Factors Associated with Physiotherapists' Interest in Cardiorespiratory Continuing Education Using Computer-Assisted Learning: A Survey

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ABSTRACT

Purpose: To determine factors associated with Canadian physiotherapists' interest in undertaking continuing education in various cardiorespiratory content areas and their willingness to complete a portion of study within each of these content areas via computer-assisted learning (CAL).

Methods: In a six-page mailed questionnaire, 1,426 potential participants were asked to indicate their interest in 11 cardiorespiratory content areas, their continuing-education preferences, and their access and willingness to do continuing education by CAL. Demographic data were also collected from respondents.

Results: Respondents included 285 physiotherapists from cardiorespiratory interest groups (CRGs) and 447 from the licensing bodies' sample (overall response rate = 56%). Physiotherapists in public employment and practice areas other than orthopaedics had increased interest in all cardiorespiratory content areas except Exercise Physiology. Membership in a CRG increased their likelihood to be willing to learn the cardiorespiratory content area via CAL.

Conclusions: In developing content and determining the accessibility of cardiorespiratory continuing education, educators should consider the type of employer and area of practice of interested attendees as well as the lack of willingness to use CAL by those not involved in CRGs.

Key words: computer-assisted learning, physical therapists, continuing education, distance learning, Internet

Reid WD, Stanton SJ, Kelm LC. Factors Associated with Physiotherapists' Interest in Cardiorespiratory Continuing Education Using Computer-Assisted Learning: A Survey. *Physiother Can.* 2008;60:80-91

RÉSUMÉ

Objectif: Déterminer les facteurs associés à l'intérêt des physiothérapeutes canadiens pour la poursuite de la formation professionnelle continue dans divers domaines d'intérêts relatifs aux maladies cardiorespiratoires et leur volonté de terminer une partie de l'étude à l'intérieur de chacun de ces domaines d'intérêt par le truchement de l'enseignement assisté par ordinateur (EAO).

Méthodes: Nous avons posté un questionnaire de six pages à 1 426 participants éventuels et nous leur avons demandé d'indiquer 11 domaines d'intérêts relatifs aux maladies cardiorespiratoires, leurs préférences en matière de formation professionnelle continue et leur accès à la formation professionnelle continue par EAO ainsi que leur désir de s'y adonner. Des données démographiques ont aussi été recueillies auprès des répondants.

Résultats: Les répondants comptaient 285 physiothérapeutes des groupes d'intérêt des maladies cardiorespiratoires (GMC) et 447 de l'échantillonnage des organismes d'agrément (taux de réponse totale = 56%). Les physiothérapeutes dans les domaines d'emploi et de pratique publiques autres que l'orthopédie manifestaient un intérêt accru pour tous les domaines d'intérêts relatifs aux maladies cardiorespiratoires sauf la physiologie de l'exercice. L'adhésion à un GMC élevait leur susceptibilité de vouloir étudier dans le domaine d'intérêt des maladies cardiorespiratoires à l'aide de l'EAO.

Conclusions: Lorsqu'ils élaborent le contenu et déterminent l'accessibilité des cours de formation professionnelle continue en maladies cardiorespiratoires, les éducateurs devraient tenir compte du type d'employeur et du champ d'exercice des parties intéressées, ainsi que de la volonté d'utiliser l'EAO pour les personnes qui ne sont pas impliquées dans les GMC.

Mots clés: enseignement assisté par ordinateur, physiothérapeutes, formation professionnelle continue, apprentissage en ligne, Internet

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Supported by a grant from the Canadian Physiotherapy Cardiorespiratory Society of the Lung Association.

DOI:10.3138/physio/60/1/80

Continuing education to enhance physiotherapist specialization was initiated in 1971 in Australia and in 1976 in the United States, and the Physiotherapy Specialty Council of Canada was created in 1988. The move toward specialization in health care professions resulted from the increasing complexity of practice, a rapidly changing scientific knowledge base, and the fact that specialization provides an organized means to raise practice standards according to clinical specialties.¹ For the practitioner, specialization can enhance professional growth and personal achievement, as career paths are more apparent and expertise is recognized formally. For the client, who is increasingly more aware and demanding of health care accountability, specialization identifies experts and improves quality of care.²

While the advantages of specialization are clear, the practicality of formalizing the process for specialization of physiotherapy practice in Canada is still under debate. Major challenges to accessing continuing education for physiotherapists are the vast distances to major urban centres, where traditional educational courses tend to be offered, and competing priorities for those therapists whose lives are overscheduled with work and personal commitments. Technological advances in computer-assisted learning (CAL) may overcome some of these challenges. Compared to traditional delivery of instructional materials through lectures and labs, CAL offers flexibility of timing, opportunities for interaction with a more diverse group of participants, and decreased work time lost to travel and participation in continuing education.^{3,4} The quality and content of programmes can be optimized, because national and international experts can provide instruction wherever there is Internet access. Further, the advent of computer-mediated conferencing, moderated chat rooms, and e-mail discussion lists greatly increases opportunities for informal discussion of a variety of course-related issues that may arise.^{3,5-7} The costs of Internet and computer access are substantially offset by the ability to minimize lost work time, travel costs, and additional expenditures such as child care.

Cardiorespiratory physiotherapy is an area of practice that has changed and expanded dramatically over the last two decades. Previously, airway clearance techniques were the primary therapies in this area of practice. Now physiotherapists can facilitate cardiorespiratory function through a variety of interventions, including risk reduction; education to improve patient self-management; exercise to promote flexibility, strength, and endurance; breathing exercises; and positioning as well as airway clearance techniques. Because of changing health care delivery systems, clients treated in more diverse settings may have multiple cardiovascular and respiratory pathologies that must be recognized to ensure safe and effective practice. With the scope of cardiorespiratory practice expanding to more diverse interventions and

patients with multiple comorbidities, it is imperative that a recognized process of cardiorespiratory continuing education be developed to provide a vehicle for maintaining and upgrading competency.

Although it is well recognized that successful continuing-education programmes must reflect the needs and preferences of their target audiences,^{8,9} little research has examined the needs and preferences of physiotherapists for continuing and distance education in Canada,¹⁰ especially in relation to cardiorespiratory care. While CAL has been possible for a number of years, this type of instruction was ranked the least interesting method of learning in a survey of physiotherapists conducted in 1994.¹⁰ However, recent advances in information technology may have overcome some of those perceptions held by physiotherapists. A Statistics Canada survey in 2005 revealed that 72% of Canadian homes had a computer and 64% had Internet access;¹¹ another 2005 study reports that at that time 77% of Canadian households with a mean income of \$66,000 had access to high-speed data.¹² Further, the cost of computers has decreased dramatically, such that a computer with adequate specifications for CD-ROM or web-based applications costs less than \$1,000. In addition, technology has evolved to facilitate efficient transmission and receipt of online audio and video graphics in manageable file sizes.

Spurred by the increasingly autonomous nature of physiotherapy practice and the high prevalence of cardiovascular and respiratory conditions and associated risk factors among Canadians, cardiorespiratory continuing education is viewed as required for physiotherapists who specialize in this area, as well as in other areas of practice.¹³ These changing personal and environmental factors led us to sample physiotherapists from licensing bodies across Canada and those in cardiorespiratory interest groups (CRGs). The purpose of this study was to identify factors associated with Canadian physiotherapists' interest in different content areas of cardiorespiratory continuing education identified by the Canadian Cardiorespiratory Specialization process. In addition, we examined the factors associated with willingness to learn a portion of each of these content areas through CAL.

METHODS

Sample

We sampled two groups of participants: (1) individuals with a strong interest in the cardiorespiratory area, as shown by membership in at least one of the two main Canadian cardiorespiratory physiotherapy professional groups, the Canadian Physiotherapy Cardiorespiratory Society of the Canadian Lung Association and the Cardiorespiratory Division of the Canadian

Figure 1 Methods used to increase response rate. Details are provided in the “Study Protocol” section of the Methods. CRG = participants from the Canadian Physiotherapy Cardiorespiratory Society of the Lung Association and/or the Cardiorespiratory Division of the Canadian Physiotherapy Association; LB = licensing bodies.

Physiotherapy Association ($N=450$), and (2) a random sample of other Canadian physiotherapists licensed to practice by 8 of the 10 physiotherapy licensing bodies ($N=976$) (see Figure 1). The licensing bodies of Prince Edward Island and Nova Scotia chose not to participate because of a lack of office support staff to provide a random selection of members. A sample size of 6.4% of licensed physiotherapists was determined from a known population size of physiotherapists in Canada, based on a power of 0.80, α of 0.05, a standard deviation of 50%, and a minimal detectable difference of 10% between the major comparisons postulated.¹⁴ Although this was an exploratory study, we expected to observe greater interest in the Exercise Physiology content area than in other content areas and to find a greater proportion of CRG than licensing body (LB) participants interested in the cardiorespiratory courses. As to willingness to complete the cardiorespiratory courses by CAL, we expected greater travelling time and distance and residence in sparsely populated provinces to be significant factors. Because of the possibility of changes in mailing

addresses, overlap of mailing addresses, and other inaccuracies in the mail-outs, we chose to select a random 7% sample of licensed physiotherapists. Cross-checking of membership in CRGs and random samples from physiotherapy licensing bodies were performed to avoid mailing duplicate questionnaires to potential respondents. If a randomly selected participant was chosen from an LB sample and also belonged to a CRG, he or she was assigned to the CRG group for analysis.

Study Protocol

Ethics approval was obtained from the Behavioural Ethics Review Board at the University of British Columbia. Questionnaires were mailed to 1,426 potential participants with return labels and stamped envelopes to facilitate questionnaire return. Survey participants also had the option to respond by fax. Principles of the total design method^{15,16} were incorporated into the survey design and mail-out to facilitate high response rates. All potential respondents, questionnaires, and envelopes were coded with identification numbers. The survey packets included a cover letter signed by the primary investigator that included a statement of the purpose for the survey, reassurance of the participants' confidentiality, and contact information (phone, fax, and e-mail) for the primary investigator to clarify any queries related to questionnaire items. Announcements in *Contact* (the CPA newsletter) and *Physiotherapy Canada* followed the first mail-out to encourage good response rates. Five weeks after the initial mail-out, the potential respondents received a postcard to confirm receipt of the survey packet and to remind them of the importance of returning the questionnaire. Three months later, non-responders received a second copy of the questionnaire with a stamped return envelope. Data collection was completed on returned questionnaires and non-respondents five-and-a-half months after the initial mail-out, and response rates for both samples were determined (Figure 1).

Survey Questionnaire

The six-page survey (available from the primary author) was divided into three parts. Part I assessed interest in different cardiorespiratory content areas (described in Table 1) and respondents' willingness to complete a percentage of a course by CAL; Part II assessed interest in, preferences for, and access to CAL; and Part III sought information (demographic data) about respondents' personal characteristics and resources.

The second author of this study (SJS) had previously developed Parts II and III, including continuing-education preferences and background/resources. These items had already been tested on 395 occupational therapists and physiotherapists who responded to a

Table 1 Cardiorespiratory Course Content Areas.

Content Area and Level (Estimate of Course Hours)	Description
Exercise Physiology (40)	Multi-system responses and adaptations to exercise; parameters for exercise prescription.
Cardiac Rehabilitation I (30)	Assessment and therapeutic interventions related to early intervention; rehabilitation related to cardiac conditions.
Cardiac Rehabilitation II*	American College of Sports Medicine (ACSM) Certification—Exercise Specialist program.
Paediatric Cardiorespiratory Care I (30)	Pathophysiology of common paediatric cardiovascular and respiratory disorders; assessment, indications/contraindications for evidence-based treatment, exercise testing and prescription for children.
Paediatric Cardiorespiratory Care II (30s)	Pathophysiology, assessment, and therapeutic interventions for more critically ill, unstable, or complicated paediatric conditions (e.g., severe trauma, post neurosurgery or cardiac surgery)
Critical Care I (30)	Pathophysiology, assessment, and management for hypoventilation, atelectasis, secretion retention, and respiratory failure in relatively stable peri-operative and medical patients
Critical Care II (40)	Pathophysiology, assessment, and management of acute and chronic cardiorespiratory conditions in critically ill and unstable patients with multi-system involvement and/or several complicating comorbidities and those post neurosurgery or cardiac surgery.
Pulmonary Rehabilitation I (30)	Multidisciplinary assessment and management of people with chronic respiratory conditions.
Pulmonary Rehabilitation II (20)	Advanced concepts of pulmonary rehabilitation (e.g., assessment of stress, anxiety, depression, and psychological adaptation to chronic illness; adherence and barriers to adherence; exercise prescription).
Airway Clearance Techniques I (30)	Pathophysiology of secretion removal and fundamentals of clearance techniques.
Airway Clearance Techniques II (20)	Advanced airway clearance techniques (i.e., autogenic drainage, positive pressure mask, flutter [oscillatory positive expiratory pressure device], and cornet).

Content areas were previously defined and refined by two national committees consisting of cardiorespiratory clinicians and academics.

*The number of hours required by the ACSM may vary; see ACSM guidelines at <http://www.acsm.org/Content/NavigationMenu/Certification>.

distance-education needs assessment in British Columbia in April 1999.

Part I was added for the current study and pilot tested on a sub-sample of 25 physiotherapists to ensure clarity, completeness, and ease of completion. The entire questionnaire was then pilot-tested on a sample of 31 occupational therapists or physiotherapists. According to recommendations for facilitating high response rates,^{15,16} Part I was placed at the beginning of the questionnaire, because it was expected to be the section of greatest interest to respondents. The section for demographic information was placed at the end, according to recommendations by Dillman.^{15,16} In addition, each part included a section for comments, to ensure that respondents could include any additional relevant information. Table 2 provides an overview of the survey.

Statistical Analysis

Analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 10 (SPSS Inc., Chicago, IL), and SPlus & R, version 2.0 (Insightful Corp., Seattle, WA). The Cochran Q was used to test for overall differences in interest among the cardiorespiratory course content areas, followed by the McNemar test to identify specific differences between pair-wise comparisons of each of the content areas.¹⁷ To minimize multiple comparisons, data from levels I and II were grouped for analysis of the differences among the cardiorespiratory content areas: Pulmonary Rehabilitation, Airway Clearance, Critical Care, and Paediatric Cardiorespiratory Care. A similar analysis was performed on respondents' willingness to take

courses in these areas by CAL, for the CRG and LB groups as well as for the entire sample. Logistic regression and odds ratios were performed to determine which factors were related to interest in a particular content area and which were related to willingness to take continuing-education courses in the content areas by CAL. Factors included in the logistic regression analysis were type of work; language spoken by the respondent; type of employer; practice area; province; size of community; travel time to most continuing-education courses; level of education; Internet access; self-rated computer skill; and previous experience with distance education, self-study, or web-based courses. Logistic regression and odds ratios (95% CI) are provided. Odds ratios are expressed relative to a reference group chosen by the authors; this reference group was coded as 1, and odds ratios for all other levels were calculated relative to the reference group. The reference groups were selected based on the groups for which we postulated the lowest response. Thus, a positive odds ratio would be reported if significant differences were found. Reference groups for factors related to interest, as described in Table 4, were those *privately* employed for the variable of "Type of Employer" and those answering *other* for the variable "Practice Area." In Table 5, the reference group related to willingness to learn about a cardiorespiratory content area via CAL is indicated by the "No" response.

RESULTS

Of the 1,426 survey packets mailed, 757 were returned (56% response rate). Of these, 732 individuals completed the questionnaire: 285 responses from the CRG group

Table 2 Description of Survey.

Section	Number of Questions	Question Type	Topic of Question to Respondent
Part I: Which cardiorespiratory course content area might be of interest to you?	11	Likert scale (5 choices)	For each cardiorespiratory content area described in Table 1: "Please rank your interest in the course using the following scale (circle one)." The five-point scale was anchored by the following descriptors: not at all interested; undecided; likely to do; very likely to do; will do course.
	11	Likert scale (5 choices)	For each content area: "Please estimate the percentage of this course that you would be willing to take using computer based learning." A five-point scale was used: 100%; 75%; 50%; 25%; None.
	1	Likert scale (5 choices)	"I believe that my quality of care to clients would improve if I took one or more of the above-mentioned courses."
Part II: What are your continuing education preferences?	3	MCQ	Interest in different types of continuing education, including delivery formats that require or do not require computer use.
	3	MCQ	Desired scheduling of course (hours per week, duration of course, time of year)
	2	MCQ	What is a reasonable cost for a course?
	2	MCQ	Is it important to have an institution (e.g., a university or an agency such as the Canadian Physiotherapy Association) recognize the course(s) completed?
	1	MCQ	If a certificate program is offered, what should the duration of completion be?
Part III: Your background and resources	3	MCQ	Primary language, province, and size of city of respondent
	3	MCQ	Type and area of work
	3	Fill in blanks	Length of commute and mode of travel
	1	MCQ	Professional qualification
	8	MCQ	Access to computers, type of programs used, self-rated computer skill
	1	MCQ	Experience with correspondence- or computer-based education

MCQ = multiple-choice question

Table 3 Number of Respondents by Geographic Region and Other Descriptive Characteristics.

Characteristic	Subcategories of Characteristic	Region (Subtotals of Respondents)				
		Western Canada* (n = 264)	Ontario (n = 337)	Quebec (n = 69)	NB, NL (n = 58)	Other** (n = 4)
Sample	CRG	88	143	21	30	3
	LB	176	194	48	28	1
Language	English	263	311	8	49	4
	French	0	2	39	4	0
	Both	1	24	22	5	0
Size of community	< 5,000	16	18	3	6	0
	5,000–9,999	19	11	2	8	0
	10,000–49,999	42	37	13	12	3
	50,000–99,999	27	38	12	9	0
	100,000–499,999	58	103	11	21	0
	500,000–1 million	74	45	6	1	1
	> 1 million	28	85	19	0	0
Length of travel	Distance (km)	141.5	138.6	145.3	348.7	777.5
	Time (hours)	2.07	1.62	1.6	2.79	3.37
Level of education	Diploma	40	62	0	2	0
	Bachelor's degree	207	233	60	49	1
	Master's degree	13	34	5	5	1
	PhD	2	5	0	0	2
Desire for recognition	By university	131	153	43	29	2
	By another body	158	227	37	39	1

CRG = cardiorespiratory region; LB = licensing body

*Data were combined for the western provinces of Manitoba, Saskatchewan, Alberta, and British Columbia.

**Respondents from the northern territories of Canada and from other countries

(68.8% response rate) and 447 from the LB sample (47.4% response rate). See Figure 1 for more details and Table 3 for descriptive data from the respondents by geographic region.

For the whole sample, interest was greater in Exercise Physiology, Cardiac Rehabilitation, Airway Clearance, Pulmonary Rehabilitation, and Critical Care than in Paediatric Cardiorespiratory Care ($p < 0.006$;

see Figure 2). Interest in different types and levels of cardiorespiratory content areas varied from 11 to 65% of the respondents in the CRG and LB groups (Figure 3), with a trend for greater interest in level I than in level II courses. The proportion of respondents who expressed interest in cardiorespiratory content areas was higher for the CRG than for the LB group in all areas ($p < 0.007$) except Exercise Physiology, for

Figure 2 Number of respondents interested in cardiorespiratory content areas (as described in Table 1). To minimize multiple comparisons, data from levels I and II were grouped for the following cardiorespiratory content areas: Pulmonary Rehabilitation, Airway Clearance, Critical Care, Paediatric Cardiorespiratory Care. Significantly more respondents were interested in all content areas compared to the paediatric area. *Indicates significantly different at $p < 0.006$.

Figure 3 Percentage of samples interested in different levels and types of cardiorespiratory content areas (as described in Table 1). The cardiorespiratory content areas are described in Table 1. The percentage of groups in each cardiorespiratory content area was calculated by taking the number of respondents interested as a percentage of the subtotals of respondents for each group (285 for the CRG group and 447 for the LB group). *Indicates significantly different at $p < 0.006$.

which there were similar proportions for both groups. This proportion, however, might translate into a lower number of potential course participants, because the CRG population is smaller than the LB population (~450 versus ~14,000 physiotherapists).

Factors significantly related to interest in different cardiorespiratory content areas were those describing the workplace (type of employer and area of practice), as summarized in Table 4. Except for the Exercise Physiology and Cardiac Care content areas, physiotherapists employed in public health were 2.4 to 7.0 times

more likely to be interested in cardiorespiratory practice areas than were those employed privately or in both sectors. Those employed in orthopaedic practice were less likely to be interested in all cardiorespiratory content areas except Exercise Physiology. For the Cardiac Rehabilitation, Pulmonary Rehabilitation, Critical Care, and Airway Clearance content areas, therapists working in respiratory or cardiovascular practice areas were most interested, followed by those working in the neurology practice area.

Table 4 Factors Related to Interest in Different Cardiorespiratory Content Areas and Levels (as described in Table 1).

Content Area	Variable and Level	Odds Ratio (95% CI)	p	Positive Responses/n*	Odds Ratio(95% CI)	p	Positive Responses/n*
Exercise Physiology	Type of employer						
	Public	1.07 (0.62–1.84)	0.815	178/379			
	Both	1.71 (1.06–2.78)	0.030	50/83			
	Private	Reference group		88/150			
Cardiac Rehab	Level I						
	Type of employer						
	Public	3.93 (1.94–5.94)	0.001	206/376			
	Both	1.25 (0.77–2.03)	0.366	50/83			
	Private	Reference group		46/149			
	Practice area						
	Orthopaedics	0.97 (0.71–1.33)	0.849	171/350			
	Respiratory	3.45 (2.45–4.92)	0.001	149/217			
	Cardiovascular	3.87 (2.45–6.11)	0.001	86/115			
	Neurology	1.66 (1.16–2.37)	0.006	98/168			
	Other	Reference group		91/178			
Pulmonary Rehab	Level I				Level II		
	Type of employer						
	Public	5.51 (3.04–9.99)	0.001	104/373	6.06 (3.20–11.4)	0.001	77/371
	Both	0.79 (0.49–1.27)	0.420	20/85	0.54 (0.54–1.40)	0.56	19/84
	Private	Reference group		17/147	Reference group		14/147
	Practice Area						
	Orthopaedics	0.62 (0.45–0.85)	0.003	62/349	0.55 (0.40–0.76)	0.001	49/349
	Respiratory	5.13 (3.55–7.42)	0.001	74/216	4.76 (3.34–6.78)	0.001	60/217
	Cardiovascular	3.89 (2.45–6.17)	0.001	33/115	3.91 (2.54–6.01)	0.001	24/116
	Neurology	2.07 (1.43–2.98)	0.001	53/166	2.25 (1.56–3.24)	0.001	42/164
	Other	Reference group		48/183	Reference group		31/180
Critical Care	Level I				Level II		
	Type of employer						
	Public	5.67 (3.01–10.68)	0.001	208/376	6.98 (3.50–13.87)	0.001	186/376
	Both	0.77 (0.48–1.24)	0.282	40/82	0.82 (0.51–1.33)	0.420	37/83
	Private	Reference group		21/146	Reference group		15/145
	Practice area						
	Orthopaedics	0.51 (0.37–0.70)	0.001	129/348	0.44 (0.32–0.62)	0.001	106/346
	Respiratory	5.27 (3.68–7.55)	0.001	152/218	5.20 (3.64–7.42)	0.001	141/221
	Cardiovascular	3.25 (2.11–5.00)	0.001	77/114	5.55 (3.55–8.65)	0.001	84/117
	Neurology	1.94 (1.36–2.78)	0.001	94/167	1.92 (1.34 – 2.75)	0.001	85/168
	Other	Reference group		86/180	Reference group		68/180
Airway Clearance	Level I				Level II		
	Type of employer						
	Public	4.80 (2.64–8.75)	0.001	232/377	5.05 (2.53 – 10.10)	0.001	194/371
	Both	0.71 (0.44–1.13)	0.150	48/85	0.56 (0.34 – 0.91)	0.019	41/85
	Private	Reference group		28/148	Reference group		20/147
	Practice area						
	Orthopaedics	0.51 (0.37–0.71)	0.001	157/352	0.39 (0.28–0.41)	0.001	123/347
	Respiratory	4.66 (3.27–6.67)	0.001	162/220	5.02 (3.52–7.17)	0.001	142/218
	Cardiovascular	2.80 (1.83–4.29)	0.001	87/117	3.40 (2.23–5.18)	0.001	79/115
	Neurology	1.84 (1.29–2.64)	0.001	105/168	1.54 (1.07–2.21)	0.019	92/167
	Other	Reference group		100/183	Reference group		80/179
Paediatrics	Level I				Level II		
	Type of employer						
	Public	2.37 (1.16–4.83)	0.017	223/375	2.71 (1.28–5.75)	0.009	188/372
	Both	0.80 (0.46–1.39)	0.431	43/85	1.10 (0.63–1.95)	0.736	31/85
	Private	Reference group		26/148	Reference group		15/146
	Practice area						
	Orthopaedics	0.51 (0.35–0.75)	0.003	141/348	0.55 (0.36–0.84)	0.005	100/346
	Respiratory	2.46 (1.68–3.60)	0.001	156/219	2.58 (1.70–3.91)	0.001	137/218
	Cardiovascular	1.44 (0.92–2.28)	0.113	79/115	1.25 (0.76–2.08)	0.384	72/115
	Neurology	1.88 (1.26–2.80)	0.002	98/167	1.87 (1.21–2.88)	0.005	77/166
	Other	Reference group		92/181	Reference group		73/179

*Number of responses indicating an interest relative to the total number of responses.

Several factors besides type of employer and area of practice were related to only one cardiorespiratory content area. For the Exercise Physiology area, those employed in both sectors were 1.7 times as likely to be interested as those employed in the private sector

only, and those employed full-time were 0.4 times as interested as those employed casually. Experiences in self-study and distance education were related to interest in the Pulmonary Rehabilitation Level I cardiorespiratory area (1.5 times and 7.0 times, respectively,

Figure 4 Number of respondents willing to participate in computer-assisted learning (CAL) for different cardiorespiratory content areas (as described in Table 1). In order to minimize multiple comparisons, data from levels I and II were grouped for the following cardiorespiratory content areas: Pulmonary Rehabilitation, Airway Clearance, Critical Care, Paediatric Cardiorespiratory Care. *Indicates significant difference at $p=0.004$.

Table 5 Factors Related to Willingness to Take Cardiorespiratory Content Areas via Computer-Assisted Learning.

Cardiorespiratory Area	Variable and Level	Odds Ratio (95% CI)	p	Positive Responses/n*	Odds Ratio (95% CI)	p	Positive Responses/n*
Exercise Physiology	Access to Internet				For these areas, no Level II courses were described in the survey.		
	Yes	0.76 (0.018–0.33)	0.001	421/448			
	No	Reference group		27/448			
Cardiac Rehab	Level I						
	Access to Internet						
	Yes	0.02 (0.01–0.13)	0.0001	419/443			
	No	Reference group		24/443			
Pulmonary Rehab	Level I				Level II		
	Access to Internet						
	Yes	0.03 (0.01–0.14)	0.0001	294/304	0.05 (0.01–0.24)	0.0001	230/249
	No	Reference group	0.420	8/304	Reference group		19/249
	Experience in self-study course						
	Yes	0.17 (0.04–0.72)	0.016	69/302	0.10 (0.02–0.53)	0.007	53/249
	No	Reference group		233/302	Reference group		196/249
Critical Care	Level I				Level II		
	Access to Internet						
	Yes	0.008 (0.001–0.073)	0.0001	237/254	0.038 (0.01–0.19)	0.0001	229/336
	No	Reference group		17/254	Reference group		7/336
	Experience in self-study course						
	Yes	0.21 (0.05–0.98)	0.047	58/254			
	No	Reference group		196/254			
Airway Clearance	Level I				Level II		
	Access to Internet						
	Yes	0.043 (0.01–0.14)	0.0001	268/294	0.030 (0.01–0.11)	0.0001	218/234
	No	Reference group		26/294	Reference group		16/234
	Experience in self-study course						
	Yes		n.s.		0.227 (0.070–0.738)	0.014	47/234
	No				Reference group		187/234
Paediatrics	Level I				Level II		
No factors were related to willingness to take courses via CAL.							

*Number of responses indicating an interest relative to the total number of responses

compared to no experience). Interest in the Critical Care Level II cardiorespiratory area was significantly related to the respondent's community size. Those living in communities of less than 5,000 or of between 10,000 and 50,000 were 2.5 times and 1.8 times as likely to be interested in this cardiorespiratory area, respectively, as those living in communities of more than 1 million people. Travel time or distance and geographic region (Eastern Provinces, Quebec, Ontario, and Western Provinces) of the participant were not related to interest in cardiorespiratory content areas.

Willingness to use CAL was not different for different cardiorespiratory content areas. Participants from the CRGs were more willing to use CAL for any cardiorespiratory content area than participants from the LB sample ($p=0.004$; see Figure 4). Factors related to willingness to engage in continuing education in different cardiorespiratory areas via CAL are shown in Table 2. Participants who had access to the Internet were less willing to participate via CAL for Exercise Physiology, Cardiac Rehabilitation I, Pulmonary Rehabilitation I and II, Critical Care I and II, and Airway Clearance I and II.

These results should be interpreted with caution, however, because the number of participants who indicated that they did not have access to the Internet was ≤ 27 . The exact numbers are shown in Table 5 for each content area and level. Those who had experience in self-study courses were less willing to take Pulmonary Rehabilitation Level I, Critical Care Level I, and Airway Clearance Level I courses via CAL; however, the *p*-values were marginal for multiple comparisons, and the upper limit of the confidence intervals for the odds ratios was close to 1 (0.72–0.98).

Year of graduation, level of last degree obtained, and size of community of respondents were not related to willingness to complete cardiorespiratory content courses via CAL.

DISCUSSION

Interest in different cardiorespiratory content areas was greater in less specialized areas of cardiorespiratory practice: the greatest interest was in Exercise Physiology and the least interest in Paediatric Cardiorespiratory Care, and, furthermore, greater interest was shown in level I courses than in level II courses (see Figure 2). These findings will aid in prioritizing the cardiorespiratory content to be provided in continuing-education courses within the constraints of limited resources. Consideration of the relative number of potential participants in the different specialty areas will also be vital in informing decisions about the content, focus, and sequence of course development, so that CAL courses attract enough participants to be viable. For example, our findings suggest that developing specialized cardiorespiratory courses to be offered via CAL only to paediatric cardiorespiratory practitioners, who reported less interest and less willingness to work through CAL, may not be a viable option.

A main finding of the study was that a higher proportion of CRG respondents than of the LB group was interested in all cardiorespiratory content areas except Exercise Physiology. Recognition of these differing interests in certain areas provides a basis for advertising and marketing course offerings, as well as for tailoring courses to the prerequisite knowledge and differing clinical skills of participants from these two groups.

The higher proportion of interested respondents from the CRG group will likely translate to a lower number of potential course participants, because these respondents represent a smaller population: all members of the cardiorespiratory interest groups were surveyed, compared to 7% of the LB group. To exemplify how these different-sized populations and proportions translate into potential course participants, consider the data for the Pulmonary Rehabilitation Level I course. Sixty-five percent of the CRG group and 29% of the LB

group were interested in this cardiorespiratory area. Multiplying the percentage of the group interested by the total population yields 292 potential course participants from the CRG (65% of group $\times$ population of 450 physiotherapists) and 4,043 potential course participants from the LB group (29% of group $\times$ population of 13,942 physiotherapists). Considering the size of the group compared to the population is essential when estimating the number of potential course participants from the percentages of survey respondents.

Practice area was a major factor affecting the likelihood of interest in different cardiorespiratory content areas. Therapists working in respiratory, cardiovascular, and neurology practice were more likely to be interested in Cardiac Rehabilitation, Pulmonary Rehabilitation, Critical Care, and Airway Clearance content areas, which likely reflects the mixed diagnoses and physiotherapy needs of patients treated in these areas. Therapists in orthopaedic practice were less likely to be interested in Pulmonary Rehabilitation, Critical Care, Airway Clearance, and Paediatrics, perhaps because of the more focused musculoskeletal needs of patients referred to orthopaedic physiotherapists. This finding is consistent with evidence from the work of Tassone and Speechley,¹⁰ who reported that course content and the physiotherapist's perception of its relevance to practice primarily determined participation in continuing education.

Physiotherapists in public employment were 2.4 to 7.0 times as likely to be interested in all cardiorespiratory content areas, with the exception of Exercise Physiology and Cardiac Care, whereas those employed in private practice were half as likely to be interested in these areas. This likely reflects the type of care provided to Canadians in publicly funded hospitals. Cardiorespiratory comorbidities are common, especially in older age groups, according to the Canadian Institute of Health Information.¹⁸ The prevalence of hypertension is 54%, and seven other cardiovascular and respiratory diagnoses have a prevalence of between 7 and 13% in older (> 75 years) inpatient rehabilitation clients.

Physiotherapists in public employment and those privately employed were equally likely to be interested in the Exercise Physiology content area. This might appear surprising, considering the prevalence of hypertension and cardiac risk factors in the public setting, but interest in continuing education is related to a variety of factors besides the prevalence of conditions. Some therapists may choose not to take courses in exercise physiology because of a belief that such courses will not provide them with relevant practical expertise. Since detection of hypertension and identification of risk factors are not firmly entrenched as traditional physiotherapy practice, therapists may not value them as germane to their daily practice. Other practical issues, such as the perception of insufficient time to perform additional techniques, are challenges that therapists may perceive as limiting their

ability to take courses that introduce a different paradigm of techniques.

That participants from the CRGs were more willing to use CAL for all cardiorespiratory content areas may reflect the scarcity of cardiorespiratory courses offered in Canada, as a result of which individuals specializing in this area may be more willing to use less conventional instructional venues to improve their skills. This group's willingness to use online learning may also reflect different learning styles,¹⁹ as well as their recognition that expertise in this area requires more cognitive learning and less "hands-on" skill. The finding that participants from the LB group were less willing to use CAL for all cardiorespiratory content areas may be explained by the converse of the above explanations. A more kinaesthetic learning style may influence their preference for hands-on courses; as well, if their primary practice area is orthopaedics or neurology, they may expect more hands-on cardiorespiratory courses to be available, given that courses in the orthopaedics and neurology areas are more frequently offered.

CAL is often touted as better suited to cognitive than to hands-on learning.²⁰ There is some evidence, however, that practical skills can be learned using instruction that is not face-to-face. Compared to traditional teaching and learning methods of surgical skills, CAL has produced mixed results: enhanced technical skill and long-term retention are documented in one report,²¹ but another study found lower performance skills.²² A subsequent study by the latter group of investigators showed that CAL supplemented by feedback led to a higher level of mastery than CAL alone.²³ These differing results may reflect differences in content and delivery of information. Other forms of instruction that are not face-to-face, such as tele-health, emphasize the importance of clear, concise instructions and appropriate camera placement to optimize the learning of tactile skills.²⁴

The finding that those who had experience in self-study courses were less likely to be willing to take some of the cardiorespiratory courses (Pulmonary Rehabilitation Level I, Critical Care Level I, and Airway Clearance Level I) via CAL should be interpreted with caution, because the *p*-values were marginal and the upper limit of the confidence intervals for the odds ratios was close to one. This finding may, in part, be attributed to poorly designed courses that did not incorporate fundamental principles of instruction for self-directed learning, such as arousal of student curiosity and using cognitive conflict to stimulate problem solving and knowledge gain.

The benefits of distance education or CAL for cardiorespiratory physiotherapy practice are not well described, but such benefits have been outlined for other areas of physiotherapy practice and for techniques used by cardiorespiratory physiotherapists, such as pulmonary

auscultation, for medical students.^{6,25} Computer-assisted instruction of physiotherapy students in the evaluation and treatment of carpal tunnel syndrome has shown comparable knowledge gain in a shorter time frame than interactive lecture instruction.²⁶ Medical students who learned pulmonary auscultation scored equally well on sound recognition and knowledge testing after CAL as after conventional teaching.²⁷ A recent randomized clinical trial compared Internet-based continuing education with a hands-on workshop for primary care physicians. The Internet education programme produced comparable gains in knowledge and superior clinical practice skills by physicians working with high-risk patients.²⁸

Limitations

Because of the limited grant budget, the questionnaire was not translated into other languages. Whether or not this reduced responses from therapists who are fluent in French but not in English is difficult to determine. Quebec, the region with the highest proportion of French-speaking individuals, did produce a reasonable number of respondents (*n* = 69), of whom more considered themselves to be French speakers (*n* = 39) than English speakers (*n* = 8) or bilingual (*n* = 22) (see Table 3). However, we did not investigate reasons for non-responses to this type of survey. Greater fluency in languages other than English may have dissuaded some survey recipients from responding.

Another limitation is that the number of positive survey responses related to interest and willingness to take different cardiorespiratory content areas will not directly translate into enrolment in continuing-education courses. Other factors may influence whether physiotherapists enrol in a continuing-education course, including those outlined in Tables 4 and 5 in addition to such issues as convenience of scheduling, affordability, relevance to immediate needs in practice, availability of affordable child care, and other competing demands.

The outcome of this study may also have been affected by over-representation of the CRG group compared to the LB group. The authors wanted to obtain a very accurate estimate from the CRG group because we had postulated that the most interest and, hence, the most participation in future courses would be from this group. It was not practical to survey the entire LB population, however, so only a representative sample was solicited from this group. The responses obtained, however, were contrary to our postulated outcomes, since significant numbers of the LB sample were, in fact, interested in cardiorespiratory courses.

Implications

While our results suggest an interest among physiotherapists in taking cardiorespiratory continuing-education courses via CAL, it is clear that course

developers need to consider the variable levels of interest by content area when making decisions about what to offer in this format. Bates²⁹ clearly identified many factors that need to be considered in mounting distance education programmes and courses. Given the apparently limited level of experience with CAL among physiotherapists reported here and elsewhere in the literature, and as is evident from current CAL offerings, the initial costs of developing cardiorespiratory courses for online or other forms of CAL delivery may be high. For example, if all course development and instructor preparation assistance are offered by non-physiotherapists, without review by cardiorespiratory physiotherapy educators with CAL experience, there is a greater likelihood that the courses developed will not meet the learning needs of physiotherapists. To ensure financial viability, great care will need to be taken to ensure CAL courses are developed in a manner most likely to meet the needs of physiotherapists. The findings in this study, recent growth in Internet use among physiotherapists, and successful continuing-education offerings in other health disciplines suggest that development of cardiorespiratory continuing education via CAL has much promise.

KEY MESSAGES

What Is Already Known on This Subject

Providing access to high-quality, standardized continuing education (CE) for Canadian physiotherapists is a formidable challenge because of the small population dispersed across vast geographical expanses in addition to the busy schedules of today's health care practitioners, who juggle multiple roles. Nevertheless, physiotherapists in diverse settings do require ongoing CE related to cardiorespiratory content, because their clients may have multiple cardiovascular and respiratory pathologies. Although a 1994 survey found that computer-assisted learning was the least desirable form of learning among physiotherapists, computers are now mainstream technology in most middle-income Canadian homes, and high-speed Internet can now handle audio and video graphics with relative ease.

What This Study Adds

Results of this study suggest that significant numbers of Canadian physiotherapists who practise in other content areas (in addition to the cardiorespiratory area) are interested in CE related to basic-level cardiorespiratory topics and would be willing to use computer-assisted learning. Educators need to consider the type of employer and area of practice of interested participants, because those from orthopaedic practice areas appear to prefer a more hands-on approach to learning.

REFERENCES

1. Ellison J, Becker M, Nelson AJ. Attitudes of physical therapists who possess sports specialist certification. *J Sport Phys Ther.* 1997;25:400–6.
2. O'Keefe MK, McKay N. Discussion paper: review of specialization models. Toronto: Canadian Physiotherapy Association: CPA Review of Specialization Task Force; 1999 Aug.
3. Haughey M. Distinctions in distance: is distance education an obsolete term? In: Roberts JM, Keough EM, editors. *Why the information highway? Lessons from open and distance learning.* Toronto: Trifolium Books. 1995. p. 2–14.
4. Stahmer AE. Learners in the workplace. In: Roberts JM, Keough EM, *Why the information highway? Lessons from open and distance learning.* Toronto: Trifolium Books. 1995. p. 41–59.
5. Keegan D. *Foundations of distance education.* 3rd ed. London: Routledge; 1996.
6. Sheppard L, Mackintosh S. Technology in education: what is appropriate for rural and remote allied health professionals? *Aust J Rural Health.* 1998;6:189–93.
7. Walker J, Thomson A, Smith P. Maximizing the world wide web for high quality education and clinical support to health and medical professionals in rural areas. *Int J Med Inform.* 1998;50:287–91.
8. Jarvis P. *Adult education and lifelong learning: theory and practice.* 3rd ed. London: Routledge Falmer; 2004.
9. Knowles M, Holton EF III, Swanson RA. *The adult learner.* 5th ed. Woburn, MA: Butterworth Heinemann; 1998.
10. Tassone MR, Speechley M. Geographical challenges for physical therapy continuing education: preferences and influences. *Phys Ther.* 1997;77:285–95.
11. Statistics Canada. Selected dwelling characteristics and household equipment: Household electronics and vehicles [data table on the Internet]. Ottawa: Statistics Canada; 2005 [cited 2007 Nov 15]. Available from: <http://www40.statcan.ca/l01/cst01/famil09c.htm?sdi=computers>.
12. Leiper J. Consumer spending trends in Canadian wireless [slide presentation on the Internet]. Boston: Yankee Group; 2005 Nov [cited 2006 Feb 28]. Available from: <http://www.ottawawirelesscluster.com/httpdocs/presentations/Yankee%20Group%20OWC%20Preso.pdf>.
13. National Physiotherapy Advisory Group. Essential Competency Profile for Physiotherapists in Canada [homepage on the Internet]. Toronto: Canadian Physiotherapy Association; 2004 Jul [cited 2007 Apr 20]. Available from: <http://www.physiotherapy.ca/public.asp?WCE=C=47&K=224032&RefreshT=222634&RefreshS=Container&RefreshD=2226341>.
14. Daniel WW. *Biostatistics: a foundation for analysis in the health sciences.* 6th ed. New York: Wiley. 1995. p. 504–17.
15. Dillman D. *Mail and telephone surveys: the total design method.* New York: Wiley; 1978.
16. Crosby FE, Ventura MR, Feldman MJ. Examination of a survey methodology: Dillman's total design method. *Nurs Res.* 1989;38:56–8.
17. Conover WJ. *Practical non-parametric statistics.* 3rd ed. New York: Wiley; 1999.
18. Canadian Institutes of Health Information. Inpatient rehabilitation in Canada, 2003–2004 [homepage on the Internet]. Ottawa: The Institute; 2005 [cited 2006 Feb 28]. Available

- from: www.cihi.ca/cihiweb/dispPage.jsp?cw_page=PG_373_E&cw_topic=373&cw_rel=AR_363_E.
19. Greenlaugh T. Computer assisted learning in undergraduate medical education. *Brit Med J*. 2001;322:40–44.
 20. Stanton S. Going the distance: developing shared web-based learning programmes. *Occup Ther Int*. 2001;8:96–106.
 21. Summers AN, Rinehart GC, Simpson D, Redlich PN. Acquisition of surgical skills: a randomized trial of didactic, videotape and computer-based training *Surgery*. 1999;126:330–6.
 22. Rogers DA, Regehr G, Yeh KA, Howdieshell TR. Computer-assisted learning versus a lecture and feedback seminar for teaching a basic surgical technical skill. *Am J Surg*. 1998;175: 508–10.
 23. Rogers DA, Regehr G, Howdieshell TR, Yeh KA, Palm E. The impact of external feedback on computer-assisted learning for surgical technical skill training. *Am J Surg*. 2000;179:341–3.
 24. Barden W, Clarke HM, Young NL, McKee N, Regehr G. You've got mail: distance education. *Acad Med*. 2000; 75(10):S43–6.
 25. English T, Harrison AL, Hart AL. A distance learning model in a physical therapy curriculum. *J Allied Health*. 1998;27: 228–33.
 26. Kinney P, Keskula DR, Perry JF. The effect of a computer assisted instructional program on physical therapy students. *J Allied Health*. 1997;26(2):57–61.
 27. Mangione S, Zieman LZ, Gracely EJ. Comparison of computer-based learning and seminar teaching of pulmonary auscultation to first-year medical students. *Acad Med*. 1992;67(10):S63–5.
 28. Fordis M, King JE, Ballantyne CM, Jones PH, Schneider KH, Spann SJ, et al. Comparison of the instructional efficacy of Internet-based CME with live interactive CME workshops: a randomized clinical trial. *JAMA – J Am Med Assoc*. 2005;294: 1043–51.
 29. Bates AW. Managing technological change: strategies for college and university leaders. San Francisco: Jossey-Bass; 2000.