this would not only benefit the development of adaptive sports/parasports in PRM, but also in external and community-based settings such as sports clubs.

In regards to external sports clubs and groups, approximately half of the participants reported that their health institution collaborated with these establishments in order to redirect patients with physical impairments to their activities. Other authors have observed similar engagement from sports clubs and groups towards developing strong health-promoting networks.[27] Efforts towards setting up such partnerships should be continued all over Europe, as further optimizing such collaborations may help alleviate pressure from health institutions, by relaying patients to external services of quality. Also, it could help overcome another barrier reported by healthcare professionals which is lack of space to practice adaptive sports/parasports in PRM units. This could be done by appointing a staff member of the PRM multidisciplinary team to this project, with the objective of creating long-term solid networks to enhance patients' possibility to engage in adaptive sports/parasports during and after in-patient rehabilitation.

Regarding healthcare professionals' beliefs on the potential benefits of adaptive sports/parasports, we found global positive results from all participating countries. The only outlier observed in our data comes from Türkiye, where the participant obtained a belief score of 6. However, as this individual was the only Turkish participant, this result should be analyzed with caution and probably does not represent the population well. For example, Tuna *et al.* found that a majority of Turkish physical therapists value their role as promotors of PA.[28] The overall positive trend could be linked to education, though previous papers stating that education of PRM specialists still widely differs in Europe.[29] Moreover, the dissemination of the WHO's recommendations concerning PA for all, including individuals with physical impairments,[1] as well as to the increasing amount of published research on adaptive sports and its effects,[30] may also play a role.

On the hand, action to promote engagement in adaptive sports/parasports to patients with physical impairments remains relatively low overall. There is, however, more variation across the participating European. This could stem from country-specific legislation regarding certain aspects of promotion such as the prescription of PA, or the monitoring of PA-levels. For example, in Italy, which has obtained one of the best median scores in this study, guidelines exist to guide healthcare professionals to prescribe exercise.[31] However, all healthcare professionals should acknowledge the role they play in promoting such activities to their patients,[32] and PRM specialists should discuss adaptive sports/parasports possibilities with their patients with physical impairments on a regular basis. Barriers such as lack of demand, or poor access to practical information on adaptive sports/parasports programs, could be overcome by making the offer of such activities within PRM more visible to the public.

Finally, actions undertaken by the PRM professionals to promote engagement in adaptive sports/parasports were more frequent if they had participated in a workshop or course on the subject. This observation confirms findings of a scoping review on factors which influence PA promotion.[33] Health institutions could facilitate this additional training by providing PRM professionals with trainings on the work place. Furthermore, we found that the medical PRM specialists promote such activities more frequently than paramedical PRM professionals. It is important for each and every member of PRM multidisciplinary team to be involved in promoting adaptive sports/parasports.[34] Together, they will work towards achieving the goal of maintained participation in adaptive sports/parasports during and after the in-patient stay.

Limitations of the study

The main limitation of this study is the lack of adequate representation of some European countries. Indeed, 12 of the 31 participating countries were only represented by one PRM professional, decrease the external validity. Besides, this made it impossible to undertake statistical analyses per country. One solution could have been to group countries according to region (for example, the Balkans,

Central Europe, the Mediterranean Basin, Scandinavia, etc), but this would have skewed the results and have led to inadequate conclusions. However, in spite of this limitation, the data does give previous insight into the global development of adaptive sports/parasports in Europe for the first time, and further adds on the knowledge regarding beliefs and action to promote such activities to individuals with physical impairments. Future studies investigating the subject could focus on specific countries in order to obtain larger sample sizes, and build on the information provided in this manuscript.

Conclusions

The literature demonstrates that adaptive sports/parasports are efficient at rehabilitating function among individuals with physical impairments. Yet, our data demonstrates that the offer of adaptive sports/parasports in the European PRM field remains poor. A variety in presence of such activities is noted across Europe, but also within one country. Structural and legislative changes are needed to improve this situation, as well as enhancing collaborations with external establishments and stakeholders, such as sports clubs and centers. The IPC may also play a role in facilitating the development of adaptive sports/parasports in PRM as this may indirectly profit the Paralympic movement as well. Finally, though European PRM professionals are well aware of the benefits of engaging in parasports/adaptive sports, they do not frequently promote it to their patients with physical impairments. Greater education, especially of the practical aspects of available adaptive sports/parasports is a potential solution.

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Conflicts of interest
The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions
All authors have given substantial contributions to the conception or the design of the manuscript, author Declerck Louise, author Kaux Jean-François, author Hornacek Karol and author Juocevicius Alvydas to acquisition, analysis and interpretation of the data. Author Declerck Louise has drafted the manuscript, all other authors revised it critically. All authors read and approved the final version of the manuscript.

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