# Learning styles and Locus of control in undergraduate medical, nursing and physiotherapy students: a comparative study

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## ABSTRACT

**Introduction:** Locus of control is a personality variable which influences expectancies that people have in relation to everyday outcomes. The orientation on the Locus of control can be internal or external. People with internal orientation on locus of control attribute outcomes to their own control whereas those with external orientation tend to blame others for what happens to them. Internal orientation on locus of control has been found to correlate with attainment and general student satisfaction. Locus of control has been explored in health care related disciplines as well as in relation to learning characteristics, education in general and academic performance in particular.

**Purpose:** To explore potential relationship between learning styles and Locus of control.

To examine possible differences, in the learning styles and Locus of control orientation between Medical, Nursing and Physiotherapy undergraduate students.

**Materials and methods:** A cross – sectional survey of undergraduate medical, physiotherapy and nursing students was conducted, at an English London university. The Learning Styles Inventory and Locus of Control Internal External Scale were administered to a purposive sample of students in their first year of study (n = 379).

**Results:** The BSc Nursing students had the highest Locus of Control score (mean = 12.43, SD 4.164) and medical students the lowest (mean = 10.32, SD 4.034). Students who were carers had a lower mean Locus of Control score of 10.65, SD 3.713 as compared with students who were not carers, Locus of Control = 12.39, SD 4.108. Linear regressions showed statistical significance of different Kolb's learning styles on the Locus of Control. KOLB-Abstract Conceptualisation (AC) had a statistically significant impact on Locus of Control (p=0.022). The dominant learning style of the nursing students in this study was assimilating (35%) and accommodating (26%).

**Conclusions:** The findings from this study demonstrate that perhaps learning styles are not necessarily profession specific and that maybe the nursing students in this sample used more balancing styles which were influenced by the teaching methods and their curriculum. The implications for future research and educators are also discussed.

**Key words:** learning styles, locus of control, healthcare students.

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## INTRODUCTION

Populations of students entering Higher education and health care professions are from diverse backgrounds and experiences. Learning styles indicate the preferred way in which students choose to learn and differences have been identified between student populations in many studies [3-5]. There has been much research concerning learning styles and the potential of these tools in helping shape educational practice has been identified [3, 6-,9]. Although Coffield et al [10] had identified about 70 learning styles models, the most frequently used Learning style Inventory is the inventory introduced by Kolb [1]. This inventory is based on experiential learning and as such is most applicable to healthcare professionals. The inventory has been updated by Kolb several times but the key proposition is that there are four learning styles which involve – concrete experience (CE); reflective observation (RO); abstract conceptualisation (AC) and active experimentation (AE). These four modes of learning contribute to a combination of the learner's position on the continuum between the learning styles and Kolb proposes that there are four types of learners; they are Divergers, Assimilators, Accommodators and Convergers. Thus Divergers (CE/RO) learn from concrete experience supported by reflective observation, whereas Assimilators (AC/RO) learn from abstract conceptualisation and reflective observation. Accommodators (CE/AE) learn from concrete experience and active experimentation and Convergers (AC/AE) learn from abstract conceptualisation and active experimentation (Kolb [11].

In the research of healthcare students, Sutphin [12] found a predominance of Converging style in first year medical students. On the other hand, Smits et al [13] in a study of successful learning of postgraduate medical education found predominant Accomodator learning style. Rennie [14] reported that the majority of Physical Therapy students over the three year period demonstrated Converging and Assimilating learning styles. Successive studies of nursing students reported a predominance of Diverger and Converger learning styles [15-16] However, Marra [17] found a predominance of Accommodator and Convergent styles and also identified that majority of nursing students had a strong internal Locus of Control. A more recent study [6] found that majority of nursing and midwifery participant students were Divergers followed by Assimilators and Accommodators.

Learning styles without a doubt influence students' attainment and influence student experience [18]. The orientation on the Locus of control has been found to correlate with attainment and general student satisfaction [19-23]. The research into Locus of control spans over 40 years and Locus of control has been explored in health care related disciplines [24-29] in relation to learning characteristics, education in general and academic performance in particular. It has been previously reported that perceived control is associated with increased motivation, better coping with, and reduction of, stress, all leading to an improvement in life style [30]. Therefore it could be argued that increased academic motivation is linked to a learning style and thus knowing predominant learning style of any student group and matching the teaching methods could be influential in affecting motivation of such student group.

Although there is a considerable research into learning styles of nursing students [31], the research comparing nursing students with other healthcare professionals is limited and there is no previous research linking learning styles to the Locus of control. Therefore, the aim of this study was to explore Learning styles and Locus of control in healthcare undergraduate students.

## MATERIALS AND METHODS

A cross–sectional survey was used to compare populations of students on Medical, Nursing and Physiotherapy programmes.

Purposive, convenience sampling strategy was used as the three student groups were taught on a common module.

**Measures**

Locus of control Internal- External Scale (Rotter [1]) and Learning Style Inventory (Kolb [11]) were used in the study. Locus of control scale is a forced choice scale, which consists of 29 paired statements. Only 23 statements count towards the score, as 6 items are fillers. The higher scores indicate tendency towards external orientation and the lower scores internal orientation.

The evidence for reliability and validity of the Locus of control scale has been widely reported [2, 19, 20] and previously test-retest reliabilities for one month period were consistent, with reliability coefficients ranging from 0.60 for males and 0.83 for females. Internal consistency coefficients tested with the Kuder-Richardson reliabilities test were relatively stable ranging from 0.65 to 0.79.

The Kolb Learning Style Inventory scores (LSI 3.1 [31]; Kolb, [1, 11]) are based on a range of 12 questions and forced choice answers. These are then analysed by the inventory to present four basic learning styles. Internal and external validity of the KOLB LSI 3.1has been assessed and internal consistency has been demonstrated. Across a number of different populations normative scores have been established by involving over 600 individuals from differing professions. Test retest reliability has been established at 0.9 across 8 week intervals. Kappa coefficient showed retest variability in 46% of subjects. Factor analysis has

been used to study the internal structure and normative values for Learning styles (CE, RO, AC and AE) are available.

**Procedure**

Data were collected at the end of the class, at the beginning of the autumn semester. Altogether, 450 questionnaires were distributed: 200 questionnaires to medical students, 100 to physiotherapy students, 100 to BSc nursing students and 50 to diploma nursing students. Boxes were put in the classroom and the students were asked to put completed questionnaires in the box, 378 completed questionnaires were returned in all, giving 84% return. However some questionnaires had missing data, therefore only 217 questionnaires were analysed for Kolb learning styles.

**Demographic data**

Demographic data recorded from the subjects were age, gender, academic profile, being a carer and ethnicity. If students identified a known disability (e.g. dyslexia) these were recorded.

**Ethical considerations**

Approval was sought and received from the Faculty Research and Ethics Committee. Students were assigned a registration number with all data treated as confidential and all documents stored in locked filing cabinet. All students were provided with a written informed consent and were able to refuse participation if they desired.

**Statistical analysis**

The questionnaires were analysed using SPSS version 19. One way ANOVA and t - tests were used to examine differences in learning styles and Locus of control between different health care disciplines. Correlations between Kolb and Rotter IE Scale were investigated using Spearman's correlation coefficient. Linear regressions were conducted to measure the statistical significance that different Kolb's learning styles may have on Locus of control.

## RESULTS

A total of 379 students completed the Locus of control questionnaire. Just over 49.1 50% of the sample were enrolled on the Medicine course, 19.8% on the Physiotherapy course, 10.8% were pursuing a Nursing Diploma and 20.1% were enrolled on the BSc Nursing course, see Table 1.

**Table 1.** Participant student numbers and percentages per each course.

| Course | Frequency | Valid Percent |
|---|---|---|
| **Medicine** | 186 | 49.2 |
| **Physiotherapy** | 75 | 19.8 |
| **Diploma Nursing** | 41 | 10.8 |
| **BSc Nursing** | 76 | 20.1 |
| **Total** | 378 | 100.0 |

Majority of the students who completed the questionnaire (Table 2) were female 255 (71.6%) as opposed to 101 (28.4%) male. Out of total sample, 4% reported to be dyslexic. The vast majority of students had a qualification from a UK institution and most students (70%) did not have a first or higher degree. Over 31% of the students were carers for children, their spouse or other person.

**Table 2.** Participating students divided by gender and course.

| Course | Gender | | Total |
|---|---|---|---|
| | Female | Male | |
| **Medicine** | 109 | 77 | 186 |
| **Physiotherapy** | 61 | 14 | 75 |
| **Nursing Diploma** | 36 | 0 | 36 |
| **BSc Nursing** | 49 | 10 | 59 |
| **Total** | 255 | 101 | 356 |

The relationship between the course on which students were enrolled was statistically significant with the Locus of control score ($p = 0.016$), with BSc Nursing students having the highest Locus of control score (mean = 13.39) and medicine students scoring the lowest on the Locus of control (mean = 10.32), see Table 3.

**Table 3.** One way ANOVA of course by Locus of control.

| | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 158.314 | 3 | 52.771 | 3.531 | .016 |
| **Within Groups** | 3183.456 | 213 | 14.946 | | |
| **Total** | 3341.770 | 216 | | | |

The medical students were most internal on their Locus of control orientation and BSc nursing students were most external on their Locus of control orientation as shown in Table 4.

It is interesting to note that diploma nursing students were more internal than their BSc colleagues. This may be due to the fact that diploma students tended to be more mature as opposed to BSc students.

**Table 4**. Locus of control mean by course

| Course | n | LOC Mean | Std. Deviation |
|---|---|---|---|
| **Medicine** | 41 | 10.32 | 4.034 |
| **Physiotherapy** | 59 | 10.71 | 3.449 |
| **Diploma Nursing** | 41 | 11.17 | 3.680 |
| **BSc Nursing** | 76 | 12.43 | 4.164 |
| **Total** | 217 | 11.33 | 3.933 |

Mean Locus of control scores for males were lower than for females as shown below in Table 5.

**Table 5.** Mean scores for Locus of control score by gender for whole sample.

| | Gender | n | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| **LOC score** | Female | 161 | 11.30 | 3.870 | 0.305 |
| | Male | 34 | 10.71 | 3.778 | 0.648 |

Being a carer was also statistically significant (p=0.030). Students who were not carers had a mean Locus of control score of 12.39, versus a mean score of 10.65 for those students who were carers, see Table 6 and Table 7.

**Table 6.** Mean scores for Locus of control score by carer for whole sample.

| | Carer | N | Mean | Std. Deviation |
|---|---|---|---|---|
| **LOC score** | No | 80 | 12.39 | 4.108 |
| | Yes | 37 | 10.65 | 3.713 |

**Table 7. T**-test on Locus of control score by variable - carer for whole sample.

| | | Levene's Test for Equality of Variances | | | | |
|---|---|---|---|---|---|---|
| | | **F** | **Sig.** | **t** | **Df** | **Sig. (2-tailed)** |
| **LOC score** | Equal variances assumed | 0.768 | .383 | 2.193 | 115 | .030 |

Other variables such as gender, dyslexia, country of previous qualification, level of previous qualification were not statistically significant. Mean scores for Kolb's learning styles for the whole sample showed Active Experimentation (AE) to be the dominant learning style (mean= 33.62), followed by Active Conceptualisation (AC) with the mean = 30.47, see Table 8.

**Table 8.** Mean scores for Kolb learning styles for whole sample.

| N= 217 | Mean | Std. Deviation |
|---|---|---|
| **Kolb CE** | 25.35 | 6.327 |
| **Kolb AC** | 30.47 | 6.785 |
| **Kolb RO** | 29.88 | 6.308 |
| **Kolb AE** | 33.62 | 7.522 |
| **LOC score** | 11.33 | 3.933 |

Linear regressions between Kolb's learning styles and Locus of control showed, that while KOLB-Concrete Experience (CE), KOLB-Reflective Observation (RO), KOLB-Active Experimentation (AE) did not have a statistical significant impact on LOC, however, KOLB-Abstract Conceptualisation (AC) did and was significant at p=0.022, see Table 9.

**Table 9.** Linear regression Kolb AC by Locus of control.

| ANOVA[b] | | | | | | |
|---|---|---|---|---|---|---|
| **Model** | | **Sum of Squares** | **df** | **Mean Square** | **F** | **Sig.** |
| 1 | Regression | 81.040 | 1 | 81.040 | 5.343 | .022[a] |
| | Residual | 3260.730 | 215 | 15.166 | | |
| | Total | 3341.770 | 216 | | | |
| a. Predictors: (Constant), Kolb AC | | | | | | |
| b. Dependent Variable: LOC score | | | | | | |

When distribution of Kolb scores was plotted using LSI3.1 Grid, the learning styles for all participants and three groups were identified. Figure1. shows that dominant learning style for all participants was assimilating (30%) and converging.(25%).

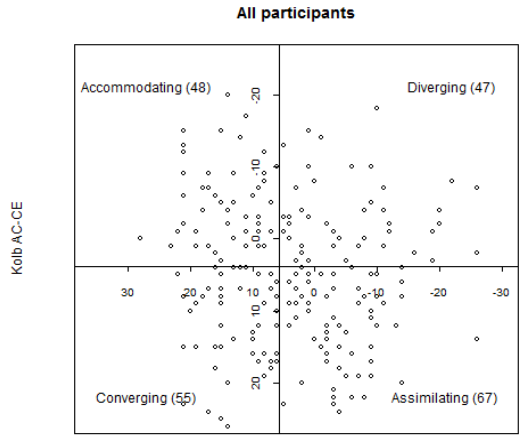


Fig. 1 Distribution of Kolb scores for all participants

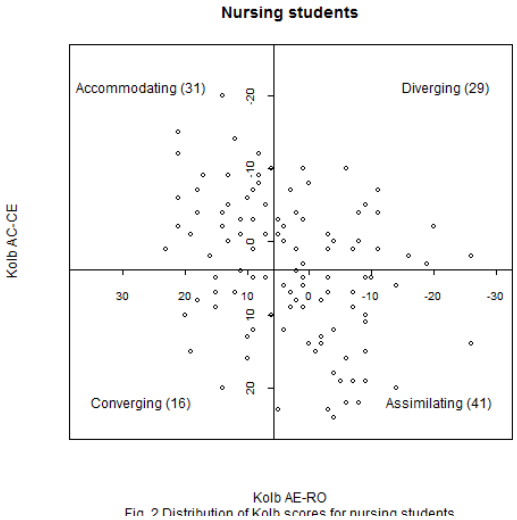


Fig. 2 Distribution of Kolb scores for nursing students

Figure 2 shows that for nursing students combined (both BSc and Diploma) the dominant learning style was assimilating (35%) followed by accommodating (26%). The distribution of Kolb scores for the medical students and physiotherapy students was not conclusive, mainly due to missing data.

## DISCUSSION

According to some researchers nursing students are most researched group of learning styles [6]. However no previous research has specifically linked learning styles with Locus of control, but it could be argued that to be successful in experiential learning the students need to have strong self-efficacy beliefs. Self-efficacy [32] is associated with choice and provides a motive to learn which may be influenced by the orientation on the Locus of control.

The findings from the current study show that the BSc nursing students in the sample had the highest mean on the Locus of control which means they were most external in the Locus of control orientation, with the mean score of 12.43, SD 4.164 as compared with medical students who were most internal on the Locus of control orientation with the mean score of 10.32, SD 4.034. This difference was statistically significant at p=0.016.

Nursing students were previously found to have higher Locus of control scores than other reported populations [29]. It could be argued that the clinical role of medical students is very different to that of nursing students, with the former being encouraged to make independent decisions, which gives them perception of greater control over situations and their learning in clinical practice. Nursing students on the other hand are expected to work in teams with greater hierarchy and have to check their decisions about care with senior staff, thus perhaps not perceiving much control over their clinical learning. What is more interesting that those students who were carers were more internal in their Locus of control orientation, with the

mean LOC score of 10.65 SD 3.713 as opposed to 12.39 SD 4.108 for non carers. This difference was statistically significant with p=0.030. The implication here is that being a carer and having responsibility for another person gave carers a greater perception of control.

The males in the current study were more internal on their LOC orientation which supports previously reported findings [2, 19, 29].

Kolb's Abstract Conceptualisation (AC) had an impact on the Locus of control and was significant at p=0.022. According to Kolb[1] Abstract Conceptualisation requires one to consider alternative solutions and to evaluate the consequences of such solutions. It is dependent on reflective observation and also on assimilation of prior knowledge. It could be argued that such abilities promote independent thinking and thus lead to increased perception of control.

The distribution of the four learning styles of the nursing students in this study did not support previously reported findings [6]. The dominant learning style of nursing students in the current study, was mainly assimilating (35%) followed by accommodating (26%). Interestingly recently reported [8] findings on the dominant learning style of pharmacy students was also assimilating.

According to Kolb [31, 6] the learning style most relevant to the nursing is diverging. Furthermore it was also reported that other healthcare students also display diverging learning style. Could it be argued that perhaps learning styles are not necessarily profession specific and that maybe the nursing students in the current study used more balancing learning styles [3] which were influenced by the teaching methods and their curriculum? Maybe more focus should be directed at other variables which influence learning, such as motivation, Locus of control, teaching methods, teaching styles, aspects of curriculum as well as continuous learning style.

**Implications for future research**

The findings from this study may benefit learning and academic support to undergraduate health care practitioners.

The findings contribute to the body of knowledge about Locus of control and learning styles and could provide the foundations for further longitudinal studies evaluating preferred learning styles in undergraduate healthcare practitioners.

**Limitations of the study**

This study has a few limitations. Data was only collected during one academic year at only one institution and therefore these findings need to be interpreted with care and cannot be generalised to all nursing student populations.

In addition, the data collection tools measure students' perceptions using self-reporting questionnaires and students may not have answered the questions honestly and may have provided socially desirable responses.

Another limitation of this study is that the student groups were not equally distributed by gender and males were underrepresented in the sample, which limits the generalizability of the findings. However, this sample closely represents the profile of healthcare students in our institution.

## CONCLUSION

The findings from this study show that nursing students had a dominant assimilating (35%) learning style, on the other hand other learning styles constituted 65%, thus demonstrating that learning styles are diverse. In spite of the fact that there are many learning styles, nonetheless they must be given consideration when designing curricula in order to maximise learning and to create positive experience of learning.

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**AUTHORS' CONTRIBUTIONS**

Maria Ponto - literature search, literature review, data collection and analysis, data interpretation, tables, writing the paper. Ann Ooms – advice on data analysis and interpretation, SPSS statistical analysis and tables. Fiona Cowieson – data collection.

**Conflicts of interest**

None.

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