



Measuring self-directed learning readiness in health science undergraduates: A cross-sectional study



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ABSTRACT

Background: The European Higher Education Area places students at the centre of the teacher-guided learning process and requires them to participate more in their education and to be responsible for acquiring the professional competences relevant to their career. Self-directed learning is a key means for developing the skills necessary for professional careers.

Objective: To measure self-directed learning readiness in health science undergraduates.

Method: Observational descriptive cross-sectional study of a convenience sample drawn from the total health science (medicine, nursing, physiotherapy and psychology) undergraduate population (n = 1699) at the University of Girona (Spain). The data collection instrument was a self-directed learning readiness scale with 38 items administered to the 1134 undergraduates who agreed to participate.

Results: Just over three quarters of the sample (n = 865; 76.27%) completed the full questionnaire. Self-directed learning readiness was indicated by an overall mean (standard deviation) score of 143.65 (11.76) points. Nursing undergraduates obtained the highest mean (SD) score – 145.08 (14.13) – in the overall scale. Associations were observed between degree course and self-directed learning readiness in the *learning planning*, *desire for learning*, *self-confidence*, *self-management* and *self-evaluation* subscales. Women scored better than men (p < 0.13) and scores progressively improved with each additional academic year.

Conclusion: The sampled students exhibited good self-directed learning readiness. Training students in self-directed learning skills is a necessary part of the teaching-learning process. This kind of training in universities needs to be reinforced to develop learning autonomy, promote lifelong learning and prepare competent future health professionals.

1. Background

European Higher Education Area (EHEA) guidelines, in underlining the recognition of qualifications across Europe, place special emphasis on the acquisition of competences by university students (European Higher Education Area, 2018). The fact that the EHEA places the student at the centre of the teacher-guided learning process requires students to be more participative in their education and to assume responsibility for acquiring the professional competences relevant to their studies. This, in turn, requires self-directed learning (SDL) to be fostered and developed as a means for students to acquire and reinforce useful professional skills. Such strategies are also required to improve students' attitudes and skills, which is why Knowles'

andragogy model (1975) is of interest. This model is based on the adult, who creates the need to learn from life experience, setting and pursuing the achievement of their own learning objectives; SDL, thus, is conceived as self-instruction and self-teaching (Knowles et al., 2005). The attitudes, skills and personal characteristics of individuals trained in SDL lead to the development of self-management and self-control faculties and a desire for learning (Fisher et al., 2001). Learners, therefore, assume responsibility for their own learning, while tutors actively negotiate and exchange opinions with them, provide resources and validate results during this process (Cerdeira and Osses, 2012). SDL, in short, is understood as a method of instruction (Fisher et al., 2001) and as much a means as an end to lifelong learning (Zhoc et al., 2018).

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SDL facilitates the inclusion of people in the information society by developing skills – as part of a natural learning process (Parra et al., 2014) – that are considered essential for both personal growth and professional success (Deyo et al., 2011).

Several instruments have been developed to evaluate SDL, e.g., the Self-Directed Learning Readiness Scale (SDLRS) (Guglielmino, 1977), the Oddi continuing Learning Inventory (OCLI) (Oddi, 1986), the Self-Directed Learning Readiness Scale for Nursing Education (SDLRSNE) (Fisher et al., 2001), the Personal Responsibility Orientation Self-Directed Learning Scale (PRO-SDLS) (Stockdale, 2003), the Self-Rating Scale of Self-Directed Learning (SRSSDL) (Williamson, 2007), Garrison's Model of Self-Directed Learning (Abd-El-Fattah, 2010) and the Self-Directed Learning Instrument (SDLI) (Cheng et al., 2010). These have subsequently given rise to numerous translations and adaptations to different languages (Fasce et al., 2011, Yuan et al., 2012, Cadorin et al., 2017, Shen et al., 2014, Fujino-Oyama et al., 2016, Visiers et al., 2018), as well as to reviews of their psychometric properties (Cadorin et al., 2017), indicating it to be a topical issue of scientific interest.

Zhoc et al. (2018) reported that more emotionally intelligent students are better self-managers of their learning and are more satisfied with their university experience. Alharbi (2018) who, despite finding low levels of SDL readiness among nursing students, reported that more motivated students had a more developed capacity for self-control. Chakkaravarthy et al. (2018), in a review of SDL, reflected on the need to improve educational activities directed at SDL to ensure its unfolding as a lifelong process in benefit of changing healthcare systems.

SDL has been reported to be a strong predictor of academic achievement (Khiat, 2017). Bravata et al. (2003), who designed a curriculum to teach SDL skills to resident physicians, reported improved SDL-oriented behaviour in half of the participants in their study. Taminiau et al. (2014), who designed a learning environment in which Dutch university students received guidance on self-evaluation and choice of learning tasks, concluded that students benefit more from learning if they have SDL skills. For a randomized controlled trial on cardiopulmonary resuscitation comparing SDL with traditional training, Roppolo et al. (2011) reported a success rate of 84% for SDL compared to 66% for traditional training.

SDL has been studied from various perspectives, including learning styles linked to self-management and self-control (Alharbi, 2018), the impact of curricula and culture (Premkumar et al., 2018) and the positive impact of technology and student engagement (Rashid and Asghar, 2016). Authors such as Slater and Cusick (2017) have reported a relationship between age, year level and previous education level among university students, concluding that the passing of time benefits the acquisition of SDL skills.

Ünsal-Avdal (2013) reported a significant positive correlation between SDL and academic achievement in nursing students. SDL fosters the professional development of nurses by enabling them to expand their knowledge and improve the quality of their practice (Shen et al., 2014). In vocational education, SDL orientation (along with the demands/characteristics of a job) is a significant and positive predictor of workplace learning (Raemdonck et al., 2014). Employees need to take responsibility for their own learning by actively searching for continuous professional development opportunities (Kyndt et al., 2014). Because SDL enables professionals to stay up to date with current knowledge, it is recommended as a way for health professionals to keep abreast of the scientific literature (Reviriego et al., 2013). In terms of evaluating SDL among clinical nurses, for instance, work experience has been linked to self-control skills, while previous education has been linked to self-management skills (Malekian et al., 2015).

In view of the above context, we pose the following research questions. Are students capable of planning their own learning while at university? Are students keen to acquire new knowledge and do they have the self-confidence to do so? Are students capable of managing and of being self-critical regarding their own learning?

Our objective was to measure SDL readiness in students taking

undergraduate health science degrees at the University of Girona (Spain) and analyse the associations with sociodemographic and academic variables.

2. Methods

2.1. Study design, population and setting

A descriptive cross-sectional study was conducted between March and October 2015 at the University of Girona (Spain). The study population was composed of all 1699 students enrolled in health science undergraduate courses: nursing (530 students), physiotherapy (325 students), psychology (317 students) (four academic years each), and medicine (530 students) (six academic years). The instruction methods and activities used for health science undergraduate courses at the University of Girona, while they include theory classes, are mainly active (problem-based learning, case studies, work experience placements, high- and low-fidelity simulations, reflective diaries and portfolios).

The inclusion criteria were that participants had to be registered for the undergraduate degree and course, be present in the classroom on the day of recruitment, and had to complete the full scale or at least some subscales of the instrument. No student meeting those criteria was excluded, except those who declined to participate or who exited the classroom during recruitment. Students were informed that their decision to participate or not participate would have no impact on their studies.

2.2. Recruitment

Permission was obtained from the university to contact faculty heads and course coordinators regarding access to students in the four undergraduate degrees. Lecturers were then contacted for permission for researchers to visit classrooms to recruit students for the study between March and October 2015.

2.3. Variables

The study variables were age, sex, degree course and academic year, and SDL in terms of the *learning planning*, *desire for learning*, *self-confidence*, *self-management* and *self-evaluation* constructs.

2.4. Instrument

A questionnaire was prepared consisting of two parts: Part 1 collected data on sociodemographic variables (age and sex) and academic variables (degree course and year), while Part 2 consisted of the SDLRSNE (Fisher et al., 2001).

The SDLRSNE was chosen as suitable for third-level undergraduate health science degree courses (Deyo et al., 2011; El-Gilany and Abusaad, 2013; Fujino-Oyama et al., 2016; Huynh et al., 2009; Phillips et al., 2015; Reviriego et al., 2013; Shen et al., 2014; Ünsal-Avdal, 2013; Yuan et al., 2012) and as being available in translation to the Spanish language (Fasce et al., 2011). Using 201 Australian nursing students, Fisher et al. (2001) validated the original SDLRSNE of 40 items (Cronbach alpha score of 0.92) grouped in the three dimensions of *self-management*, *desire for learning* and *self-control*, obtaining an overall Cronbach alpha score of 0.85, 0.84 and 0.83 for *self-management*, *desire for learning* and *self-control*, respectively.

In the validated Spanish adaptation (Fasce et al., 2011) the original 40 SDLRSNE items were reduced to 38 items reflecting the attitudes, abilities and personal characteristics of autonomous learners. The 38 items were grouped in three dimensions and five subscales as follows:

- The procedures dimension, covering *learning planning* (defined as an ability to organize and schedule learning times and activities) and

consisting of 10 items.

- The attitudes dimension with two subscales: *desire for learning* (defined as a desire and interest in learning new content), consisting of 6 items, and *self-confidence* (defined as positive self-attributed learner characteristics), consisting of 9 items.
- The cognitive dimension, with two subscales: *self-management* (defined as a willingness to take responsibility for decisions and for reflexive and critical decision making), consisting of 9 items, and *self-evaluation* (defined as the ability to critically analyse performance according to self-defined criteria), consisting of 4 items.

The translated SDLRSNE, validated in a population of Chilean medical students (Fasce et al., 2011), showed both good internal consistency (Cronbach alpha 0.89) and, when the instrument was re-administered after six months, test-retest reliability ($r = 0.68$). Readiness for SDL was considered to be reflected in a score of 142.5 or more for the 38 items (Fasce et al., 2011), reduced from 150 or more for the original 40-item scale (Fisher et al., 2001).

2.5. Data collection

A pilot classroom-based study was run with 90 third-year nursing students to test understanding of the questionnaire and timing. These students, who were encouraged to ask for clarifications as necessary, completed the questions without any problems, doing so in around 20 min.

For the definitive survey, a researcher visited the classrooms of the students in each degree course to recruit volunteers and to administer the questionnaire. These visits took place during taught class periods. Students were first informed of the objectives and purpose of the study and that their decision to participate or not participate would have no consequences for their studies. Students who declined to participate were allowed to leave the classroom. Recruited participants completed the questionnaire in the classroom in 20 min.

2.6. Data analysis

For the independent variables, a univariate descriptive statistical analysis was conducted of the mean and standard deviation (SD) as measures of central tendency and dispersion. Categorical variables were expressed as frequencies and percentages. In a bivariate analysis, Pearson's chi-squared test or Fisher's test was used to test for associations between categorical variables. To compare two related groups, the Student *t*-test was used for paired data or analysis of variance (ANOVA) for repeated means. Spearman's correlation coefficient was used to test for associations between two numerical variables. Logistic regression was performed to study the relationship between SDL readiness and age, sex, degree course and year. Results were considered statistically significant for $p < 0.05$ and a confidence interval of 95%. The data were analysed using IBM SPSS Statistics version 23 for Windows.

2.7. Ethical considerations

Permission was sought – in the absence of a university research ethics committee – from the heads of the university and of the different faculties. Students were informed that the decision as to whether or not to participate in the study would have no repercussions and that they would be able to withdraw at any time. Anonymity was guaranteed by identifying each participant by a code so that no data could be associated with any particular participant. Confidentiality and data anonymization was thus guaranteed as required by Spanish legislation protecting data of a personal nature (Boletín Oficial del Estado, 1999) and the study was performed in accordance with the Declaration of Helsinki and ICMJE recommendations.

Table 1
Demographic data (n = 1134).

Degree	Sex		Total n (%)	Age Mean (SD)
	Women n (%)	Men n (%)		
Nursing	328 (84.4)	59 (15.6)	387 (34.09)	22.59 (5.73)
Physiotherapy	70 (49.7)	70 (50.3)	140 (12.33)	22.77 (3.05)
Medicine	266 (70.8)	108 (29.2)	374 (32.95)	21.77 (2.94)
Psychology	192 (82.4)	41 (17.6)	234 (20.61)	20.94 (5.22)

3. Results

3.1. Sample characteristics

The response rate for the 1134 undergraduate students finally recruited for the study was 76.27% (865 students); 26.6% were men and 73.4% were women, and mean (SD) age was 21.58 (3.54) years (range, 17–44 years) (Table 1). All 38 items were answered by the 865 students: 311 (36.14%), 259 (29.6%), 189 (21.85%) and 106 (12.25%) from medicine, nursing, psychology and physiotherapy, respectively. Between 1001 and 1119 students completed the different subscales. Among those who completed the questionnaire, participation was highest (44%) among first-year students. The mean (SD) score of 143.65 (11.76) achieved by the 865 students demonstrated readiness for SDL (cut-off 142.50).

3.2. Scoring by sociodemographic characteristics

A statistically significant relationship was observed between sex and both the overall score and scores for the *desire for learning*, *self-management* and *self-evaluation* subscales, whereby women obtained better results than men (Table 2).

There was a weak but positive and significant correlation between age and both the *desire for learning* subscale ($r = 0.07$, $p = 0.01$) and the *self-evaluation* subscale ($r = 0.08$, $p = 0.01$).

Likewise, there was a weak but positive and significant correlation between the academic year and both the overall scale ($r = 0.07$, $p = 0.04$) and the *self-confidence* subscale ($r = 0.08$, $p = 0.01$).

3.3. Scoring by degree course

Statistically significant differences were detected in the ANOVA applied to the overall and subscale scores by degree course, except for the *learning planning* subscale (Table 3). The post-hoc Scheffé test pointed to statistically significant differences between physiotherapy and nursing ($p < 0.00$), physiotherapy and medicine ($p < 0.00$) and physiotherapy and psychology ($p < 0.02$). For the overall scale, the highest and lowest mean (SD) scores were 145.08 (14.13) and 138.95 (10.8), obtained by nursing undergraduates and physiotherapy undergraduates, respectively.

There was an association between degree course and SDL readiness, with nursing undergraduates showing the greatest willingness to undertake SDL (60.2%) of all the undergraduates (Table 4).

3.4. Scoring by academic year and degree course

Table 5 show results for each degree course and academic year.

No statistically significant differences were detected in the ANOVA applied to the overall and subscale scores for the degree courses by academic year, except for physiotherapy students in relation to the overall scale and the *desire for learning* subscale (Table 5).

Nursing undergraduates generally obtained the highest SDL readiness scores (Table 5) in all academic years, notably in *desire for learning* (24.90), *self-management* (37.12) and *self-evaluation* (15.32) (see

Table 2
Self-directed learning readiness scores by sex (n = 1124).

	Total n Mean (SD)	Learning planning n Mean (SD)	Desire for learning n Mean (SD)	Self-Confidence n Mean (SD)	Self-management n Mean (SD)	Self-evaluation n Mean (SD)
Men	230 142.21 (13.96)	267 32.97 (4.14)	280 24.01 (3.49)	259 34.24 (4.88)	277 36.16 (4.24)	285 14.7 (2.34)
Women	635 144.17 (10.82)	735 33.31 (3.48)	831 24.64 (2.9)	753 34.18 (4.15)	817 36.82 (3.21)	835 15.09 (2.13)
p (student-t)	0.03	0.2	< 0.00	0.85	0.01	0.01
Total	865 143.65 (11.76)	1001 33.22 (3.37)	1110 24.48 (3.06)	1011 34.20 (4.34)	1093 36.66 (3.51)	1119 14.99 (2.18)

Bold data indicates statistically significant differences.

Table 3).

Medicine undergraduates obtained higher scores in *learning planning* (33.43) and in *self-confidence* (34.51) than any of the other health science undergraduates, whereas psychology undergraduate students scored best in *self-management* (36.42) (see [Table 3](#)). [Table 4](#) shows results for medicine and psychology undergraduates, respectively, for each academic year.

Finally, the logistic regression aimed at exploring the relationship between SDL and age, sex, degree course and academic year indicated no statistically significant differences, for results as follows: SDL and age, OR = 0.980 (p = 0.357; 95% CI: 0.938–1.023); SDL and women, OR = 1.088 (p = 0.612; 95% CI: 0.786–1.505); SDL and physiotherapy, OR = 1.1198 (p = 0.242; 95% CI: 0.885–1.623), medicine, OR = 0.785 (p = 0.173; 95% CI: 0.554–1.113) and psychology, OR = 1.393 (p = 0.116; 95% CI: 0.921–2.106) in relation to nursing studies; and SDL and second year, OR = 0.885 (p = 0.657; 95% CI: 0.518–1.1514); third year, OR = 1.017 (p = 0.937; 95% CI: 0.671–1.542) and fourth year, OR = 1.311 (p = 0.223; 95% CI: 0.848–2.028) in relation to the first year of studies.

4. Discussion

Readiness for SDL among health science undergraduates at the University of Girona is comparable to that reported by [Fisher et al. \(2001\)](#). Studies by [Fasce et al. \(2013\)](#), [Fuenzalida \(2013\)](#), [Márquez et al. \(2014\)](#) and [Spormann et al. \(2015\)](#) confirm this observation regarding SDL readiness among higher education students. Our *learning planning*, *desire for learning*, *self-confidence*, *self-management* and *self-evaluation* scores were slightly lower than those reported by the above authors, while our *self-evaluation* score was similar.

Although the studies included in our literature review are also based on health science student populations, the differences in our results may be due to cultural heterogeneity ([Márquez et al., 2014](#); [Premkumar et al., 2018](#)). Such differences in how SDL readiness is perceived are likely to hinder the objectivity of comparative analyses.

We found statistically significant differences in SDL readiness by

Table 3
Self-directed learning readiness scores by undergraduate degree (n = 1124).

Degree	Total n Mean (SD)	Learning planning n Mean (SD)	Desire for learning n Mean (SD)	Self-confidence n Mean (SD)	Self-management n Mean (SD)	Self-evaluation n Mean (SD)
Nursing	259 145.08 (14.13)	308 33.21 (4.05)	380 24.90 (3.11)	306 34.49 (4.47)	371 37.12 (3.76)	378 15.32 (2.34)
Physiotherapy	106 138.95 (10.8)	130 32.82 (3.31)	129 23.34 (3.11)	127 32.22 (4.43)	134 35.63 (3.63)	140 14.41 (2.03)
Medicine	311 144.25 (10.17)	352 33.44 (3.66)	372 24.42 (2.95)	357 34.51 (4.13)	365 36.70 (3.28)	369 14.80 (2.12)
Psychology	189 143.29 (10.50)	211 33.11 (3.28)	229 24.48 (3.01)	221 34.42 (4.18)	223 36.42 (3.25)	232 15.09 (2.05)
p (Fisher)	< 0.00	0.4	< 0.00	< 0.00	< 0.00	< 0.00

Bold data indicates higher values in SDL.

Table 4

Self-directed learning readiness by undergraduate degree (n = 865).

Degree	SDL readiness	
	Yes, n (%)	No, n (%)
Nursing	156 (60.2)	103 (39.8)
Physiotherapy	38 (35.8)	68 (64.2)
Medicine	174 (55.9)	137 (44.1)
Psychology	91 (48.1)	98 (51.9)
Total	459 (53)	406 (47)

$\chi^2 = 20.70$, p < 0.00.

sex, corroborating findings by [Fasce et al. \(2013\)](#). [Parra et al. \(2014\)](#) also found that women have stronger self-evaluation and self-management skills than men. Higher but not statistically significant different scores were reported for women in an Australian student nurse population ([Phillips et al., 2015](#)).

While we found no association between age and SDL readiness, we did observe a positive association between age and *desire for learning* and age and *self-evaluation*. We also observed a significant correlation between academic year and the overall scale and the *desire for learning* and *self-confidence* subscales. The fact that students in more advanced years showed a greater desire for learning and greater self-confidence corroborates the findings of [Estrada \(2013\)](#) and [Fuenzalida \(2013\)](#). Students who were older or in more advanced academic years have elsewhere been reported to obtain higher scores for SDL readiness ([El-Gilany and Abusaad, 2013](#)), especially for self-control ([Yuan et al., 2012](#)). A recent review confirms the positive impact of age on SDL ([Slater and Cusick, 2017](#)).

The gradual increase in SDL readiness as students advance through academic years would point to the advisability of training in SDL skills, as proposed by [Taminiau et al. \(2014\)](#). Furthermore, this learning should be gradual, starting with extensive tutoring that would be reduced as a student acquires and demonstrates SDL skills. [Cazan and Schiopca \(2014\)](#) confirm that SDL is not only a predictor of academic

Table 5
Self-directed learning readiness scores by academic year (n = 1134).

Degree	Academic year	Total n Mean (SD)	Learning planning n Mean (SD)	Desire for learning n Mean (SD)	Self-confidence n Mean (SD)	Self-management n Mean (SD)	Self-evaluation n Mean (SD)
Nursing	1st	83 145.43 (11.24)	99 33.17 (4.34)	117 26.68 (2.81)	94 34.32 (3.75)	119 37.28 (3.29)	121 15.18 (2.44)
	2nd	49 143.3 (22.35)	66 33.13 (4.79)	91 24.57 (3.87)	64 34.95 (5.91)	83 36.85 (5.12)	82 15.3 (2.67)
	3rd	73 145.27 (10.16)	82 33.37 (3.04)	86 25.1 (2.94)	84 34.55 (4.06)	85 36.68 (3.01)	87 15.22 (1.94)
	4th	54 145.88 (13.4)	61 33.11 (3.94)	86 25.34 (2.69)	64 34.18 (4.34)	84 37.57 (3.44)	88 15.6 (2.22)
	p (Fisher)	0.8 (0.33)	0.22 (1.46)	0.79 (0.34)	0.77 (0.37)	0.39 (1.00)	0.6 (0.61)
Physiotherapy	1st	81 137.69 (10.24)	103 32.8 (3.22)	100 23.04 (2.99)	98 32.12 (4.08)	106 35.45 (3.44)	110 14.44 (1.91)
	2nd	4 153 (11.74)	4 33.75 (2.75)	5 25.8 (2.86)	5 35.4 (5.77)	5 37.4 (3.64)	5 15.4 (3.04)
	3rd	20 142.1 (10.34)	22 32.9 (3.81)	23 24.34 (3.21)	23 32.08 (5.47)	22 36.22 (4.46)	24 14.08 (2.35)
	4th	1 138.95 (10.79)	1 0.64 (0.55)	1 0.02 (3.30)	1 0.36 (1.06)	1 0.46 (0.85)	1 0.51 (0.76)
	p (Fisher)	< 0.00 (4.40)	0.64 (0.55)	0.02 (3.30)	0.36 (1.06)	0.46 (0.85)	0.51 (0.76)
Medicine	1st	54 145.18 (8.97)	68 33.76 (3.52)	76 24.59 (3.11)	70 34.01 (4.15)	74 36.52 (3.72)	73 14.63 (2.34)
	2nd	40 141.17 (12.76)	43 32.97 (3.18)	47 24.1 (2.97)	43 33.48 (4.59)	45 36.04 (3.34)	46 14.91 (2.49)
	3rd	54 144.46 (9.23)	60 33.15 (3.63)	61 24.8 (2.95)	62 34.91 (3.9)	62 37.01 (2.8)	62 14.45 (1.94)
	4th	59 142.71 (10.34)	68 33.47 (4.06)	70 23.78 (3.21)	66 34.37 (4.03)	68 36.44 (3.63)	70 14.68 (2.06)
	5th	58 146.24 (8.05)	63 33.6 (3.64)	65 24.93 (2.32)	63 35.11 (3.28)	65 37.18 (2.54)	64 15.23 (1.7)
	6th	46 145.04 (11.72)	50 33.48 (3.83)	53 24.24 (2.94)	53 34.96 (4.89)	51 36.88 (3.43)	54 15 (2.12)
	p (Fisher)	0.15 (1.61)	0.88 (0.34)	0.2 (1.45)	0.28 (1.25)	0.47 (0.91)	0.34 (1.13)
Psychology	1st	55 144.05 (12.47)	65 33.4 (2.98)	74 24.25 (3.05)	70 34.75 (4.57)	74 36.82 (3.54)	74 15.16 (2.11)
	2nd	49 142.97 (9.22)	53 33.62 (3.16)	59 24.57 (3.17)	55 34 (3.51)	55 35.92 (2.89)	61 15.11 (1.99)
	3rd	49 143.22 (10.22)	55 32.41 (3.54)	58 24.41 (2.98)	57 34.91 (4.17)	55 36.47 (3.48)	57 15.19 (2.23)
	4th	36 142.61 (9.49)	38 32.92 (3.45)	38 24.84 (2.77)	39 33.69 (4.29)	39 36.28 (2.8)	40 14.77 (1.74)
	p (Fisher)	0.92 (0.16)	0.22 (1.46)	0.79 (0.34)	0.39 (0.99)	0.48 (0.82)	0.75 (0.39)

Bold data indicates p-value statistically significant.

achievement but also that this achievement is greater in more advanced academic years. Similarly, [Alotaibi \(2016\)](#) reported that SDL readiness had a positive impact on academic performance, while [Zhoc et al. \(2018\)](#) reported a positive relationship between SDL readiness, academic results and emotional intelligence.

In our study, students of nursing and medicine obtained the highest scores (followed by students of psychology and physiotherapy in that order). Other authors have also reported higher scores for nursing and medicine students ([Ünsal-Avdal, 2013](#); [Phillips et al., 2015](#); [Fasce et al., 2011](#)) compared to pharmacy students ([Deyo et al., 2011](#); [Huyh et al., 2009](#)) and nutrition and dietetics students ([Fuenzalida, 2013](#)). However, little evidence is as yet available for psychology and physiotherapy students. In the case of psychology, this may be because this discipline refers to and studies the slightly different concept of 'self-regulated learning' that originated in educational psychology ([Rascón, 2016](#)).

4.1. Research limitations

The scant literature on the SDL readiness construct and the variety of measurement instruments available make it hard to compare findings. Nonetheless, our research into SDL readiness in undergraduates provides evidence in favour of changing the approach to SDL and making improvements in this setting.

The findings of our research may be affected by the low participation rate among physiotherapy undergraduates. A possible barrier to their recruitment may have been the fact that those students are enrolled in a private centre attached to the main university that may operate differently from the other faculties.

Another limitation may be self-selection bias, in that students who completed the questionnaire may have been those more interested in or more motivated by SDL. What was evident was a loss from the sample, as, of 1699 students, between 1001 and 1119 students completed different subscales and 865 completed the full questionnaire.

5. Conclusions

SDL has been widely demonstrated to develop attitudes, abilities and personal characteristics that equip students with ongoing learning skills and enable them to acquire professional skills. Although the concept of SDL has been clearly defined, there are difficulties in using and measuring the concept accurately. In this research, we have attempted to contextualize SDL readiness for health science undergraduates studying nursing, medicine, psychology and physiotherapy degrees at the University of Girona.

These students demonstrate a readiness for SDL. Nonetheless, we suggest that the health science faculties of the University of Girona need to invest further efforts in developing, maintaining and improving SDL

readiness, given the benefits for the professional future of its graduates. Training in SDL would not only be valuable for the students themselves, but also for the teachers and health professionals who train them.

To enrich perspectives on SDL, it would be useful to follow up these students longitudinally and to collate contributions made by them in interdisciplinary focus groups.

Finally, we suggest that an indispensable figure in any teaching-learning process is the teacher, who, as guide, mentor and intermediary, potentially plays a key role in equipping the student with the specific skills required by their future profession. Since encouraging the development of SDL skills benefits students by preparing them to be competent professionals, it is important to conduct further research and to improve SDL in higher education.

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Declaration of competing interest

None.

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