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Pain Knowledge, Attitudes and Beliefs of Allied Health Learners Across Three Curricular Models

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Abstract

Purpose: The global burden of pain is considerable; therefore, all health professionals require comprehensive pain education. Pain education is essential and should be embedded in health professional curricula. This paper reports on pain knowledge, attitudes and beliefs changes of osteopathy learners undertaking pain education via three curricula models.
Methods: Osteopathy learners undertook pain education via three different curricula models and at different time points in the course: Standard (Year 4 & 5), Integrated (Year 2 & 3) or Block (Year 1). Learners completed questionnaires at the start (T1) and end (T2) of the 2018 academic year. Evaluation included demographic information, Neurophysiology of Pain Questionnaire (NPQ) and the Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT).
Results: Matched data was received for 211 learners (40.5% response rate). Pain knowledge increased from T1 to T2 within all curricula models ($p < 0.007$) and between Block and Standard curricula models ($p < 0.01$). Differences in biomedical orientation scores for Block and Integrated ($p < 0.01$) and Block and Standard ($p < 0.01$) were found between groups, with Block model respondents recording the highest biomedical orientation scores. Differences in behavioural orientation score were found for Block and Standard ($p < 0.01$) with highest behavioural scores in the Integrated and Standard models. Cronbach's alpha was acceptable for PABS-PT Biomedical orientation score only ($\alpha = 0.71$). T2 NPQ score was found to have a medium negative correlation with the T2 PABS-PT biomedical orientation score for all models, and with the behavioural orientation score for the integrated curriculum group ($r = -0.31$, $p < 0.03$).
Discussion: There were reductions in biomedical beliefs and increases in behavioural orientation scores as pain knowledge increased in each cohort over the 2018 academic year. However, osteopathy learners were also measured at different progress points and some measures have low reliability. Following these learner groups over time will enable further comparisons between these different curricula models.

Keywords: Attitudes; Back pain; Curriculum; Education; Osteopathic medicine

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1. Introduction

In the last few decades there has been a growing body of educators advocating for the inclusion of pain education in professional preparation curricula for health professionals.[1,2] In part, this situation has arisen from the increasing recognition about the global burden of pain, and in particular musculoskeletal pain.[3] For example, in Australia it is estimated that 19.2% of Australians experience chronic pain,[4] with pain complaints reported as the most common presenting issue in allied health musculoskeletal practice.[5−7] Therefore, practicing allied health professionals require understanding of pain mechanisms and contributors, with knowledge of how these influences may impact the individual.

The importance of embedding pain education into the professional preparation of health professionals is echoed by several peak bodies. The International Association for the Study of Pain (IASP), for example, has stipulated a pain curriculum for many years, with the introduction of disciplinary specific and interdisciplinary curriculum in more recent times.[8] Further, Australia's National Pain Strategy recommends comprehensive pain education and training to furnish health professionals with knowledge and resources to provide appropriate pain management. The strategy specifically states that "… education in the biological processes underpinning acute and chronic pain will give health professionals an accurate conceptualisation of pain and underpin care" (p. 17).[9] A contemporary understanding of pain neurophysiology is suggested to facilitate the ability of practitioners to adequately explain the basis of a patient's pain to the patient.[8]

Darlow and colleagues suggest that professional beliefs and attitudes towards chronic pain should also be considered as they are often consistent with and may influence those of their patients.[10] For instance, they suggest that professionals who are fear avoidant or biomedically oriented are more likely to advise patients to limit work and physical activities, contrary to clinical guidelines.

However, the process of embedding pain education into health professional preparation programs can be challenging given the ever-competing demands on curricula time. An early example of a positive attempt was the introduction of an interfaculty pain curriculum across six discipline areas including medicine, nursing and physical therapy in Canada.[11] More recent initiatives have involved the introduction of interprofessional pain education,[12] the application of discipline-specific pain curricula frameworks,[13,14] and pain competencies.[15]

Content is only one part of the solution to enhancing provision of pain education. The method of curriculum delivery is also an important variable to consider and evaluate. That is, when and how is pain education incorporated into curricula facilitate students' knowledge about pain and shift their attitudes away from a biomedical approach to a biopsychosocial model of care.

The osteopathy course at Victoria University is a combined Bachelor-Master's degree and one of three accredited programs in Australia. Since 2015 the program has undergone changes at the program and institutional level, resulting in three distinct curricula models running concurrently over a five-year time frame. The standard curriculum (Model 1) used a standard discipline-based approach covering discrete subject areas (anatomy, biomechanics, research and medical and musculoskeletal assessment and management), delivered across five years (two semesters per year). The standard model was reviewed along with feedback from stakeholders and a new model was developed to enhance integration of the clinical knowledge and reasoning.

The redesign of this standard curriculum, during 2014−2015, resulted in an integrated 4.5-year curriculum (Model 2), in 2016, resulting in pain education being taught across three years of the curriculum. The Model 2 curriculum was developed around 4 domains of osteopathic practice that were horizontally and vertically integrated across the four-and-a-half-year course. In 2016, there was an institution-wide mandate to introduce block-mode delivery across all courses at Victoria University,[16] where each disciplines specific subjects were delivered in four-week intensive blocks (Model 3). In this model, four subjects were delivered sequentially across 16 weeks instead of across the semester as per model 2.

There is some data evaluating the first model demonstrating improvement in pain knowledge before and after the semester long pain module was delivered.[14] There is no current evaluation of the integrated (Model 2) or block model (Model 3) of pain curriculum delivery. Therefore, this paper reports on our initial evaluation comparing the efficacy and effectiveness of these three models. We document the knowledge, attitudes and beliefs changes via The Neurophysiology of Pain Questionnaire (NPQ),[14,17,18] and the Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) and discuss relationships between demographic variables and questionnaire results.[19]

2. Method

2.1. Participants

All enrolled learners in the osteopathy courses at Victoria University in 2018 were invited to participate. All participants reviewed an Information to Participants form and received a short explanation of the study, with a chance to ask questions from the lead author. All participants completed and signed a consent form indicated their consent to participate in the study.

Anonymity was maintained by the consent form being detached from the questionnaires by the lead author prior to data entry. Any questionnaires returned without consent forms were not included for data entry.

2.2. Materials

Learners were evaluated using a short demographic survey and two questionnaires to assess pain knowledge, attitudes and beliefs at two time points, at the start and end of the 2018 academic year.

The demographic questionnaire gathered data about year level, age, gender, previous training in either a health professional course or CPD/short course. The questions also asked the participant about their lived experience of pain, and whether they have either previously or currently were experiencing chronic pain.

The first questionnaire was the Neurophysiology of Pain Questionnaire (NPQ), developed by Moseley,[17] which measures pain neurophysiology knowledge. It consists of 19 items with options for selecting true, false or uncertain and each item is scored as 'correct' or 'incorrect' with a total score out of 19. 'Uncertain' responses are coded as 'incorrect'. The NPQ has been previously utilised for measuring change in pain knowledge in health professional curricula.[14,17,20–22] In this study we used an updated version of this questionnaire, published in 2013 by Catley,[18] as this version had 19 items in total but a number of items had been reworded to ensure there was no confusion over the terminology. This strategy was appropriate as the short versions of the NPQ questionnaire (with 12 or 13 items) published elsewhere[18,23] have not been validated for the current study population.

The second questionnaire measured the attitudes and beliefs of health professionals via The Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) questionnaire. This 20-item questionnaire, with two sub scales (biomedical and behavioural), measures these two treatment orientations. Respondents read 20 statements and recorded their agreement using a 6-point scale from 'totally disagree' (score = 1) to 'totally agree' (score = 6).[19] A higher score on the biomedical orientation scale indicates the responder favours a biomedical model of disease, where treatment is aimed at relieving the pain and disability through treating specific pathology in the spinal and associated tissues. A higher behavioural orientation score suggests higher engagement with a biopsychosocial approach, where pain experience is acknowledged to be influenced by biological, social and psychological factors rather than just tissue damage.[24] The internal consistency of the biomedical orientation score has been reported from 0.77 to 0.84, while the behavioural orientation score from 0.62-0.68.[25]

2.3. Procedure

The osteopathy curriculum at Victoria University in Melbourne, Australia has recently undergone substantial changes to its delivery approach, moving from a standard (discipline specific) framework through to an integrated curriculum. The integrated curriculum was initially semester-based delivery, then transitioned to a block model delivery.

2.3.1. Model 1 - standard (discipline specific) curriculum framework

Prior to 2016, the curriculum adopted a discipline specific and biomedical approach with up to 7 units of study (regional anatomy, physiology, pathology, medical and musculoskeletal examination, ethics, research, statistics, clinical practicum) per semester over 10 semesters. Given this shortcoming of this focus, from 2014 the course team began developing an integrated biopsychosocial curriculum (for delivery in 2016). To bridge gaps in pain education between the standard curriculum and delivery of the new integrated curriculum, a pain education subject entitled "Understanding Pain" was developed. The unit ran in 2016–2017 in year 3 and was mapped against the IASP recommended curricula for Physical Therapy.[26] Learners in this standard curriculum cohort undertook this as a semester long subject to fill this perceived gap in their education. Details of this curriculum model have been previously published.[14]

Table 1
Learner year levels and curricular models with pain education exposure.

Year Level 2018	Curriculum Model	Delivery	Teaching Approach	Pain Education model	Subject Name (s)	Estimated hours on pain education *Delivery (X hours)/ semester*
Year 4 & 5	Model 1: Standard (Discipline Specific) Curriculum Framework	Semester Mode: 12 weeks per semester × 2 per year	Teacher centred	Single subject in year 3 semester 1. Year 5 completed in 2016, Year 4 completed in 2017.	Understanding Pain	Lectures (9 h), Practical simulated learning activities (9 × 2 h)/semester.[14]
Year 2 & 3	Model 2: Integrated Curriculum Framework	Semester mode: 12-week semesters for two semesters per year	Student centred	Horizontally and vertically integrated across domains and body regions, reinforced by weekly Case Based Learning (CBL).	Integrated into the following subjects over 3 years: • Scientific Basis of Osteopathy (SBO) • Clinical Skills • Patient, Practitioner & Health	• Year 1 – Lectures (4 h), Tutorials (4 h), CBL (12 or 18 h)/semester • Year 2 & 3, Semester 1 – Lectures (4 h), CBL (18 h), Practical workshops (10–25 h)/semester. • Year 3 – Semester 2: Lectures (12 h) pain neurophysiology, Lectures (12 h), Practical workshops (12 × 2 h), CBL (12 h).
Year 1	Model 3: Amended Integrated Curriculum Framework	Block model: Sequential delivery of 4 subjects for 4 weeks each for 2 semesters per year.	Student centred	Delivered in two blocks per semester, twice per year.	Biomedical Science for Osteopathy 3	Prereading (1–3 h), workshops (3 h), Block model modified CBL (9 h)/block.

2.3.2. *Model 2 - integrated curriculum framework*

The integrated curriculum commenced in 2016 with pain education being taught systematically from early in year 1 through to year 3. Content was delivered across four domains of practice via a region-based approach. Each semester focused on a new region for the first five semesters (Upper Limb, Lower Limb, Spine, Thorax, Abdomen/pelvis). The sixth semester was centred around preparation for entering clinical placements with a focus on acute pain assessment and management.

2.3.3. *Model 3- amended integrated curriculum framework block model*

'In 2018, Victoria University developed and applied the block-model delivery across all courses for year one learners. The integrated curriculum model described above was modified to fit the requirements of delivery of four sequential intensive mode subject "blocks" rather than the previously described 12-week semesters with subjects delivered simultaneously. Consecutive, block model delivery immerses the learner in one subject at a time sequentially for four weeks, before moving on to the subsequent subject. The three curricula are contrasted in Table 1. None of the content delivered included any reference to the items used in the NPQ or PABS-PT to mitigate bias.

Learners who volunteered to participate were asked to complete printed versions of a short demographic information survey, the NPQ and PABS-PT during week 1 of the 2018 academic year (February 2018) and during the final week of the 2018 academic year (October 2018) (Appendix A).

Table 2
Demographic data of three curriculum model cohort.

Curricula model	Block (n = 49)	Integrated (n = 89)	Standard (n = 69)
Mean Age (years)	18.51 (3.74)	22.92 (5.27)	23.26 (4.21)
Gender			
Number of Females	25 (51.02%)	45 (50.56%)	36 (52.17%)
Number of Males	24 (49.98%)	44 (49.44%)	33 (47.82%)
Previous Health Professional Course			
Yes	8 (16.32%)	19 (21.34%)	25 (36.23%)
No	41 (83.68%)	70 (78.66%)	44 (63.76%)
Previous Pain Course			
Yes	6 (12.25%)	12 (13.48%)	22 (31.88%)
No	43 (87.75%)	77 (86.52%)	45 (65.21%)
Personal Experience of Chronic Pain			
None	14 (28.58%)	34 (38.20%)	37 (53.62%)
Previous	29 (59.18%)	41 (46.06%)	16 (23.18%)
Current	6 (12.24%)	14 (15.73%)	14 (20.20%)

Table 3
Mean Total NPQ, PABS-PT (Biomedical orientation) and PABS-PT (Behavioural orientation) scores at T1 & T2.

		Curricula Model					
Measure	Time	Block		Integrated		Standard	
		(n = 49)		(n = 89)		(n = 69)	
		Mean Score (SD)	% Correct	Mean Score (SD)	% Correct	Mean Score (SD)	% Correct
NPQ (Score 0–19)	T1	7.88 (2.33)	41.47%	9.00 (2.17)	47.36%	9.93 (1.88)	52.26%
	T2	9.51 (2.18)	50.05%	9.66 (2.43)	50.84%	10.09 (1.91)	53.10%
PABS-PT Biomedical	T1	51.69 (6.90)	–	48.92 (6.40)	–	46.64 (6.60)	–
(Score 14–84)	T2	49.61 (6.60)	–	45.39 (6.50)	–	43.64 (6.40)	–
PABS-PT Behavioural	T1	18.08 (3.10)	–	19.87 (3.00)	–	19.87 (2.30)	–
(Score 6–36)	T2	19.29 (3.33)	–	20.85 (2.90)	–	21.07 (2.30)	–

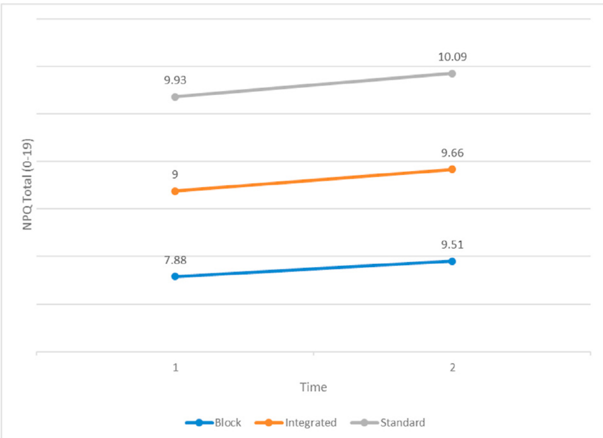

Fig. 1. Total Mean NPQ Scores at T1 & T2 between curriculum models.

2.4. Analysis

Data from the demographic questionnaire and pre- and post-intervention measures were entered into SPSS version 25 (IBM Corp, USA) for analysis. Descriptive statistics were generated for each of the demographic variables. The NPQ total score and PABS-PT biomedical and behavioural orientation items were scored and a total score generated as per the respective author instructions.[18,19]

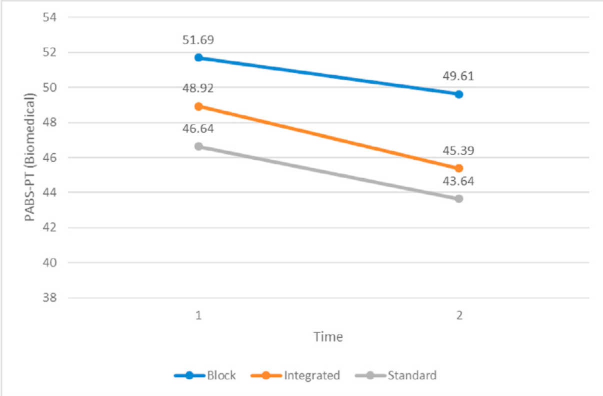

Fig. 2. Total Mean PABS-PT (Biomedical) Scale Scores at T1 & T2 between curriculum models.

Pearson's *r* was used to correlate scores of the NPQ and PABS-PT Biomedical and Behavioural sub-scales at the commencement of the academic year (T1) and the end of the academic year (T2) in the three different curriculum models (Standard, Integrated, Block). Inferential statistics were used to explore the relationship of the curricula models with NPQ, and PABS-PT Biomedical and Behavioural orientation scores over the two data collection time points. A repeated measures ANOVA was used with Bonferroni correction where appropriate with alpha set at $p < 0.05$.

3. Results

From a total study population of 552 students, we collected 385 completed questionnaires at the start (February) of the 2018 academic year (T1). At the end (October) of the 2018 academic year we collected 326 completed questionnaires. The number of matched data sets at T1 and T2 was n = 211 (38.22% response rate).

3.1. Demographic data

The mean age of participants completing both time points was 21.95 years (±4.94) and females comprised 51.65% of respondents (n = 109). There was no significant difference for whether the learner completed both times points or not for the NPQ total score ($p = 0.31$), and the PABS Biomedical ($p = 0.09$) and Behavioural ($p = 0.06$) subscales. The demographic details and descriptive items for the three curriculum models are reported in Table 2.

3.2. Differences in pain knowledge by curricula model

The total mean NPQ scores at the start (T1) and end (T2) of the 2018 academic year between curricula models are shown in Table 3 and Fig. 1 respectively. Significant within groups differences in T1 and T2 NPQ scores by curricula model were found ($F(2, 204) = 5.2$, $p < 0.007$, power = 0.882). Significant

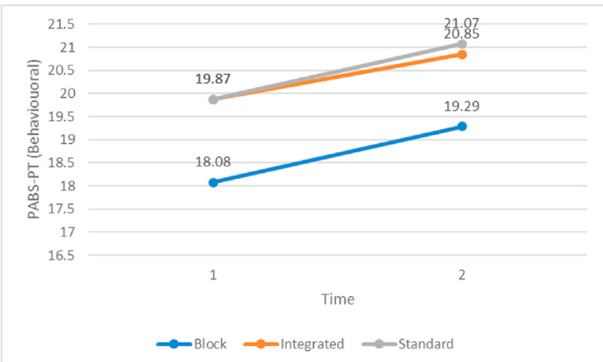

Fig. 3. Total Mean PABS-PT (Behavioural) Scale Scores at T1 & T2 between curriculum models.

between groups differences were also found ($F(50.2,6.3) = 7.9$, $p < 0.001$, partial $eta^2 = 0.048$). Bonferroni-adjusted post hoc analysis revealed a significant difference between Block and Standard curricula models ($p < 0.001$) but not between Block and Integrated ($p < 0.136$) or Integrated and Standard ($p < 0.57$). Cronbach's alpha for the 19-item NPQ was reported ($\alpha = 0.424$). The number of correct and incorrect responses for the NPQ items by curriculum at T2 are reported in Appendix B.

3.3. Differences in biomedical orientation by curricula model

The total mean PABS-PT biomedical orientation scores at the start (T1) and end (T2) of the 2018 academic year between curricula models are shown in Table 3 and Fig. 2 respectively. No significant within groups differences in T1 and T2 PABS-PT Biomedical orientation scores were found ($F(2, 204) = 0.816$, $p < 0.443$). Significant between groups differences ($F(2,204) = 13.48$, $p < 0.001$, partial $eta^2 = 0.117$) were found. Bonferroni-adjusted post hoc analysis revealed significant differences between Block and Integrated models ($p < 0.002$) and Block and Standard models ($p < 0.001$) but not between Integrated and Standard models ($p < 0.085$). Block model respondents demonstrated the highest biomedical orientation scores while the Integrated and Standard curricula groups showed signficantly lower biomedical orientation scores than their Block counterparts, but were not significantly different from each other ($p < 0.085$). Cronbach's alpha for the 14-item Biomedical orientation score was reported ($\alpha = 0.714$). Mean response scores for each of the 14 items for T1 & T2 can be found in Appendix C.

3.4. Differences in behavioural orientation by curricula model

The total mean PABS-PT Behavioural orientation scores at the start (T1) and end (T2) of the 2018 academic year between curricula models are shown in Table 3 and Fig. 3 respectively. No significant within groups differences in T1 and T2 PABS-PT behavioural orientation scores were found ($F(2,204) = 0.12$, $p < 0.887$), however significant between groups differences were found ($F(2,204) = 9.998$, $p < 0.001$, partial $eta^2 = 0.089$). Bonferroni post hoc analysis revealed Block model respondents demonstrated the lowest behavioural orientation scores which are significantly lower than both Integrated ($p < 0.001$) and Standard ($p < 0.001$) respondents. The scores between Integrated and Standard were not significantly different ($p = 1.000$). Cronbach's alpha for the 6-item behavioural orientation score was reported ($\alpha = 0.376$). Mean response scores for each of the 6 items for T1 & T2 can be found in Appendix C.

3.5. Relationships between measures

The NPQ (T2) total score was found to have a medium negative correlation with the PABS-PT (T2) biomedical orientation score in Block ($r = -0.402$; $p < 0.004$), Integrated ($r = -0.329$; $p < 0.002$) and Standard ($r = -0.416$; $p < 0.002$) curricula respectively. The PABS-PT biomedical orientation score was also found to be moderately negatively correlated with PABS-PT behavioural orientation score in the Integrated curriculum group only ($r = -0.311$; $p < 0.003$).

3.6. Relationships between demographic factors and NPQ & PABS-PT scores

There were no significant relationships found between T1 and T2 for either NPQ, PABS-PT biomedical or behavioural orientation scores for age, gender, previous history of pain or having undertaken a previous pain course ($p > 0.050$). Differences were found in PABS-PT behavioural orientation scores for those who had undertaken a previous health care professional course and were enrolled in the block-mode curriculum ($F(2,201) = 5.26$, $p < 0.006$). Age was found to have a medium positive correlation with T2 NPQ scores ($r = 0.336$, $p < 0.001$), a small positive correlation with T2 Behavioural orientation score ($r = 0.248$, $p < 0.001$) and a medium negative correlation with the Biomedical orientation score ($r = -0.354$, $p < 0.001$).

4. Discussion

Our study contrasts the effectiveness and efficacy of different curricula models on pain knowledge, attitudes and beliefs within the same allied health professional preparation course. Those learning via the standard curriculum model showed higher pain knowledge than those undertaking the block model curriculum approach. There were reductions in biomedical beliefs and increases in behavioural orientation scores as pain knowledge increased in each model.

4.1. Pain knowledge by curricula model

Pain knowledge as measured by the NPQ showed increased scores within each cohort across the academic year. However only block-model and standard model curricula cohorts demonstrated significant score increases, with the standard model cohort having higher knowledge levels at T1. While the learners are at different stages of their education as osteopaths, the results suggest the learner cohorts in each curriculum model did increase their pain knowledge as they progressed through the course. What is unclear is how much the different delivery models contributed to the increase, if at all. Further assessment of the cohorts as they move through the curriculum is required. Learners may also learn simply by undertaking the measurement process or the process itself may stimulate new thinking or integration of knowledge.[27]

Part of the cohort learning via the standard model have previously had their NPQ results reported after the pain curricula intervention.[14] The results reported 10/19 (52.6%) correct responses before the intervention and 14/19 (72.6%) correct after the intervention, delivered when this group were in their third year of learning in 2017. These results suggest the standard curriculum approach has contributed to increased pain knowledge. However, we are not able to directly compare this groups performance now at the start and end of their 4th year of learning via the standard curricula approach, as their data is pooled with that of the year 5 students. In addition, is uncertain how many of the 55 learners reported in the 2017 study had participated in the current study.

Considering the mean NPQ score at the end of the academic year for the standard curriculum respondents was 10.09 or 53.1% correct responses, compared to a mean of 14 (72.6%) of correct responses captured 18 months ago, this suggests that knowledge of pain decreases once the delivery of the pain neurophysiology content has ceased. This finding highlights the need for ongoing reinforcement of pain curriculum content with learners.

Hush[13] recently reported outcomes of prospectively embedding the 2012 IASP Pain Curriculum for Physical Therapy throughout the 3-year pre-licensure Doctor of Physiotherapy Program at Macquarie University. Pain knowledge from pooled learner data across 4 cohorts was measured at commencement, and end of semester A, and again at the end of semester E via a 13-item NPQ.[18] Within a single cohort, the 13-item NPQ correct responses were 57.8% at entry, with scores of 81% at the end of semester A and 80.1% at the end of semester E. These results offer support for increase in pain knowledge across an IASP curriculum benchmarked program using a spiral curriculum approach in post graduate learners. However, the short version (13 item) NPQ-R is an issue as it was validated for use in a low back pain patient population of 300 random data sets which limits its translation into student knowledge measurement. Secondly, these authors have not utilised correctly the recommendations of the author analysis of the 19 item NPQ. The recommendation was that seven misfitting items be removed from the original 19 item NPQ, resulting in a 12 item NPQ.[18] Therefore, use of the full 19 item version may potentially have yielded different pain knowledge results. These issues make it difficult to directly compare results of the differing curricular approaches between our study and others.

When considering whether or not the current study indicates that learners simply increased pain knowledge by being in a health professional course over time, we can consider a recent publication for comparison.[20] This study utilised the 19 item NPQ and reported physiotherapy students in their final year had higher 19 item NPQ scores than the cohort in their first year, and increased scores from 8/19 (42%) to 13/19 (68%) correct. It also reported parallel results from both medicine and nutrition courses at the same university which showed the medicine course (with some pain content) had lesser increases in knowledge (8/19 correct to 10/19 (52%) correct), while the nutrition course (8/19 to 8/19) with no pain content did not change. These findings provide some support that inclusion of pain curricula within a health professional course will increase pain neurophysiology knowledge, and the health professional training environment itself is not solely responsible for the increased scores.

When discussing changes in pain knowledge, we must also consider the reliability analysis of the NPQ as used in this cohort. Cronbach's alpha was reported as $\alpha = 0.424$ which suggests the questionnaire may not be internally consistent in this student population. Further psychometric analysis of the NPQ in the current study population is required to explore construct validity and determine which items should be retained to generate a reliable total knowledge score and is an area for future study.

4.2. Changes in biomedical orientation in different curricula models

There were no significant differences in pre- and post-academic year biomedical orientation scores within the three curricula cohorts. This finding suggests that biomedical attitudes and beliefs towards pain within each group have remained relatively stable over the course of the year irrespective of the curriculum model experienced by the learner (lectures, tutorials, practical workshops, or clinical placements).

That said, the block-mode curriculum respondents entered the course with higher biomedical orientation scores, and showed higher biomedical orientation scores at T2 than their Integrated and Standard curricula counterparts. Interestingly, the lower biomedical orientation scores were no different between the integrated and standard model cohorts. Perhaps the integrated curriculum model of education reduced these learners biomedical beliefs to the same level as their senior, standard curriculum educated near-peers.

The block curriculum cohort are at the earliest stage of education, in their first year of the four and a half year osteopathy course. This groups attitudes and beliefs may reflect their own understandings, knowledge, experience and biases prior to entering the world of health professional education.

Measuring learners attitudes and beliefs towards chronic pain is the initial step to determine whether they display biomedically or behaviourally orientated stance to clinical practice. The next step would be to explore whether or not behaviourally orientated beliefs and attitudes translate into more appropriate, biopsychosocial patient centred care, and whether this care translates into a desirable outcome for the patient. This study only focused on determing information about the first step in the process, namely what are the attitudes and beliefs of osteopathy learners educated via different curricula models. Follow up of these learners over time would provide better insight into whether or not their learning was maintained overtime.

While there are no quantitative studies reporting osteopathy students treatment orientation, studies have been undertaken in physical therapy students which can provide a basis for comparison. For instance, physical therapy learners who undertook a short IASP benchmarked curriculum of 2.5 weeks in their third year, showed a positive change in both biomedical and behavioural orientation as indicated by PABTS-PT scores,[28] in contrast to the current study. Possible reasons for the differing findings include the physical therapy cohort was post graduate and had completed four years of college prior to entry. This study included undergraduate cohorts, albeit varying numbers (Block-model 12%, Integrated Model 14% and Standard Model 32%) had undertaken health related study previously. In addition, the findings in this study were assessed using the modified PABS-PT with a 10 item biomedical and 9 item behavioural orientation subscale and reliability was not directed measured, only indirectly reported. This 19 item amended version[29] was developed using a physical therapy population, and therefore has not been validated for use in an osteopathy student population.

The PABS-PT[19] 14 item biomedical orientation score reported a Cronbachs alpha of 0.714 in the current study, suggesting the measure has good internal consistency in this population and offers support for drawing inferences about the data discussed above.

4.3. Change in behavioural orientation in different curricula models

As for biomedical orientation scores from the PABS-PT, there were no significant within groups differences at T1 & T2 for behavioural orientation scores. This suggests again within groups attitudes and beliefs were stable over the academic year and not significantly altered by the content irrespective of curriculum model. . However, caution is warranted when discussing the behavioural orientation scores, as the Cronbachs alpha was reported to be 0.376 suggesting low reliability for this measure. Whether the measure is capable of capturing behavioural orientation over time requires additional investigation.

When comparing the groups, the block model cohort demonstrated the lowest behavioural orientation scores. The scores were significantly lower than both the Integrated and Standard curricula, while the scores between Integrated and Standard were not significantly different. This may suggest the integrated curriculum model of education created positive behavioural pain beliefs at the same level as their near peer learners who are in their clinical placement years. However, we balance this statement with our acknowledgement of the low reliability of the measure in the current population.

To provide further support for caution, a recent publication determined the discriminative validity of the separate biomedical and behavioural orientation scores (or subscales) of the 19 item version of the PABS-PT was not supported.[30] These authors suggested combining all questions to create a global assessment of treatment attitudes would facilitate discrimination of treatment orientation. This finding offers an avenue for future study.

4.4. Relationships between demographic factors and NPQ & PABS-PT scores

The results identified no significant differences between T1 & T2 for either NPQ, PABS-PT biomedical or behavioural orientation scores due to age, gender, previous history of pain or having undertaken a previous pain course ($p > 0.05$). This finding suggests that age, gender and previous personal history of pain do not significantly influence learners pain knowledge, or their beliefs or attitudes as measured by the PABS-PT. This finding is supported by another study, albeit of practitioners rather than learners in another allied health profession.[31]

Previous research of osteopathy learners, however, did report a weak relationship between the magnitude of the change between age and pre and post NPQ scores[14] which was not identified in the current findings. The finding of no difference with a personal history of pain aligns with one report stating a finding of a practitioners own experience of back pain not seeming to negatively affect the pain beliefs of physical therapists or doctors.[30]

4.5. Relationships between pain knowledge and attitudes and beliefs towards pain

The finding that as pain knowledge increases, attitudes and beliefs towards chronic low back pain improve is reflected in recent literature in allied health professions.[22,28,32,33] Each paper also reports differing curriculum models. These papers report findings from both HC-PAIRS and PABS-PT and the trend is consistent irrespective of the attitudes and beliefs measure. We must be cautious in drawing inferences that the education and knowledge led to changes in attitudes and beliefs as the reliability of the HC-PAIRS is inconsistent, and the PABS-PT behavioural scale is consistently below acceptable levels, as it was in the current study. Further psychometric analysis is needed to strengthen these discussions.

4.6. Limitations

As outlined above, there are several limitations in this study. The results offer some promising directions for further debate about appropriate mechanism for assessing effects on knowledge, attitudes and beliefs towards pain and pain content in curricula. However, it is also important to note that the learners were measured at different progress points within their course due to the transition requirements of rolling out curriculum change within a higher education setting. One might expect that immersion in pre-clinical health professional education, irrespective of the specifics of the content or curriculum model, would result in increased knowledge and improved attitudes towards pain.

We must also consider the psychometric analysis of each of these measurement instruments for these cohorts to further interpret the findings. While psychometric analysis reported in the literature suggests the NPQ is reliable, the analysis of the current study suggests low reliability of the measure within this population. It is possible that changes in knowledge may not be adequately detected which limits our ability to draw inferences about the impact of the different curricula models. Similarly, for the PABS-PT behavioural subscale, while the literature reports amended versions from the original with higher reliability, these measures have not been validated for the current population. Psychometric analysis of these measures or even development of new measures is crucial and is an area for future study.

5. Conclusion

Our study identified reductions in biomedical beliefs and increases in behavioural orientation scores as pain knowledge increased in each model over the 2018 academic year. While these results offer some promising avenues for further discussion of pain curricula models, it is also important to note that the learners were measured at different progress points within their course so further evaluation is needed. Further, the NPQ 19 item version and the PABS-PT (Behavioural) measures were reported to have low reliability in this population. Following these learner groups over time will enable further comparisons between these curricula models of learning, and their efficacy in delivering effective pain education.

Authors' contributions

KF & BV conceived of the study and all authors contributed to the design. T1 & T2 data was collected by KF. 2018 Osteopathy students entered the T1 data (see acknowledgements) and KF entered T2 data. BV undertook the statistical analysis. All authors contributed to the analysis of the results and the manuscript development.

Ethics approval and consent to participate

This study was approved by the Victoria University Human Research Ethics Committee (HRE17–020). All enrolled learners in the osteopathy courses (Bachelor of

Science (Osteopathy) and Master of Health Science (Osteopathy)) at Victoria University in 2018 were invited to participate. All participants reviewed an Information to Participants form and received a short explanation of the study, with a chance to ask questions from the lead author. All participants completed and signed a consent form indicated their consent to participate in the study.

Anonymity was maintained by the consent form being detached from the questionnaires by the lead author prior to data entry. Any questionnaires returned without consent forms were not included for data entry.

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Consent for publication

All authors consent to the publication of this manuscript.

Availability of data and materials

The datasets analysed during the current study are available from the corresponding author on reasonable request.

Declaration of competing interest

The authors declare that they have no competing interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.hpe.2020.09.001.

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