ORIGINAL RESEARCH

Examination of self-directed learning readiness of paramedic undergraduates: A multi-institutional study

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Abstract

Background: The ability to engage in self-directed learning (SDL) is considered to be essential for professional practice in out-of-hospital settings since paramedics are expected to continue and update their knowledge and understanding throughout their professional career.

Objectives: The objective of this study was to determine undergraduate paramedic students' attitudes and readiness towards self-directed learning at four Australian universities.

Methods: A cross-sectional study involving a paper-based questionnaire was undertaken employing a convenience sample of undergraduate paramedic students in semester 1, 2010. Attitudes and readiness for self-directed learning were elicited by the Self-directed Learning Readiness Scale (SDLRS) consisting of a 5-point Likert scale (1=Strongly Disagree and 5=Strongly Agree).

Findings: There were 259 students who participated. Most students were from Monash University (n=113) and Charles Sturt University (n=77). Two-thirds (n=169) of students were < 25 years of age with 54% female. Students from Queensland University of Technology produced the highest SDL score 160.38 (SD=13.56) while participants from Charles Sturt University produced the lowest mean score 154.60 (SD=14.51). Second year students produced the highest total mean score 157.52 (SD=15.19). Statistical significance was identified between the Self-Control Subscale F=3.10, p=0.010 and Self-Management Subscale F=2.83, p=0.017.

Conclusions: This is the first study of its kind involving paramedic undergraduate students in Australia. The results from this study suggest undergraduate paramedic students from four different Australian universities possess an adequate level of self-directed learning readiness. As paramedic-orientated degree programs continue to emerge and develop, establishing SDL needs will assist paramedic educators in diagnosing student learning needs, and assist in shaping contemporary and student-centred curriculum.

Key words

Self-directed learning, Undergraduate education, Paramedics

1 Introduction

The continual advances in biomedical science, informatics, technology and medicine, require health care professionals to develop skills that will enable them to evolve into lifelong learners, with greater emphasis on continuing to learn outside of structured education periods [1]. Self-directed learning (SDL) is significant for health care professionals to develop during their tertiary and professional education, and could potentially be the dominant mode of ongoing education for practicing health care professionals [2]. Knowles [3] provides the most common definition of SDL

> *"a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes"* (p.18)

It is important that health care professionals develop the skills required to undertake SDL in the face of an ever changing body of medical knowledge and increasing application of technology in every day clinical practice [3]. Paramedicine is an area of health care that is growing and developing at a rapid rate, requiring practicing paramedics to maintain their knowledge and practical skills through SDL and professional development activities. In recent times there has been a move in paramedic education within Australia from vocational based diploma level training to university based degree education [4]. This change is being driven by a desire to be professionally recognised, and to fall in line with other mainstream health care disciplines that require degree education as a minimum [5].

The participating universities, Charles Sturt University (CSU), Edith Cowan University (ECU), Monash University (MU), and Queensland University of Technology (QUT) all provide paramedic undergraduate programs. Integrated throughout these university courses are elements of SDL. For example, encouragement and fostering of SDL provided by the curricula and educators at the universities and the concept of becoming life-long learners. This is implanted into paramedic students through patient-centred learning activities usually in the form of small and individual learning tasks. The notion of self-directedness is generally considered an important trait because paramedics are often required to work autonomously and are expected to update their knowledge, skills, and understanding throughout their career [6]. This is also driven by the move of paramedics towards being a professional body, as professional development through a unique body of knowledge is considered to be one of the key elements of a profession [7].

Currently, there is limited investigation of SDL in paramedic education, both at the undergraduate education stage and upon entry into the profession, with continuing education once qualified as a paramedic. In a study performed by De Lorenzo and Abbott [6], on different methods of training U.S Army combat medics, it was found that adult learning (which incorporates strategies of SDL) was able to slightly improve the National Registry of Emergency Medical Technicians (NREMT) EMT-Basic exam score (intervention 71.6 vs. control 69.6, $p=<0.05$) [6]. De Lorenzo and Abbott also found that there was a difference in pass rates between the intervention and control group (63% vs. 49%, $p=>0.05$) despite it not being statistically significant [6] and so could have occurred by chance.

Cooper [3] and Martin [8] have investigated the level of SDL amongst the paramedic workforce within the United Kingdom (UK), and have found that there is anecdotally a low level of SDL amongst practicing paramedics. Cooper reported that the continuing education model within the UK paramedic workforce is of, so-called, 'spoon feeding' rather than actual individualised education, and that a major cultural change is required in the workforce before SDL is accepted [3]. This is also supported by the work that Martin has done on incorporating Continuous Professional Development (CPD) into the paramedic workforce in the UK, which relies heavily upon SDL and personal motivation [8]. The objective of this study was to determine undergraduate paramedic students' attitudes and readiness towards self-directed learning at four Australian universities.

2 Method

2.1 Design

A cross-sectional study involving a paper-based questionnaire was undertaken employing a convenience sample of undergraduate paramedic students in semester 1, 2010.

2.2 Participants

Students enrolled in undergraduate paramedic programs from Monash University (MU), Charles Sturt University (CSU), Edith Cowan University (ECU), and Queensland University of Technology (QUT) provided data for the analysis. There were 890 students eligible for inclusion in the study. Inclusion criteria for the study was being enrolled on a full time basis in an undergraduate paramedic program from one of the participating universities, and present at the end of a lecture when expressions of interest to take part in the study were sought.

2.3 Instrumentation

The 40-item SDLRS was first developed by Fisher and colleagues in 2001 [9] and is designed to assess students' readiness for self-directed learning that consists of three subscales: Self-management (13 items), Desire for learning (12 items), and Self-control (15 items). The items are rated on a 5-point Likert style scale (1=strongly disagree and 5=strongly agree). Four items are negatively phrased, and are reversed scored for data analysis. While a number of previous studies have used the 40-item SDLRS [10-12] several more recent studies have tested the measurement properties of the SDLRS using both exploratory and confirmatory factor analyses suggesting more validation and replication studies need to be undertaken [13, 14]. A demographic section at the beginning of the questionnaire asked for demographic information about the university enrolled in, gender, year of study, age group.

2.4 Procedures

Ethics approval was obtained from each of the respective Human Research Ethics Committees. At the conclusion of lectures for each of the undergraduate programs, students were invited to participate in the study. Students were provided with an explanatory statement and were informed that participation was voluntary and anonymous. A non-teaching member of staff facilitated the process and participants were administered the questionnaire. The questionnaire took students approximately ten minutes to complete and consent was implied by its completion and submission in a drop box prior to leaving the lecture room.

2.5 Data analysis

The Statistical Package for Social Sciences (SPSS; Version 18.0) was used for data storage, tabulation, and the generation of descriptive statistics. Means were used to describe the descriptive data and an independent samples t-test and Analysis of Variance (ANOVA) were used to determine if any differences existed between the participants' gender, year of study, and age groups. All tests were two tailed unless otherwise stated, results are considered statistically significant if the p value is < 0.05.

3 Results

3.1 Participant profile

There were 259 participants who fully completed the SDLRS, a response rate of 29%. All missing data were excluded from the analysis. While it is common practice to replace missing values particularly in clinical longitudinal studies, in data sets where missing values are small and occur randomly, it is suggested they are removed [15]. ECU and QUT had the lowest participation rate (6.9% and 12.0% respectively). The majority of participants were female (54.1%), enrolled in

second year (33.5%), and were mostly under the age of 25 (64.4%). This profile is consistent with the broader profile of students enrolled in the undergraduate paramedic programs nationally. The full demographic distribution is outlined in Table 1.

Table 1. Demographic profile of participants

Variable	Descriptor	N	Percentage (%)
University	CSU	77	29.7
	ECU	18	6.9
	MU	133	51.4
	QUT	31	12.0
Gender	Male	88	34.0
	Female	140	54.0
	(Missing)	31	12.0
Age	15-19 years	88	34.0
	20-24 years	81	31.3
	25-29 years	28	10.8
	30-34 years	12	4.6
	35-39 years	12	4.6
	40-44 years	5	1.9
	44-49 years	2	0.8
	(missing)	31	12.0
Year level	Year 1	67	29.5
	Year 2	87	38.3
	Year 3	59	26.0
	Year 4	14	6.2

3.2 Dimensionality of the SDLRS

With recent studies demonstrating improved parsimony from the original 40-item SDLRS, a factor analysis with Oblimin rotation was undertaken to examine the construct validity and dimensionality of the SDLRS. Results following the factor analysis (item correlations > 0.30) suggested multidimensionality with 33-items loading onto three factors accounting for 31.7% of the explained variance (see Table 2).

Table 2. Pattern Matrix (Principal Axis Factoring Analysis with Oblique Oblimin Rotation)

Item	Factor			
	1	2	3	h^2
I want to learn new information	**.787**			.617
I enjoying learning new information	**.749**			.605
I have a need to learn	**.672**			.741
I enjoy a challenge	**.587**			.503
I am open to new ideas	**.508**			.397
I critically evaluate new ideas	**.487**			.370
I like to evaluate what I do	**.405**			.235
I need to know why	**.403**			.635
I enjoy studying	**.370**			.600
I am able to focus on a problem	**.344**			.505
I am logical	**.314**			.426
I like to gather the facts before I make a decision	**.306**			.464
I am self disciplined		**.781**		.525
I have good management skills		**.757**		.866

Table 2. (Continued)

Item	Factor			
	1	**2**	**3**	h^2
I am organised		**.722**		.744
I manage my time well		**.693**		.657
I set strict time frames		**.603**		.549
I am systematic in my learning		**.518**		.505
I am methodical		**.518**		.441
I set specific times for my learning		**.482**		.454
I prioritise my work		**.476**		.564
I am responsible		**.383**		.299
I can be trusted to pursue my own learning		**.370**		.302
I have high personal expectations		**.327**		.255
I prefer to set my own learning goals			**.835**	.534
I prefer to set my own goals			**.630**	.505
I prefer to plan my own learning			**.578**	.437
I like to make decisions for myself			**.441**	.409
I am confident in my ability to search out information			**.431**	.379
I evaluate my own performance			**.430**	.373
I prefer to set my own criteria on which to evaluate my performance			**.428**	.334
I am responsible for own decisions actions			**.375**	.302
I can find out information for myself			**.342**	.295
Eigenvalues	9.16	2.97	2.41	
Explained Variance	22.9	7.43	6.04	

There were 12 items that loaded on the Self-Control Subscale with item loadings ranging from 0.30-0.78 and explaining 21.2% of the variance. The top item within the factor was: 'I want to learn new information'. There were 12 items that loaded on the Self-Management Subscale with item loadings ranging from 0.32-0.78 and explaining 5.94% of the variance. The top item within the actor was: 'I am self-disciplined'. Finally, there were nine items that loaded on the Desire for Learning Subscale with item loadings ranging from 0.34-0.83 and explaining 4.55% of the variance. The top item within the factor was: 'I prefer to set my own learning goals'.

3.3 Subscale scores and internal consistency

Mean scores and standard deviations for each subscale were: Self-control 61.20 (5.77); Self-management 46.69 (6.19); and Desire for learning 49.69 (4.98). The internal consistency was measured using Cronbach's alpha coefficient. The resultant alpha coefficient for the 40 items was α=0.90 which was well above the commonly used .07 benchmark for scale reliability (Hair et al,. 1995). Subscale reliability alpha coefficients were: Self-control α=.83; Self-management α=.82 and Desire for learning, α=.81. See table 3 for a summary of the SDL results.

Overall, SDL scores for each university were similar, and greater than the accepted mean score of 150 for example, students from QUT produced the highest SDL score 160.38 (SD=13.56) while participants from CSU produced the lowest mean score 154.60 (SD=14.51). There was no statistically significant difference in total SDL scores between universities F=1.45, p=.227, although statistical significance was reached in the self-management subscale F=3.09, p=.028. Second year students produced the highest total mean score 157.52 (SD=15.19) again, no statistical significance was detected between year levels. Statistical significance was reached in the Self-Control Subscale F=3.10, p=.010 and Self-Management Subscale F=2.83, p=.017.

Female participants produced higher mean scores across each subscale and total SDL scale. Statistical significance was reached in the self-control subscale $t = 0.18$, p=0. 035. Students aged < 20 years of age had the lowest mean SDL scores 153.93 (SD=15.40), while those aged between 40-44 years produced the highest score of 169.80 (SD=10.75). It should be

noted that the 40-44 age group only consisted of five participants. With this group removed from the ANOVA analyses, no statistical significance was found between age groups, although mean scores were higher with older participants. Full comparison results can be found in table 4.

Table 3. Mean scores across variables

	Total SDL (SD)	Self-control (SD)	Self-management (SD)	Desire for learning (SD)
University (n)				
CSU (77)	154.60 (14.52)	60.95 (6.09)	44.73 (6.89)	48.92 (4.92)
ECU (18)	159.34 (13.61)	60.67 (4.78)	48.06 (5.2)	50.61 (5.16)
MU (133)	157.11 (14.31)	61.11 (6.18)	46.82 (6.08)	49.41 (4.94)
QUT (31)	160.39 (13.56)	61.16 (5.26)	47.32 (6.67)	51.90 (4.38)
Gender (n)				
Male (88)	157.48 (13.82)	61.68 (5.75)	45.74 (6.65)	49.27 (5.34)
Female (140)	154.79 (15.04)	59.98 (6.34)	46.05 (6.20)	49.39 (4.71)
Age (n)				
15-19 (88)	153.93 (13.99)	60.21 (5.92)	45.97 (5.97)	47.82 (4.75)
20-24 (81)	156.05 (13.5)	61.30 (6.18)	45.28 (6.07)	49.58 (4.62)
25-29 (28)	159.70 (16.09)	61.75 (5.88)	46.75 (8.31)	51.33 (4.57)
30-34 (12)	163.40 (15.94)	63.08 (7.38)	49.17 (6.86)	51.50 (4.25)
35-39 (12)	157.33 (11.68)	59.50 (3.75)	47.75 (3.34)	50.08 (6.07)
40-44 (5)	169.80 (10.76)	65.40 (4.51)	49.60 (6.77)	54.80 (4.87)
45-49 (2)	164.00 (32.53)	61.50 (10.61)	51.00 (12.73)	51.50 (9.19)
Year level (n)				
Year 1 (67)	157.15 (14.41)	61.19 (5.96)	46.13 (6.81)	49.93 (5.00)
Year 2 (87)	157.52 (15.19)	61.11 (6.49)	47.12 (5.72)	49.31 (5.43)
Year 3 (59)	156.28 (13.03)	60.84 (5.53)	46.37 (6.40)	49.39 (4.35)
Year 4 (14)	146.71 (11.28)	60.14 (5.98)	40.21 (5.38)	46.35 (2.70)

Table 4. Scale and subscale comparisons

	Total scale	Self-control subscale	Self-management subscale	Desire for learning subscale
University	F=1.45, p=0.227	F = 0.88, p<0.038	F=3.09, p=0.028	F=1.91, p=0.093
Gender	t=2.59, p=0.053	t = 0.18, p=0. 035	t=1.23, p=0.282	t=3.10, p=0.010
Age	F=3.09, p=0.028	F = 2.09, p=0.074	F=4.52, p=0.617	F=2.83, p=0.017
Year Level	F=0.04, p=0.989	F= 3.10, p=0.010	F=2.83, p=0.017	F=1.91, p=0.093

4 Discussion

Overall, the results that were obtained in this study were positive, with the vast majority of the participating paramedic students being considered to possess the required level of SDL readiness as outlined by Fisher et al [13]. The results that were obtained also indicated that there is a strong link between age and SDLRS scores overall, and within the subscales of Self-Management, and Desire for Learning in particular. Interestingly, there were differences detected between participating universities, indicating that different teaching methods may hold a role in SDL readiness. Moreover, other factors such as learning or personality styles may also influence SDL readiness as might student's pathway into tertiary education, for example mature-age students versus school leavers.

4.1 SDL readiness

According to Fisher et al [13], a mean score of >150 on the SDLRS is considered to be an acceptable level of SDL readiness. All of the universities participating in this study were able to achieve a mean score above the acceptable level of SDL readiness, with a combined mean score of 156. The paramedic students participating in this study had a relatively high level of SDL readiness, with 179 paramedic students (70.5%) obtaining a score of >150 on the SDLRS. These results are similar to Klunklin et al [16], who found that Thailand nursing students also had a relatively high level of SDL readiness, but our results contradict those obtained by Smedley et al [17], who found that only 37 out of 67 (55%) nursing students had an acceptable level of SDL readiness. A study conducted on pharmacy students by Huynh et al [18] showed that third year pharmacy students from a US university had a high level of SDL readiness, obtaining a score of 159 (±20) prior to an Advanced Pharmacy Practice Experience (APPE) component of their education. Post completion of APPE showed a slight improvement in SDL readiness scores, obtaining a score of 159 (±24) [18]. It is possible that undergraduate paramedic students have a greater emphasis placed on working independently during their tertiary education due to the nature of their work when compared with nursing students and other health care professionals given their largely autonomous work environment [3].

A clear trend exists when comparing the total mean scores and age subgroups. As highlighted there is a progressive increase in the overall mean scores as age increases, with the vast majority of age subgroups being significantly higher than the 15-19 years old subgroup. This supports the work of Smedley, who established a link between mean score and age [17], and also supports Kocaman et al, who found that SDL readiness scores increased over the four years of education of the nursing population that was examined [19]. This might suggest that a greater exposure to educational processes increases SDL readiness, changing learning and teaching styles or perhaps students become attuned to tertiary education expectations. This may well be the case for those students who have directly entered from high school where SDL is less of a focus compared with tertiary education.

4.2 Self-control

The Self-Control Subscale is used to determine the students' ability to self-evaluate and as a result determine their own learning goals and outcomes. This subscale includes components such as 'I am aware of my limitations', I have the ability to set my own goals', and 'I have high expectations of myself'. This subscale was scored out of 75 and mean score overall was 61. This is a moderate score for this subscale and indicates that, potentially, more resources and time should be spent on attributes found in the domain of self-control. The only statistically significant results that were obtained for self-control subgroup, was that females were superior to males. From the literature that has been reviewed, an existence of differences between genders has never been reported, with Smedley also reporting similar findings [17]. The attributes that fall under the construct of the self-control subscale should be fostered throughout students' learning, both in tertiary and professional settings, which might provide future success in postgraduate studies and/or research opportunities.

4.3 Self-management

The Self-Management Subscale is a construct of the students' ability to be able to implement their own learning goals, and effectively manage the learning resources available to them [18]. This subscale includes components such as ability to manage time effectively, ability to apply systematic and methodical approaches to learning, set times for learning, prioritising and seeking additional information and resources, and problem solving [17]. This subscale is scored out of 65 and the mean score overall was 46. This is a moderate score for the Self-Management Subscale and indicates that there might be areas of improvement in the self-management domain. This could be potentially a sign that additional efforts and resources should be considered in the area of self-management as independent practice and education is one of the key characteristics of a paramedic. This might take place in the form of study and learning support orientation packages that are integrated throughout the program. As with other subscales, results for the self-management subscale showed a trend that younger students produced lower mean scores compared with their older counterparts. Although it is important to point out that results may be skewed due to the fact that 74% of the participants were aged 17-21 and it is expected that

SDL scores will improve with age, particularly in the area of self-management [9]. This supports the findings of Smedley, that nursing students aged <23 were likely to have a lower SDL readiness level than that of their older counterparts, and that life experience may be an important contributing factor to SDL readiness levels [17]. This is an area worthy of further follow-up and horizon-based research.

When the self-management subscale was examined for differences between universities, it was revealed that CSU produced the lowest mean score, although not statistically significant. This subscale has particular relevance, and therefore, effect on paramedic education, as paramedics are expected to have a high level of self-management and independent practice in their day-to-day practice [3]. This subscale has the potential to be used by universities as a gauge of the development, or recession, of self-management in paramedic students of the period of the course. For example, this may used during clinical placements or mannequin-based simulations where periods of 'downtime' or inactivity require students to self-manage and reflect on their learning. It may also be used by ambulance services to gauge the level of self-management and independent practice of practicing paramedics to allow targeted educational sessions for novice practitioners as they enter the paramedic workforce.

4.4 Desire for learning

The Desire for Learning Subscale was applied to the participating students to determine their motivation for learning and if they are able to reflect on this motivation. The subscale, desire for learning, includes such questions as 'I have a need to learn', 'I enjoy a challenge', 'I like to evaluate what I do' and 'I am open to new ideas' [17]. This subscale was scored out of 60 and the mean score overall was 49. The overall mean scores that were obtained by the participants show a relatively high mean score and indicate that the 'desire for learning' was significantly different across age groups and gender. We are unclear why differences would occur between females and males, but we speculate that the role that age holds in the differences in age subgroups could possibly be explained by the potential positive effect that life experience has on SDL readiness scores [17].

Despite the obvious benefits of self-directedness, many paramedics still resist undertaking education or training in their own time [3]. Utilising the classical stimulus-response (didactic teaching) approach does not necessarily lend itself to the self-directed learning that is at the heart of training courses in the other states. The notion of self-directedness is generally considered an important trait because paramedics are often required to work autonomously and are expected to update their knowledge, skills, and understanding throughout their career [6]. Given the independent nature of paramedic practice, being self-directed provides important personal investment and professional growth [3] and reinforces that future longitudinal and predictive studies should be undertaken by research teams. Further research is required to determine the full effect of adult learning strategies, and therefore SDL, on the education of out-of-hospital care providers.

In other health care professions, with the exception of nursing, there is a paucity of literature on SDL and its role in health care professional education. Nurse researchers have created a SDL readiness scale (SDLRS) which has undergone several replication studies and has been modified based on these psychometric studies [9, 13]. The creation of the SDLRS has allowed nursing and other cognate and non-cognate professions to use the SDLRS based upon three subscales: 'self-management', 'desire for learning', and 'self-control'. There has been a mixture of results obtained in nursing based studies, with Klunklin et al finding that nursing students have a "high level" of SDL readiness [16]. While Smedley found that only 37 out 67 (55%) of nursing students had an acceptable level of SDL readiness (considered to be a mean score of >150 on the SDLRS [13]) and that nursing students aged less than 23 were more likely to have a low level of SDL readiness [17]. This supports the findings of O'Shea, who found in her literature review that school-leavers (those nursing students that were directly from high school) were more likely to have a lower level of SDL readiness than non-school-leavers [2]. The universities, from which the participants were invited to participate, all have discrete components of SDL integrated into elements of the curricula, using in the form of workbooks, assignments and psychomotor skills. Also, the attribute of being able to conduct SDL is one of the key attributes that graduate paramedics should possess at the completion of their undergraduate course at each university respectively [20].

5 Limitations

This study is limited by the use of convenience sampling. This method, while being easier to recruit participants, it may not recruit a representative sample of students. Consequently, the study is limited by the nonreponse bias of those not sampled. The study was limited by the disproportionate number of students that were invited to participate from two universities, with over 81% of participants responding from Charles Sturt University and Monash University. This skewed the results that were obtained due to the sample bias. It is recommended that future studies use larger sample sizes, thus allowing better generalisability. There are also opportunities for other researchers to extend these baseline results with interventional or comparative studies. These investigations might include whether there are any predictors of SDL readiness and university admissions, assessment examination scores or clinical placement/internship evaluations.

6 Conclusion

Based on the results obtained in our study, undergraduate paramedic students from four different Australian universities possess an adequate level of SDL readiness. The role of a paramedic requires a high level of SDL readiness in order for paramedics to adapt and remain up to date with the ever changing and expanding evidenced-based medicine and health care. Therefore results from this study provide academics, policymakers, and curriculum designers with important baseline data in their attempts at curricula renewal. As paramedic-orientated degree programs continue to emerge and develop, establishing SDL needs will assist paramedic educators in diagnosing student learning needs, and assist in shaping contemporary and students-centred curriculum.

Acknowledgments

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