Physical Education for Manual Wheelchair Users in Quebec: A Description of Teacher Training and Child Integration in Elementary and High Schools

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Abstract Pediatric manual wheelchair users (PMWUs) do not meet the Canadian 24-hour movement guidelines. Consequences are significant in terms of physical, emotional and cognitive health. Physical education (PE) classes are an important facilitator to increased physical activity among children and youth with disability. However, many teachers do not feel adequately prepared to provide education to children with special needs. Indeed, many Quebec (Canada) schools do not meet the recommended minutes of PE per week and the provincially mandated education program targets typically developing children only. Study objectives were to describe (1) the PE teachers’ training in adapted physical activity and (2) the integration of PMWUs in PE classes within Quebec elementary and high schools. An online survey asked 47 questions about: (1) demographic and descriptive information, (2) integration of PMWUs in PE classes, (3) teaching strategies (4) evaluation methods, (5) use of reference tools and (6) interests and opinions. Complete responses were received from 136 PE teachers. Forty-nine percent of PE teachers received adapted physical activity training through their university curriculum and 14.9% took additional training after university. Eighty-six percent of PE teachers were interested in receiving education about manual wheelchair skills training. While 97% of PMWUs participate with or without assistance in PE classes, some PE teachers were not satisfied with how they adapted their PE courses for PMWUs, reporting that adaptations to classes and evaluations are primarily based on professional judgment. Most PE teachers who did not currently teach PMWUs would not feel equipped to adapt their classes to do so. More work is needed to develop programs to facilitate PE teacher training. Improved PE courses may in turn increase physical activity among PMWUs.

Keywords: pediatrics, manual wheelchair, adapted physical activity, physical education, teachers

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1. Introduction

Despite global (i.e., World Health Organization Global Recommendations on Physical Activity for Health [1]), national (i.e., Canadian 24-Hour Movement Guidelines [2]) and provincial (i.e., Quebeckers on the Move [3]) physical activity recommendations, physical inactivity is the 4th leading risk factor for global mortality [1]. The Canadian 24-hour movement guidelines for children and youth recommends a minimum of 60 minutes per day of moderate to vigorous physical activity [2]. Regrettably, only 39% of Canadian children and youth are meeting this recommendation [4]. Among those with disabilities, the percentage decreases to 11% [5], confirming previous findings that children with disabilities are less physically active than their typically developing peers [6]. According to the Régie de l’assurance maladie du Québec (RAMQ), there were 1612 children and youth (ages 4 to 21) who used a manual wheelchair for mobility in 2020 [7]. Using the 11% estimate, approximately 1435 pediatric manual wheelchair users (PMWUs) in Quebec are not meeting the Canadian movement guidelines. The consequences of physical inactivity for the general population are significant and indeed amplified for children with disabilities, not only physically (e.g., increased risk for cardiovascular disease, diabetes, obesity), but also emotionally and psychologically (e.g., behavior problems, depression) and cognitively (e.g., decreased attention and sensory processing) [8].

As part of the Quebeckers on the Move [3] policy, the province of Quebec has an objective to increase by 20%
the proportion of young people between the ages of 6 and 17 who meet the minimum recommended amount of physical activity by 2027. Studies from the Netherlands have identified participation in physical education (PE) classes in school as an important facilitator to increased physical activity among children and youth with disability [9,10]. It is thus one solution to improving physical activity among PMWUs. However, in a recent survey [11], Quebec teachers reported that they do not feel that their original education (Bachelor of Education) adequately prepared them for educating students with special needs, that there are insufficient funds for professional development and that there is a lack of support for educators. This survey also highlighted that there is a poor or even lack of evaluation of the needs and abilities of students with special needs resulting in inadequate or inappropriate services, thus jeopardizing educational success.

From the PE perspective, it is not surprising that there would be a lack of evaluation of the needs of PMWUs as the existing national and provincial evaluations do not accommodate the needs of children and youth who use a manual wheelchair. For example, at the national level, the Canadian Assessment of Physical Literacy (CAPL) [12] is being used to monitor the physical literacy of children (i.e., ‘the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life’) [13] and to develop personal, individualized PE programs. However, the CAPL domain that measures the fundamental motor skills required for physical competence is not adapted for PMWUs. Specifically, 5 of 7 items (i.e., two-foot jumping, sliding, skipping, one-foot hopping and kicking) cannot be completed by PMWUs. Similarly, at the Quebec provincial level, the Physical Education and Health program [14] doesn’t take into consideration the physical limitations of PMWUs. The program consists of three interrelated competencies: 1. performs movement skills in different physical activity settings; 2. interacts with others in different physical activity settings; and 3. adopts a healthy, active lifestyle. The movement skills that are assessed under the locomotor category include walking, running and jumping and no recommendations are provided to adapt these essential motor skills to assess PMWUs.

At present there is a paucity of data describing PMWUs’ integration in PE classes in elementary and high schools in Quebec. Given the lack of guidance for the adaptation of PE for PMWUs in existing programs, it is likely that there are differences in how well PMWUs are integrated into PE, leaving opportunities to increase participation in physical activity. Thus, the objectives of this study were to describe (1) the PE teachers’ training in adapted physical activity and (2) the integration of PMWUs in PE classes within Quebec elementary and high schools.

2. Methodology

2.1. Design

A descriptive cross-sectional study was conducted using an online survey. Ethical approval for this study was obtained from the Sainte-Justine University Hospital research ethics committee (#MP-21-2020-2422).

2.2. Participants and Recruitment

A convenience sample of PE teachers in elementary and high schools (regular and specialized) in Quebec, Canada, was recruited using advertisements shared via websites, online newsletters and social networks frequented by Quebec PE teachers (e.g., Fédération des commissions scolaires du Québec, 100 degrés organization, PE Facebook pages, Quebec’s Ministry of Education and Higher Education). The advertisement was shared in both English and French languages according to the language of the site, newsletter and network. The survey was launched in June 2020 and remained open until September 2020. Participants provided informed consent by completing and submitting the survey.

![Survey logic and number of questions answered by each group](qst: question)

2.3. Measurement

The survey was co-constructed by our research team and a team of school-based collaborators that included two occupational therapists, two physical therapists, two PE teachers and one school-based rehabilitation program manager. All team members were directly involved in the rehabilitation and inclusion of PMWUs in physical activity through their daily job. The final version of the survey was based on two, 3-hour survey development meetings plus iterative feedback from our collaborative team members and pilot testing of the online version by five professionals in the PE domain.

The 6-section survey
was formatted using Survey Monkey and contained a total of 47 questions including close-ended questions, (i.e., multiple choice, yes/no questions and Likert scale questions), open-ended, short-answer questions and comment boxes to obtain additional qualitative information. The survey logic guided the participants into different pathways based on their responses. Specifically, participants were separated into 3 distinct groups according to their responses: Group A included those participants who at the time of the survey had or previously had PMWUs in their class; Group B included those who at the time of the survey had or previously had PWMUs in their school but not in their class; and Group C included those participants who did not have PMWUs in their school (Figure 1). Most of the questions in sections 2, 4 and 5 were not pertinent for Groups B and C. However, the questions regarding if they would feel equipped to adapt their courses if a PMWU started to attend their class (Section 2) and if they were familiar with the Wheelchair Skills Program (WSP) (Section 5) were applicable to all participants. The survey was developed in French and translated into English by bilingual members of our team.

Section 1, **Demographic and descriptive information**, gathered demographic information to describe the sample of participants (e.g., gender, age, language, level of education, years of experience) and the school in which they worked (e.g., type of school, the amount of PE provided, accessibility of school, age of their students, number of PMWU in their PE classes). Section 2, **Integration of PMWUs in PE classes**, included questions about if and how PMWUs are integrated into PE classes, whether or not the PE provided is adapted for PMWUs to meet provincial PE requirements and whether PE classes included manual wheelchair skills education. Section 3, **Use of Motor Learning Principles**, asked about the use of a variety of motor learning principles in PE classes. Section 4, **Evaluation methods**, asked participants how they adapted their evaluation methods for PMWUs and how confident and equipped they felt to do so. Section 5, **Use of reference tools**, asked participants about their familiarity with the WSP [15], as well as about other books or resources used to adapt courses/evaluations for PMWUs. In Section 6, **Interests and opinions**, participants were asked about including manual wheelchair skills into their PE programs/classes and which manual wheelchair skills would be considered fundamental to improve the participation of PMWUs in PE classes. The wheelchair skills included in the survey were taken from the WSP [15] an evidence-based training program that can be used to test and train a range of manual wheelchair skills from 3 different classifications: indoor skills, community-based skills and advanced skills.

### 2.4. Analysis

Descriptive statistics (means, standard deviations, frequencies and proportions) were used to describe the population and to analyze the quantitative data. The data from the comment boxes, open-ended questions and the short answer questions was synthesized narratively. Data were categorized according to the three groups (A, B and C). Survey responses were collected online and raw data were exported into Microsoft Excel 2016 for analysis.

### 3. Results

#### 3.1. Demographic and Descriptive Information

A total of 158 PE teachers initiated the survey between June and September. Among them, 22 completed less than the first quarter (i.e., sociodemographic questions only), thus these data were removed from analyses. Of the remaining 136 participants, 115 completed all survey questions (84.6%), while 21 (15.4%) skipped some. The data of all 136 participants were retained for analyses. Group A (PE teachers who at the time of the survey had or previously had PMWUs in their class) was composed of 35 participants who initiated the survey and 28 of whom completed the survey. From Group A, 18 of 28 (64.3%) participants were from specialized schools or regular schools with specialized class. Group B (PE teachers who at the time of the survey had or previously had PWMUs in their school, but not in their class) included 23 participants of whom 17 completed the survey. Group C (PE teachers who at the time of the survey did not have PMWUs in their school) contained 78 participants, of whom 70 completed the survey. We collected data from 39/72 (54%) school service centers and school boards representing 16/17 administrative regions of Quebec (Figure 2).

Table 1 presents the sociodemographic characteristics of participants and Table 2 presents the sociodemographic characteristics of the schools in which they worked.

Most of the schools represented by our sample were public regular or public regular with specialized classes (81.6%) at the elementary education level (64%). Almost 40% of the schools did not provide the minimum of 2 hours of PE classes per week that is mandated by the provincial government. Less than half of the schools currently had PMWUs enrolled and for those that did, there were a variety of diagnoses represented. Most schools (73.3%) provided extra physical activity opportunities, but most PMWUs (71.1%) did not participate in these extracurricular activities. According to participant comments, the extracurricular activities offered during lunch time or after school, were often taught by non-PE teachers, and included volleyball, ball hockey, yoga, and strength training.

#### 3.2. Description of PE Training

The sample consisted of 47.8% males and 51.5% females PE teachers who were 41.5 years of age on average, with 65.4 % reporting 10 years or more experience as a PE teacher. Close to half of the participants (48.5%) received education about adapted physical activity during their university training. According to qualitative data from the comment boxes, the majority of these participants received training on general adaptation of PE lessons during a 45-hour course of 3 credits. The courses covered several disabilities (e.g., visual, motor, intellectual) and the students had the opportunity to try different adapted sports (e.g., soccer, basketball, goalball for students with visual impairment). Training was not specific to the adaptation of PE classes for PMWUs.
Figure 2. Representation of participants’ administrative regions. Source: Authors’ own work with the image from [https://dec.canada.ca/docs/carte-regions2.png](https://dec.canada.ca/docs/carte-regions2.png)

Table 1. Participants’ sociodemographics

| Questions                                      | Answers                                      | %   | N    | Group(s) |
|------------------------------------------------|----------------------------------------------|-----|------|----------|
| Gender                                         | Woman                                       | 51.5| 70/136| A, B, C  |
|                                                | Man                                          | 47.8| 65/136| A, B, C  |
|                                                | Prefer to not answer                         | 0.7 | 1/136 | A, B, C  |
| Age Mean (SD)                                  |                                              |     |      |          |
| Language                                       | French                                       | 89.0| 121/136| A, B, C |
|                                                | English                                      | 5.9 | 8/136 | A, B, C  |
|                                                | Other                                        | 5.1 | 7/136 | A, B, C  |
| Level of education completed                   | Bachelor’s degree in PE                      | 78.7| 107/136| A, B, C |
|                                                | Master’s degree                              | 12.5| 17/136| A, B, C  |
|                                                | Ph.D                                         | 2.2 | 3/136 | A, B, C  |
|                                                | Other                                        | 6.6 | 9/136 | A, B, C  |
| Education about adapted physical activity received in their university training | Yes                                          | 48.5| 65/134| A, B, C |
|                                                | No                                           | 51.5| 69/134| A, B, C |
| Additional courses taken specific to adapted physical activity (after university) | Yes                                          | 14.9| 20/134| A, B, C |
|                                                | No                                           | 85.1| 114/134| A, B, C |
| Type of additional adapted physical activity courses taken | Continuing education offered as part of a university program | 25.0| 5/20   | A, B, C  |
|                                                | Conference / workshop                        | 55.0| 11/20  | A, B, C  |
|                                                | Training opportunity offered by a private organization | 30.0| 6/20   | A, B, C  |
|                                                | Online course                                | 25.0| 5/20   | A, B, C  |
|                                                | Self-study, personal research                | 45.0| 9/20   | A, B, C  |
|                                                | Training offered by the school or school board you teach | 55.0| 11/20  | A, B, C  |
| Employment status                              | Full-time contract                           | 15.4| 21/136| A, B, C  |
|                                                | Part-time contract                           | 14.0| 19/136| A, B, C  |
|                                                | Permanent                                    | 70.6| 96/136| A, B, C  |
|                                                | Substitute                                   | 4.4 | 6/136 | A, B, C  |
| Experience as a PE teacher                     | Less than 1 year                            | 0.7 | 1/136 | A, B, C  |
|                                                | 1-5 years                                    | 16.2| 22/136| A, B, C  |
|                                                | 6-10 years                                   | 17.6| 24/136| A, B, C  |
|                                                | More than 10 years                           | 65.4| 89/136| A, B, C  |
### Table 2. Participants’ school description

| Questions                                      | Answers                        | %    | N    | Group(s) |
|------------------------------------------------|--------------------------------|------|------|----------|
| **Experience as a PE teacher in current school**|                                |      |      |          |
| Less than 1 year                               | 11.8                           | 16/136 |      | A, B, C  |
| 1-5 years                                      | 27.9                           | 38/136 |      |          |
| 6-10 years                                     | 17.6                           | 24/136 |      |          |
| More than 10 years                             | 42.6                           | 58/136 |      |          |
| **Age of students**                            |                                |      |      |          |
| 4-12 years                                     | 72.1                           | 98/136 |      | A, B, C  |
| 13-17 years                                    | 36.8                           | 50/136 |      |          |
| 18-21 years                                    | 9.6                            | 13/136 |      |          |
| **Average number of students who use a manual wheelchair in their PE classes in the past 5 years** |                                |      |      |          |
| 0                                              | 35                             | 21/60 |      | A, B     |
| 1-5                                            | 43.4                           | 26/60 |      |          |
| 6-10                                           | 8.3                            | 5/60  |      |          |
| 11 or more                                     | 13.3                           | 8/60  |      |          |
| **Years of experience teaching PMWUs**         |                                |      |      |          |
| Less than 1 year                               | 41.7                           | 25/60 |      | A, B     |
| 1-5 years                                      | 33.3                           | 20/60 |      |          |
| 6-10 years                                     | 8.3                            | 5/60  |      |          |
| More than 10 years                             | 16.7                           | 10/60 |      |          |
| **Type of school**                             |                                |      |      |          |
| Public regular school                          | 61.0                           | 83/136 |      | A, B, C  |
| Private regular school                         | 3.7                            | 5/136 |      |          |
| Specialized public school                      | 11.8                           | 16/136 |      |          |
| Specialized private school                     | 0.7                            | 1/136 |      |          |
| Public regular school with specialized classes | 20.6                           | 28/136 |      |          |
| Private regular school with specialized classes| 0.0                            | 0/136 |      |          |
| Other                                          | 2.2                            | 3/136 |      |          |
| **School level of education**                  |                                |      |      |          |
| Elementary                                     | 64.0                           | 87/136 |      | A, B, C  |
| High school                                    | 29.4                           | 40/136 |      |          |
| Elementary and high school                     | 6.6                            | 9/136 |      |          |
| **Gym wheelchair accessible**                  |                                |      |      |          |
| Yes                                            | 79.4                           | 108/136 |     | A, B, C  |
| No                                             | 20.6                           | 28/136 |      |          |
| **PMWUs attending the school**                 |                                |      |      |          |
| Yes                                            | 42.6                           | 58/136 |      | A, B, C  |
| No                                             | 57.4                           | 78/136 |      |          |
| **PMWU’s diagnosis**                           |                                |      |      |          |
| Congenital malformation                        | 30.5                           | 18/59 |      | A, B     |
| Cerebral palsy                                 | 47.5                           | 28/59 |      |          |
| Neuromuscular disease                          | 49.2                           | 29/59 |      |          |
| Spina bifida                                   | 32.2                           | 19/59 |      |          |
| I don’t know                                   | 18.6                           | 11/59 |      |          |
| Other                                          | 54.2                           | 32/59 |      |          |
| **School provides extra physical activity**    |                                |      |      |          |
| Yes                                            | 73.3                           | 96/131 |     | A, B, C  |
| No                                             | 26.7                           | 35/131 |      |          |
| **PMWUs participation in extra physical activity** |                        |      |      |          |
| Yes                                            | 28.9                           | 13/45 |      | A, B     |
| No                                             | 71.1                           | 32/45 |      |          |
| **School offers the minimum of 2 hours of PE classes per week** |                    |      |      | A, B, C  |
| Yes                                            | 63.1                           | 82/130 |     |          |
| No                                             | 36.9                           | 48/130 |      |          |

N: number of participants, PMWU: pediatric manual wheelchair user, PE: physical education.

3.2. Integration of PMWUs in PE Classes

For participants of Group A, the majority (67.6%) reported that the PMWUs in their class participated actively with or without assistance, while 2.9% were only observers. The PMWUs mostly participated in the same activity (58.8%), but in some cases they had a specific role (23.5%). In a minority of situations, PMWUs participated in a different activity (17.6%). Most of the participants (70%) had access to the medical file of the PMWUs and used that information to adapt their courses according to the functional abilities of the students and to respect the medical contraindications. As represented in Table 3, a vast majority (71.0%) of the participants adapted their classes for PMWUs to meet the requirements of the Competency 1, performs movement skills in different physical activity settings, (80.6%) and Competency 2, interacts with others in different physical activity settings, of the Quebec Education Program. Most of the participants were satisfied by the adaptation of their PE classes for Competency 1 (84%) and Competency 2 (86.4%). In the comments, participants indicated that the adaptation was
case by case for which they relied on student’s capacities, and that they had to be flexible and find alternatives. Participants reported that there is an absence of a specific guide on how to adapt PE classes for PMWUs, therefore, they primarily rely on their professional judgment. Some participants mentioned that they used the Competency-Based Approach to Social Participation (CASP-I) Education Program, a program aimed for students with moderate to severe intellectual disabilities [16]. Only 1 participant included manual wheelchair skills training in their classes. This participant indicated that to adapt the courses, she/he trains wheelchair skills that can be used in daily life to become more independent and less dependent on adults, including moving forward and backward, changes of direction, turns and narrow passages. This PE teacher taught in a specialized school for students who use a wheelchair. Finally, among all of the participants (Groups A, B, and C), 62.9% wouldn’t feel equipped to adapt their courses for this population.

3.3. Use of Motor Learning Principles

Figure 3 presents the motor learning principles used in PE classes. Our findings indicate that the motor learning principles of demonstration, concise and precise verbal instruction, physical rehearsal: simplification and segmentation of the task, variability of learning context and extrinsic and intrinsic proprioceptive feedback were used by the majority of all Groups in their PE classes. PE teachers from Groups B and C used the set training goals principle more frequently than those from Group A. Mental imagery was used least frequently by all Groups.

Table 3. Adaptation of PE classes and evaluation for PMWUs

| Questions                                                                 | Answers                                                                 | %   | N       | Group(s) |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------|-----|---------|----------|
| At least one PMWU participates in teachers’ PE classes                     | Yes                                                                     | 62.5| 35/56   | A, B     |
|                                                                           | No, the student is on my attendance list, but is not present in my PE classes (ex: PE is replaced by another activity) | 7.1 | 4/56    |          |
|                                                                           | No, the student is in the class of a colleague                          | 30.4| 17/56   |          |
| PE teachers whose PMWUs actively participate in PE class activities       | Yes, without assistance                                                | 67.6| 23/34   | A        |
|                                                                           | Yes, with assistance                                                    | 67.6| 23/34   |          |
|                                                                           | No, PMWUs are only observers                                            | 2.9 | 1/34    |          |
| Generally, PMWUs...                                                       | participate in the same activity as other students                      | 58.8| 20/34   | A        |
|                                                                           | participate in the same activity as the other students, but by assigning him a specific role (ex: goalkeeper) | 23.5| 8/34    |          |
|                                                                           | do a different activity from the other students                         | 17.6| 6/34    |          |
| Adaptation of PE classes to meet the requirements of the Quebec Education Program for Competency 1 | Yes                                                                     | 80.6| 25/31   | A        |
|                                                                           | No                                                                      | 19.4| 6/31    |          |
| Level of satisfaction for their adaptation of PE classes related to Competency 1 | Strongly agree                                                         | 28.0| 7/25    | A        |
|                                                                           | Agree                                                                   | 56.0| 14/25   |          |
|                                                                           | Disagree                                                                | 12.0| 3/25    |          |
|                                                                           | Strongly disagree                                                       | 4.0 | 1/25    |          |
| Adaptation of PE classes to meet the requirements of the Quebec Education Program for Competency 2 | Yes                                                                     | 71.0| 22/31   | A        |
|                                                                           | No                                                                      | 29.0| 9/31    |          |
| Level of satisfaction for their adaptation of PE classes related to Competency 2 | Strongly agree                                                         | 36.4| 8/22    | A        |
|                                                                           | Agree                                                                   | 50.0| 11/22   |          |
|                                                                           | Disagree                                                                | 13.6| 3/22    |          |
|                                                                           | Strongly disagree                                                       | 0.0 | 0/22    |          |
| If a PMWU started to take my PE classes tomorrow, I would feel equipped to adapt my course for this student | Strongly agree                                                         | 30.5| 13/124  | A, B, C  |
|                                                                           | Agree                                                                   | 26.6| 33/124  |          |
|                                                                           | Disagree                                                                | 42.7| 53/124  |          |
|                                                                           | Strongly disagree                                                       | 20.2| 25/124  |          |
| Adaptation of assessment methods and criteria related to Competency 1 for PMWUs | Yes                                                                     | 79.3| 23/29   | A        |
|                                                                           | No                                                                      | 20.7| 6/29    |          |
| Adaptation of assessment methods and criteria related to Competency 2 for PMWUs | Yes                                                                     | 79.3| 24/29   | A        |
|                                                                           | No                                                                      | 20.7| 6/29    |          |
| Level of confidence that the adaptation of assessment methods and criteria allow them to assess properly Competency 2 | Strongly agree                                                         | 34.8| 8/23    | A        |
|                                                                           | Agree                                                                   | 30.4| 7/23    |          |
|                                                                           | Disagree                                                                | 34.8| 8/23    |          |
|                                                                           | Strongly disagree                                                       | 0.0 | 0/23    |          |
| I feel sufficiently equipped to adapt my assessment methods               | Strongly agree                                                         | 20.7| 6/29    | A        |
|                                                                           | Agree                                                                   | 34.5| 10/29   |          |
|                                                                           | Disagree                                                                | 37.9| 11/29   |          |
|                                                                           | Strongly disagree                                                       | 6.9 | 2/29    |          |
| Resources used to adapt PE classes and assessment methods and criteria for PMWUs | Adapted physical activity resources                                     | 25.0| 7/28    | A        |
|                                                                           | I do not use any specific resource                                      | 57.1| 16/28   |          |
|                                                                           | Other                                                                   | 46.4| 13/28   |          |

N: number of participants, PMWU: pediatric manual wheelchair user, PE: physical education.
3.4. Evaluation Methods

The majority of the participants adapt their methods and criteria for evaluating Competency 1 (23/29; 79.3%) and Competency 2 (23/29; 79.3%). Most of the PE teachers (65.2%; 15/23) were confident with the adaptation of their assessment methods for Competency 2. The level of confidence in the adaptation of their evaluation methods for Competency 1 is not available due to an error in the survey logic. In the comments, participants reported that they make personalized and specific assessment profiles for PMWUs.
3.5. Use of Reference Tools

Fifty-seven percent of the sample did not use a specific reference or resource to adapt their PE classes or evaluations. Only one participant had taken an additional course, a workshop, specific to manual wheelchair skills training after the university program (i.e., the same participant that trains manual wheelchair skills in his/her classes). This participant’s training consisted of a conference or workshop and self-study. As described in Table 4, the majority of participants (94.1%) were not familiar with the WSP. However, most (86.3%) were interested in receiving training about teaching basic manual wheelchair skills and most believed it would be possible to implement the training of basic manual wheelchair skills in their PE classes. All participants strongly agreed or agreed that it was important for the independence of PMWUs to learn the basic manual wheelchair skills for getting around. As presented in Figure 4, the manual wheelchair skills are less integrated in PE class activities when they are deemed essential to improve the PMWUs’ participation by all participants. The skill that has a greatest difference (45.3%) in terms of integration (33.3%) compared to whether it is deemed essential (78.6%) is “getting over obstacles”. The skill which has a smallest difference (4.3%) in terms of integration (60%) compared to whether it is deemed essential (64.3%) is “rolling longer distance”. Participants from Group A (78.6%) deemed the skill “getting over an obstacle” more essential than participants from Groups B and C (60%), this is the largest difference (18.6%) concerning whether or not a skill is deemed essential for PMWUs to improve their participation. The skill which has the smallest difference (0.8%) between the Groups (A: 89.3% and B: 88.5%) is “rolling backward a short distance”.

3.7. Distance

The distance of a skill is defined by the skill’s percentage difference between the groups. The skill with the smallest difference (0.8%) between the Groups (A: 89.3% and B: 88.5%) is “rolling backward a short distance”.

4. Discussion

We accomplished the objectives to survey PE teachers across the province of Quebec regarding their training in adapted physical activity and the integration of PMWU skills into PE classes. This was the first study to address PMWUs’ participation in physical education classes in Quebec. Of the 4797 PE teachers in Quebec [17] 136 responded to the survey. Although the response rate was low, participants represented over half of the school boards and 94% of the administrative regions. All participants answered general questions about the training received concerning adapted PE and expressed their opinion/interest about manual wheelchair skills training. However, only 35 PE teachers have or ever had PMWUs in their class and therefore answered questions about adapting courses and assessments in PE.

This study confirmed previous survey findings (10) regarding a lack of adapted physical activity training for PE teachers. Moreover, the adapted physical activity training was not specific to the adaptation of PE classes for PMWUs. Indeed, this present study confirms that PE teachers do not feel equipped to adapt their PE courses for PMWUs.

Over 50% of participants did not receive adapted physical activity training as part of their university curricula. This is surprising given that there is currently a mandatory adapted physical activity course in the Bachelor of Education university programs of PE teachers in the majority of Quebec universities [18-23]. However, participants who did take an adapted physical activity course described that it was very general and not specific to PMWUs. Interestingly, although a short 15-credit (approximately 225 hours) adapted physical activity Graduate Program (post-Bachelor of Education) is available at the University of Quebec in Montreal (UQAM) [24], it has only been offered 2 times in 10 years due to insufficient number of registrants (personal communication, Martin Lemay). Several factors may explain the lack of registrants, including those identified in a previous survey (i.e., insufficient funds for professional education) and potentially the need for a more targeted program (e.g., PMWUs). That 86.3% of PE teachers have an interest in receiving specific training on how to teach basic manual wheelchair skills could provide an interesting avenue for exploring the development of an adapted physical activity course or program that targets the provision of PE to PMWUs. A Massive Open Online Course (MOOC) may provide a flexible, accessible option for PE teachers.

This present study also confirmed the lack of guidelines on evaluation of the needs and abilities of students with special needs, [11] such as PMWUs. Indeed, although the
majority of PE teachers who currently have PMWUs in their classes reported that they adapt their PE classes according to both Competency 1 and 2 of the Physical Education and Health program [14], 15% are not satisfied with their adaptations. That courses are not adapted to the needs of 20-30% of PMWUs (potentially 15% more), is concerning. That 62.9% from the entire sample reported that they would not feel equipped to adapt their course or evaluation is even more concerning. To extrapolate our data to the entire sample of 4794 PE teachers in Quebec, it is possible that over 3000 PE teachers do not feel equipped to adapt their courses and evaluations to the population of PMWUs. All that being said, it should be noted that the participation rate of PMWUs in PE classes was surprisingly high despite the lack of a PE program tailored to their needs. Overall, teachers are relatively satisfied with their course adaptation and assessment, with over half of teachers reporting that they do not use resources to adapt their courses for PMWUs. It would be interesting to understand the reasoning of PE teachers in order to explore on what their level of satisfaction is based.

Regarding the motor learning principles used by PE teachers, some differences were reported between the Group A and Groups B and C. Group A teachers used the principle “set training goals” much less than Groups B and C teachers. It is possible that it is more difficult to establish precise training objectives with PMWUs due to individual variations in physical and intellectual capacities among students, such as in a specialized class with many PMWUs. Further, it is interesting to note that several motor learning principles such as “simplification of the task”, “segmentation of the task”, “demonstration” or “concise and precise verbal instruction” are not used by 100% of Group A participants. Indeed, these motor learning principles are particularly important to use with people presenting disabilities, such as PMWUs [15]. It may be due, in part, to the lack of teacher training about manual wheelchair skills and adapted PE, as reported in this survey. It is possible that there is a lack of awareness of these motor learning principles or a lack of knowledge regarding how to integrate them into their courses. Finally, the strong use of the motor learning principle “customize the training process” is consistent with the fact that participants rely on their professional judgment to personalize courses and assessments for PMWUs.

There are similarities and differences among the groups of participants regarding wheelchair skills considered essential to improve the participation of PMWUs in PE classes. First, all groups considered basic manual wheelchair skills as essential in a large majority compared to community-based skills. This perspective can be explained by the fact that the main physical environment in which PE classes take place in Quebec (gymsnasiums) do not contain the elements requiring the use of community-based skills, in particular going up / down an inclined slope, going up / down level changes and over an obstacle. Also, team sports are commonly taught in Quebec high school PE classes [25], which minimally solicits community skills. Those skills are probably more solicited in physical activity like obstacle courses, outdoor activities and other individual activities. In fact, Figure 4 showed that a higher proportion of participants from Group A identified community-based skills as essential compared to Groups B and C. For example, a significant difference between those groups is noted for the skill “getting over obstacles”. Other differences such as for the skill “picking an object from the floor” may be explained by the fact that teachers do not know how to train the skill and thus adapt their courses so the PMWUs do not have to perform this skill or the PE teacher or other students compensate for the lack of abilities of the PMWUs (e.g., a PMWU does not need to pick the basketball up off of the floor because other students do). Since the majority of teachers in Group A teach in a specialized school, it is possible that their courses are already adapted to be accessible for all PMWUs, regardless of their abilities. In addition, it is curious to see that not all of the participants answered that indoor wheelchair skills were essential to improve the participation of PMWUs in PE classes. That some teachers identified specific skills as essential to improve PMWUs participation in PE classes without actually integrating them into their course could be explained by the lack of knowledge about teaching and training manual wheelchair skills. Also, it is possible that by answering this question during the survey, the teachers identified skills that constitute an ideal to be achieved. These assumptions would have to be clarified in a later study.

Preliminary evidence suggests that learning manual wheelchair skills using an evidence-based program such as the WSP [15] can improve PMWUs’ mobility. Therefore, integrating wheelchair skills training into physical education may improve how PMWUs participate in PE classes. Given the association between fundamental movement skills and physical literacy, improved wheelchair skills may increase overall physical activity among PMWU and provide health benefits [26]. Provision of wheelchair skills training to PE teachers may facilitate implementation of wheelchair skills training in PE courses. Indeed, this survey revealed that the majority of PE teachers (88.9%) believe it would be possible to implement basic manual wheelchair skills training (e.g., moving forward, backward, turning in place, stopping, picking up an object on the ground) in their courses. It would be interesting to explore whether they also believe in the possibility to implement community-type skills (e.g., navigating ramps, ascending and descending small curbs) training in their courses. Indeed, the training of community-based and advanced skills would require more preparation, time, knowledge and equipment [15].

4.1. Limitations

Given the total population of physical education teachers in elementary and secondary schools in Quebec is 4,797 [17], it was estimated that a sample of 357 participants was needed to be representative of the population [27]. However, the results (n = 136) are representative of half of the school boards and 94% of the administrative regions in the province. The results of this study cannot be generalized to the rest of Canada due to the differences in the school systems from province to province. Moreover, there was unequal representation of the number of participants for each study objective (i.e., the responses of 136 individuals comprised the results for objective 1, while the responses of 28 individuals...
5. Conclusion

The findings from our study suggest that there is a lack of training of PE teachers about adapted PE for PWMUs. However, PE educators support the implementation of basic wheelchair skills into PE curriculum to optimize the participation of PWMUs in their PE classes. Findings reveal that PWMUs participate in a majority in PE classes and that PE teachers adapt their courses accordingly to the best of their abilities based on their professional judgment. There is a need for resources and training to facilitate PE teachers to adapt their courses.

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Journal of Physical Activity Research 57
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