

Bond University

Australian Journal of Clinical Education

Volume 3 Issue 1

2018

Undergraduate Grade-Point Average as a Selection Criterion for a Postgraduate
Entry-Level Physiotherapy Program

Rebecca Terry
Bond University

Wayne Hing
Bond University

Robin Marc Orr
Bond University

Nikki Milne
Bond University

Follow this and additional works at: <https://ajce.scholasticahq.com/>



This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 4.0 Licence](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Undergraduate grade-point average as a selection criterion for a postgraduate entry-level physiotherapy program

Rebecca Terry,^{*} Wayne Hing,^{} Robin Marc Orr⁺ and Nikki Milne⁺⁺**

^{*} Assistant Professor, Physiotherapy, Bond University.

^{**} Professor, Physiotherapy, Bond University.

⁺ Associate Professor, Physiotherapy, Bond University.

⁺⁺ Assistant Professor, Physiotherapy, Bond University.

Abstract

Aim: Undergraduate GPA (UGPA) is commonly used to select students into postgraduate physiotherapy programs. The aim of this study was to explore the relationships between UGPA and the academic and clinical performance of postgraduate entry-level physiotherapy students.

Method: A retrospective cohort study of students from four cohorts (2010-2013) of a postgraduate entry-level physiotherapy program. UGPA, average pre-clinical coursework marks and clinical performance scores were investigated. Clinical performance was measured by the Assessment of Physiotherapy Practice. Normality tests, descriptive analysis and correlations between variables were calculated. Participants were then grouped according to UGPA and a one-way ANOVA was performed to determine differences in clinical or coursework performance between groups.

Results: Data from 121 students were analysed. There were no significant relationships identified between UGPA and pre-clinical coursework or clinical performance scores. There were no significant differences in academic or clinical performance between groups when students were classified by UGPA.

Conclusion: These findings indicate a need to reconsider the use of UGPA as a sole selection criterion and supports the inclusion of other criteria to select students into competitive programs. Minimum UGPA entry requirements for postgraduate physiotherapy programs should be reviewed to ensure all suitable applicants are eligible for admission.

I Introduction

In the last decade, the global trend in physiotherapy education has shifted towards postgraduate entry level programs (Commission on Accreditation In Physical Therapy Education, 2018; Council of Canadian Physiotherapy University Programs, 2009). In Australia, prospective physiotherapy students can still choose between an undergraduate and postgraduate entry-level education. Of the 28 accredited Australian entry-level programs there are 17 Bachelor programs, eight Master and three Doctor of physiotherapy programs (Australian Health Practitioner Regulation Agency, 2013). Appropriate selection of candidates into these postgraduate programs represents high stakes decisions for both applicants and institutions. Applicants are required to have completed set prerequisites to be eligible for admission. This represents a significant time and financial investment from the applicant, so selection processes must reflect the significance of this commitment with the use of valid and reliable assessments. The rising costs of delivering, and receiving, a professional tertiary education has resulted in community demands that institutions have a moral obligation to admit students who are equipped academically and personally for success within their chosen program of study. This is necessary to avoid failing students accruing fruitless debt, and institutions and clinical education partners pouring resources into students that will not graduate to be employed within the health sector.

II Literature Review

Previous literature from within the physiotherapy profession investigating program admission requirements has tended to focus on entry measures into undergraduate degrees (Edgar, Mercer, & Hamer, 2014; Howard & Jerosch-Herold, 2000; Morris & Farmer, 1999; Payton, 1997; Watson, Barnes, & Williamson, 2000). Entry requirements into undergraduate physiotherapy programs differ from those of postgraduate programs. Undergraduate physiotherapy programs typically use academic school-leaving scores (or those equivalent) to determine entry. Contemporary literature suggests that while significant relationships do exist between academic admission scores and a student's future academic performance in an undergraduate physiotherapy program, the relationships are weak and of limited predictive value (Edgar et al., 2014; Howard & Jerosch-Herold, 2000; Morris & Farmer, 1999; Watson et al., 2000). Significant relationships between prior academic performance and subsequent academic performance in undergraduate medical programs have also been identified (Mercer & Puddey, 2011; Howard & Jerosch-Herold, 2000; Morris & Farmer, 1999; Watson et al., 2000). However, contemporary studies have found no relationship between previous academic performance and the future clinical performance of undergraduate physiotherapy students (Edgar et al., 2014; Watson et al., 2000).

Postgraduate physiotherapy programs tend to place greater emphasis on candidate selection. Candidate selection is used by medical and allied health schools in an attempt to ensure that students entering the program possess the traits desired by their profession and have the potential to successfully complete the program. This is especially true where there is competition for limited places. Tools used in postgraduate entry-level programs may include: pre-admission academic grades, aptitude tests, interviews, written submissions and letters of reference (Salvatori, 2001).

Previous academic performance is a common criterion assessed on application to postgraduate study. Predictive relationships between undergraduate grade point average (UGPA) and both academic and clinical performance in postgraduate medical education programs have been identified (Kulatunga-Moruzi & Norman, 2002). Utzman et al. (Utzman et al., 2007) in the United States of America (USA) analysed data from 20 postgraduate entry-level physiotherapy programs in the USA and concluded that UGPA, in conjunction with other academic admissions measures, could be used to estimate students' academic risk. However, their study did not investigate relationships between undergraduate academic performance and specific physiotherapy program performance outcomes, such as performance on clinical placement. An earlier study by Thieman et al. (Thieman et al., 2003) did investigate the relationship between overall undergraduate academic performance and students' performance in a Masters of Physiotherapy program (MPT). Thieman and colleagues identified a moderate relationship between students' overall

undergraduate GPA (UGPA) and their overall MPT GPA but found no significant relationship between UGPA and clinical performance. The conflicting findings between research conducted in undergraduate and postgraduate physiotherapy education programs, as well as those within the medical profession is a clear indication of the need for further research on this topic.

A search of entry requirements listed on official university websites for the 11 postgraduate entry-level physiotherapy programs currently on offer in Australia (see Appendix 1 for programs and websites referenced) revealed that all programs listed prerequisite subjects necessary to be eligible for admission. Ten of the 11 programs used prior academic performance as an admission criterion: seven programs listed a minimum desired UGPA or equivalent, a further three stated that a competitive UGPA was required. Of these ten programs, seven did not use any other measures to determine applicants' appropriateness or rank.

Undergraduate academic performance, as measured by students UGPA, is the most common method used in Australia to determine admission into a postgraduate entry-level physiotherapy program, with most programs using it in isolation to select students. The use of UGPA is a more cost-effective method of selection for institutions compared to the time and financial cost of administering interviews and additional testing. The postgraduate program investigated in this study uses UGPA as evidence for likely academic success, alongside a semi-structured interview and personal statements as part of its selection process. The administrative and academic time spent interviewing and reviewing personal statements represents a significant financial investment by the university into the selection process, given that the number of applications well exceeds the available places. This raises the question as to whether these additional selection measures represent a good investment for the university, and the wider physiotherapy profession that will be serviced by the graduate, if UGPA is in fact a valid predictor of students future clinical practice performance.

Entry into the host program is competitive, with applicants required to meet set academic prerequisites, submit supporting documentation and undertake a semi-structured interview process. Applicants are first vetted to ensure they have met academic prerequisites. All eligible applicants are then interviewed by faculty staff. There is some evidence of small to moderate relationships between applicants' performance on an admission interview and their future clinical performance in an Australian undergraduate physiotherapy program (Edgar et al., 2014). The interviewers review applicants' personal statements and academic record prior to the interview. A semi-structured interview is then conducted where applicants are required to respond to set questions that are scored, and also respond to questions raised by the review of submitted documents. The interview process is aimed at ensuring applicants are knowledgeable about both the physiotherapy profession and the program itself, can demonstrate the personal qualities desired as a health-professional program graduate, and are equipped to meet the demands of the program. The interviewers consider factors including previous industry experience, applicants' personal reflections and motivation for physiotherapy as a career, their reasoning for entry into a postgraduate physiotherapy program, and their academic history. A minimum UGPA requirement is advertised, however applicants who strongly display the personal attributes desired by the physiotherapy profession but have a UGPA lower than the published threshold may be offered a place if the selection panel note an upward trajectory in their grades over the final year of their undergraduate program. The applicant is questioned to seek clarification or further detail on any information given in personal statements and during the interview itself. The applicant is then ranked into bands based on their responses during the interview. Offers are made based on these rankings, and UGPA is used as the factor to differentiate between appropriate candidates within the same band.

The selection process is intended to admit students who are likely to succeed on clinical placement and in the future as competent health professionals. There is a clear bias to this process in that only applicants who display the personal attributes, communication skills and commitment to the profession are admitted into the program. However, the host program still uses UGPA as a factor to differentiate between students of equal rank after the interview process. This assumes that UGPA is a valid predictor of applicant's future performance. Given that applicants

are competitively selected based on their ability to demonstrate the attitudes, behaviours and communication skills required of a health professional during the interview process, it is an implicit assumption by faculty that future variations in academic and clinical performance as a student can be partially explained by the student's previous academic performance. This is clearly a widely held assumption, given the reliance on UGPA as an admission criterion to select students into Australian post-graduate physiotherapy programs. However, there is currently no clear evidence supporting this assumption given the limited amount of published literature investigating relationships between admission measures and student performance in contemporary physiotherapy education, particularly in the Australian context. Rather, there are conflicting findings between research conducted in undergraduate and postgraduate physiotherapy education, as well as that conducted in the medical profession.

III Aims

The dominant method of determining entry into post-graduate physiotherapy programs in Australia is through applicant UGPA with this approach used by the host institution to discriminate between equally ranked applicants. The aim of this study was to determine if a relationship existed between UGPA and the academic and clinical performance of postgraduate entry-level physiotherapy students in the host institution. This study also aimed to determine if differences in performance existed between students when grouped according to UGPA. These findings will then be related to current practice and implications for student selection into post-graduate physiotherapy discussed. This study focused on students' performance in core areas of physiotherapy that are likely to be consistently represented in curriculums across Australia and internationally.

IV Methods

This was a retrospective cohort study. Participants in this study were students from four consecutive cohorts of an Australian post-graduate, entry-level physiotherapy program. The student numbers in each cohort are shown in Table 1. All students who enrolled in their first year of study between 2010 and 2013 were included within the study. Students were excluded if they did not complete any clinical placements. Ethics approval was received from the host institution.

Table 1.
Students numbers by cohort

Cohort Entry	Number of students
A	27
B	30
C	30
D	36

Preclinical coursework data and clinical performance data were retrieved for four core areas of physiotherapy: Cardiorespiratory (CR), Orthopaedics (Ortho), Neurological (Neuro) and Musculoskeletal (MSK) Physiotherapy. Data were retrieved from electronic records and archived hardcopies stored at the host university. Pre-clinical coursework data retrieved consisted of total subject marks for the coursework subjects undertaken in the four core areas. Marks were retrieved as a percentage out of 100. These six pre-clinical coursework subjects totalled 60 credit points. Clinical performance was measured by the Assessment of Physiotherapy Practice (APP) instrument. The APP is well described in the literature (Dalton et al., 2009) and is a valid (Dalton et al., 2011) and reliable (Dalton et al., 2012) tool used to measure physiotherapy student clinical performance. A systematic review with a Level 2 recommendation for its use was given in a recent systematic review on the edumetric and psychometric properties of clinical performance tools (2017). Clinical placements were embedded within the program and were completed directly after the relevant unit of study. Students completed five-week clinical placements in each of the core

clinical areas: CR, Ortho, Neuro and MSK. Students were immersed in authentic clinical environments and practiced their profession under the supervision of a Clinical Educator, a practicing clinician from that workplace. The Clinical Educator completed the APP formatively at mid-unit and summatively at end-unit. Summative APP scores were retrieved for the core placements as a percentage out of a possible 100%. The CR and Ortho placements were undertaken in the second semester of study for the program, and the Neuro and MSK placements took place in the third semester of study.

A Data Management and Statistical Analysis

Undergraduate GPA was retrieved by the University admissions office and provided to the research team in a non-identifiable form. UGPA scores were retrieved in four different formats: a score out of four (n=60), a score out of seven (n=52), a score out of 100 (n=6), or a score out of another numeral (n=3). These scores are converted to a score out of 7 using methodology adopted by the Queensland Tertiary Admissions Centre (QTAC) to allow for a consistent comparison across all applicants.

Students' mean APP score across all placements completed was calculated to produce the Mean APP. Pre-clinical coursework performance was determined by calculating the mean subject mark (i.e. Mean Pre-Clinical Coursework) for the six pre-clinical coursework subjects completed across the four core areas of physiotherapy investigated. All data was made non-identifiable. Data was entered in the Statistical Package for the Social Sciences (SPSS) software (Chicago, IL) Version 24 with significance set at $p < 0.05$. Student data were profiled using descriptive statistics.

Tests for normality were performed to identify the appropriate analyses to undertake. Pearson's correlations were undertaken unless the data was not normally distributed in which case relationships were explored using Spearman's rho correlations. Correlations were calculated between UGPA and the dependent variables: Mean Pre-Clinical Coursework, Mean APP, and APP scores from individual clinical placements. Linear regressions were then performed to explore the influence of UGPA on students' performance on each of the dependent variables. To explore if there were differences in performance between students who did or did not meet the various minimum GPA requirements for entry into a post-graduate physiotherapy program, students were grouped based on undergraduate GPA. Groups were chosen based on common minimum GPA requirements across the 11 Australian post-graduate programs. These groups were: <4.5 , $4.5-4.99$, $5.00-5.49$, $5.50-5.99$, ≥ 6.0 . A one-way ANOVA and Tukey post-hoc analysis (with testing of assumptions) was performed to determine if mean pre-clinical coursework and clinical performances were different between students according to their undergraduate GPA. Homogeneity of the variances was assessed using Levene's test. Alpha levels were set at 0.05 a priori.

V Results

There were 123 students enrolled in their first year of study between 2010-2013 (male n=65, female n=58), the numbers in each cohort are displayed in Table 1. Two students withdrew in the early stages of the program for personal reasons and as they did not progress to clinical placement their data were excluded from analysis (male n=1, female n=1). Data from 121 students were analysed. Of these 118 (97.5%) graduated from the program.

Descriptive statistics are displayed in Table 2. The frequency and distribution of UGPA's are displayed in Figure 1. The dependent variable Mean Pre-Clinical Coursework was normally distributed. The distributions of all other dependent variables were skewed to the left with a dominance of scores at the higher end.

Figure 1.
Frequency and distribution of undergraduate GPA scores

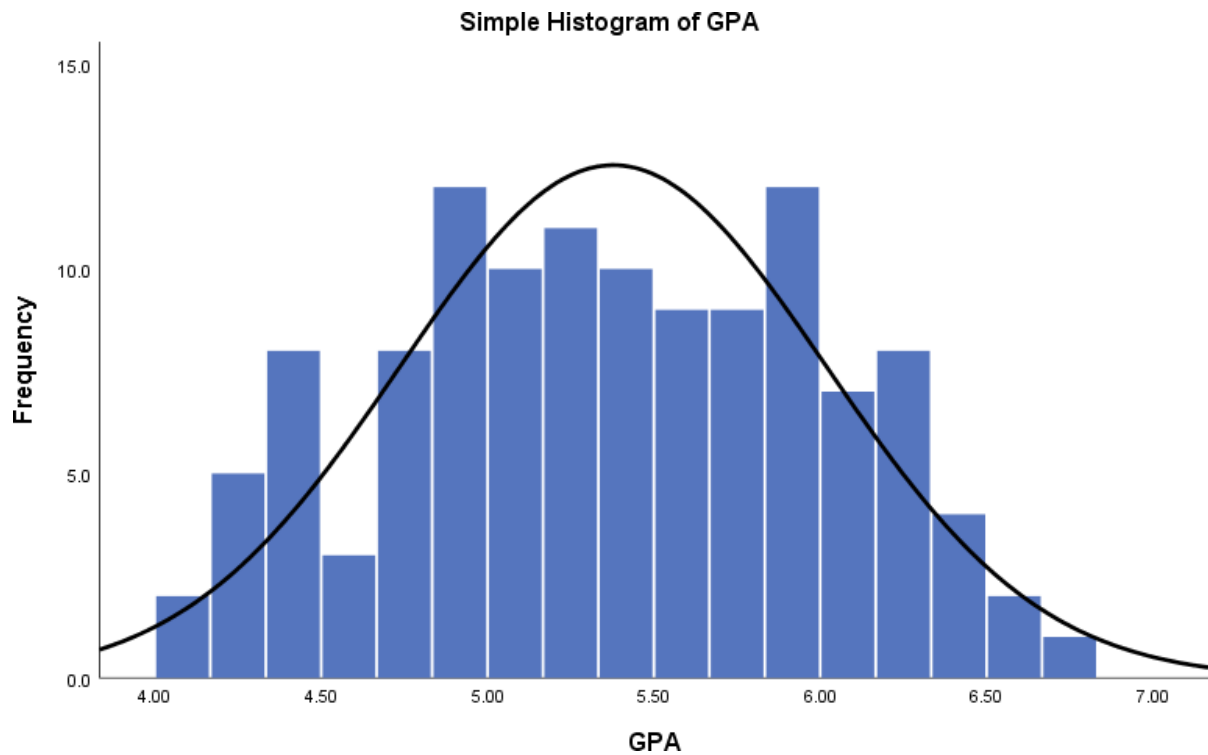


Table 2a.
Descriptive statistics of normally distributed data

Variable	N	Minimum	Maximum	Median	Interquartile Range
Undergraduate GPA	121	4.12	6.81	5.38	0.64
Mean Pre-clinical Coursework	121	62.95	89.46	75.14	5.30

GPA – grade-point average

^a Undergraduate GPA is displayed as a score out of 7.

^b All other variables displayed as percentages out of 100

Table 2b.
Descriptive statistics of data with a left-skewed distribution

Variable	N	Minimum	Maximum	Median	Interquartile Range
Mean APP	121	36.25	97.50	77.92	72.50 – 85.07
Orthopaedic APP	118	36.25	100.00	77.50	66.25 - 90.23
Neurological APP	116	48.75	100.00	85.00	70.31 - 93.75
Musculoskeletal APP	116	42.50	100.00	81.88	67.81 - 92.50
Cardiorespiratory APP	119	36.25	100.00	75.00	67.50 – 85.00

APP – Assessment of Physiotherapy Practice

^b Variables displayed as percentages out of 100

There were no significant relationships identified between undergraduate GPA and measures of coursework or clinical performance taken in the first half of the participants program of study. These findings are displayed in Table 3.

Table 3.
Correlations between undergraduate GPA and measures of clinical and academic performance

Independent Variable	N	Correlation	p-value
Mean Pre-clinical Coursework	121	0.14	0.13
Mean APP	121	0.15	0.09
Cardiorespiratory APP	119	0.02	0.86
Orthopaedic APP	118	0.17 [†]	0.07
Neurological APP	116	0.11 [†]	0.25
Musculoskeletal APP	116	0.09 [†]	0.36

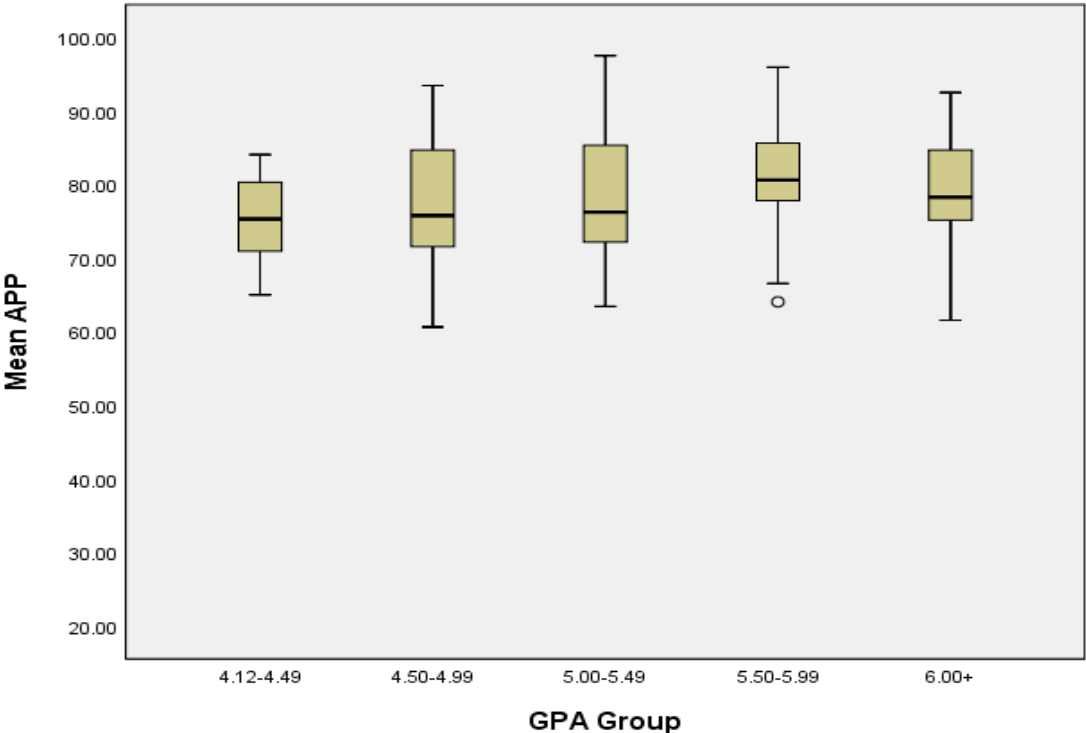
APP – Assessment of Physiotherapy Practice

[†]Spearman's rho used to calculate correlation

Linear regressions established that undergraduate GPA did not significantly predict students' mean pre-clinical coursework performance, $F(1, 119)=2.34$, $R^2_{adj}=0.011$, $p=0.13$, or mean clinical performance, $F(1, 119)=1.62$, $R^2_{adj}=0.005$, $p=0.21$. Undergraduate GPA also did not predict student performance on clinical placement in the core areas of: cardiorespiratory, $F(1, 117)=0.001$, $R^2_{adj}=-0.009$, $p=0.98$; orthopaedics, $F(1, 116)=3.56$, $R^2_{adj}=0.021$, $p=0.06$; neurological, $F(1, 114)=2.38$, $R^2_{adj}=0.012$, $p=0.13$; or musculoskeletal physiotherapy, $F(1, 114)=1.05$, $R^2_{adj}<0.001$, $p=0.31$.

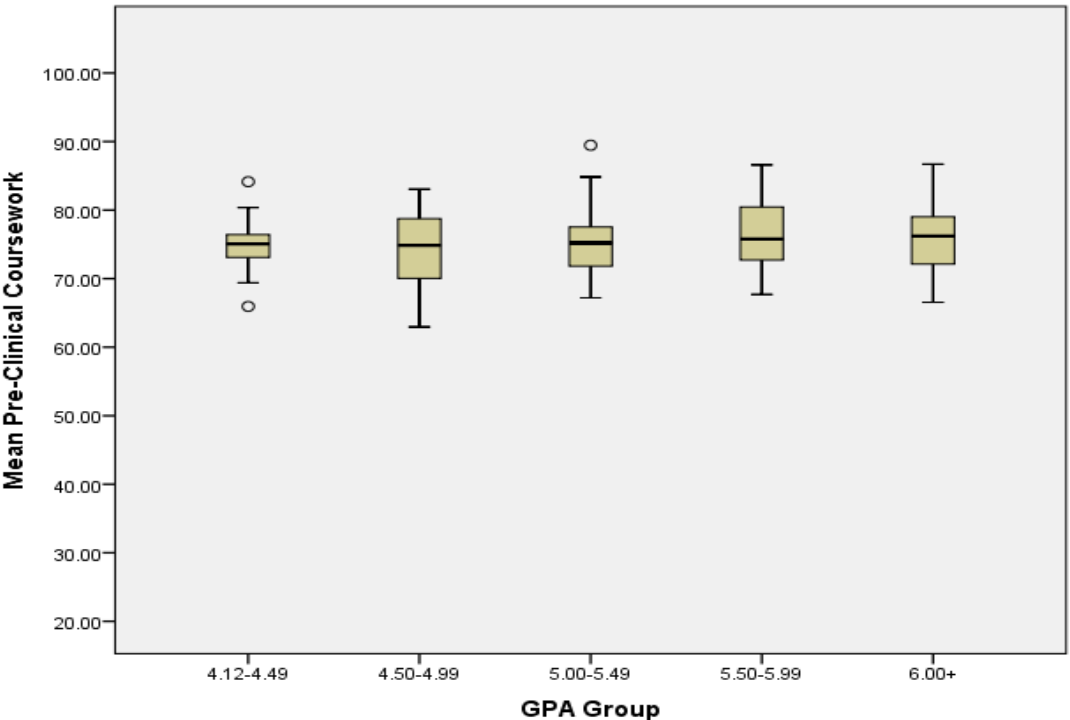
When students were grouped by GPA the number of students in each group were as follows: <4.5, $n=12$ (9.9%); 4.50-4.99, $n=20$ (16.5%); 5.00-5.49, $n=34$ (28.1%); 5.50-5.99, $n=30$ (24.8%); and ≥ 6.0 , $n=25$ (20.7%). A one-way ANOVA determined there was no significant differences between the mean pre-clinical coursework marks or clinical performance scores of students when classified into five groups based on their undergraduate GPA. These findings are displayed in Figures 2-7. Testing of assumptions identified that there was homogeneity of variances and outliers were retained. The data were normally distributed in all groups except for the Neuro APP and MSK APP variables. For these two variables it was determined that although the ANOVA was an acceptable test to utilise, an Independent Samples Kruskal-Wallis Test may also be appropriate. As such the analysis was repeated using this Independent Samples Kruskal-Wallis Test which confirmed that there were no significant differences between the distribution of students' performance on Neuro or MSK placements when classified into groups based on their undergraduate GPA.

Figure 2.
Boxplot of comparison of students' Mean APP scores when classified by undergraduate GPA



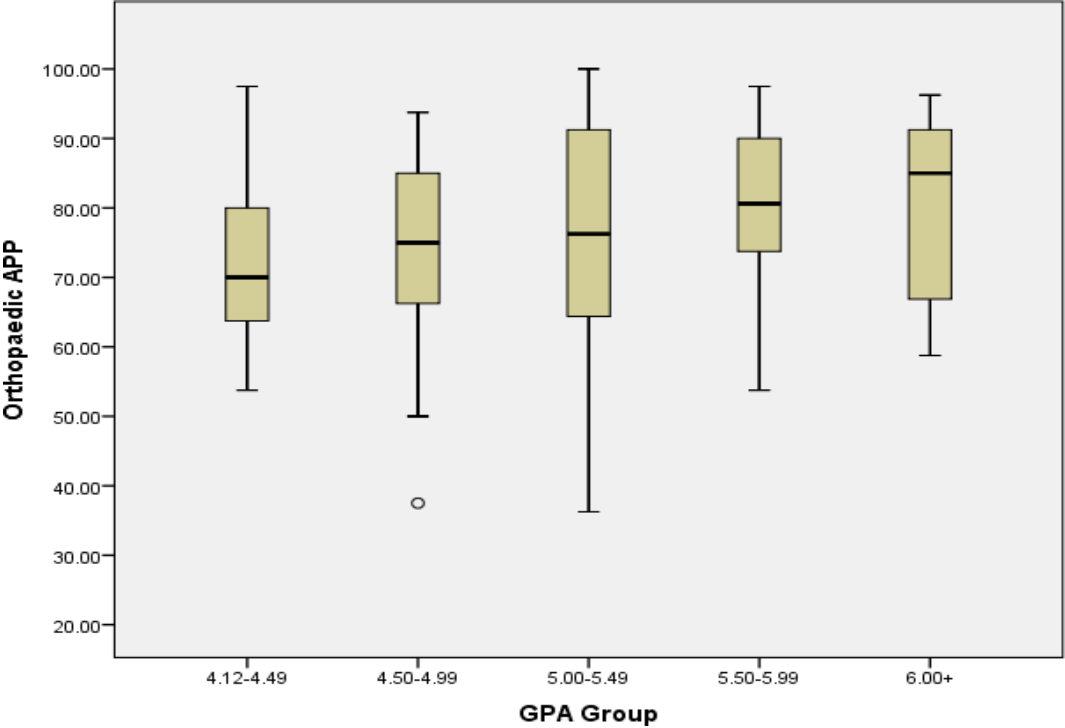
○ represents outliers

Figure 3.
Boxplot of comparison of students' Mean Pre-Clinical Coursework scores when classified by undergraduate GPA



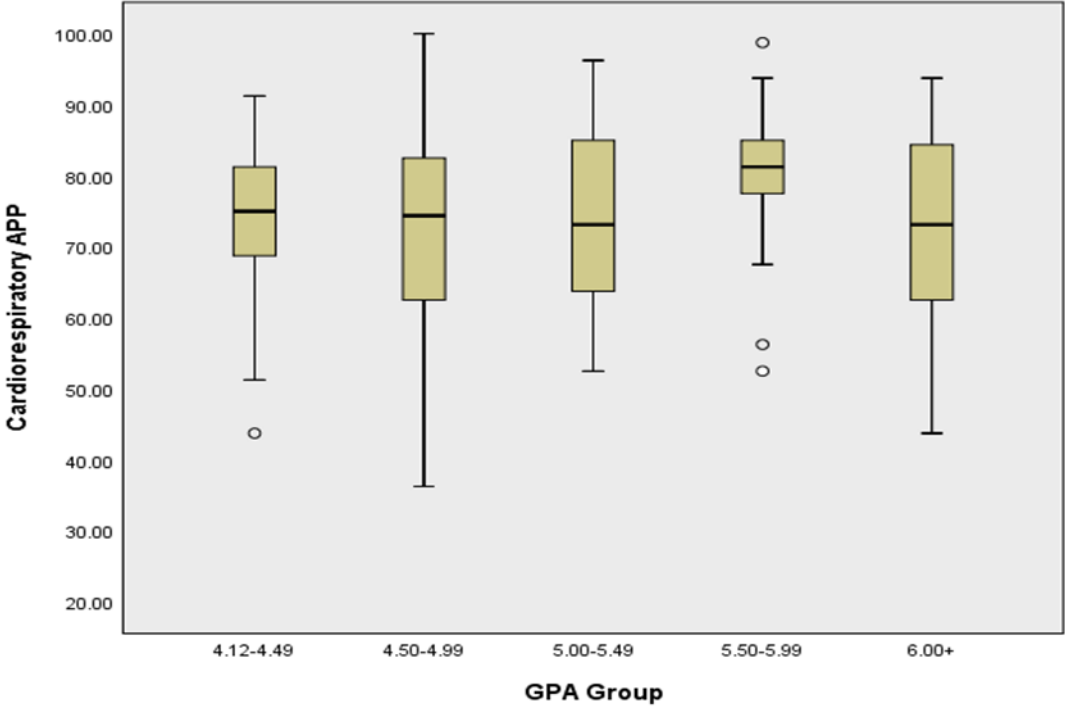
○ represents outliers

Figure 4.
Boxplot of comparison of students' Orthopaedic APP scores when classified by undergraduate GPA (first or second placement)



^o represents outliers

Figure 5.
Boxplot of comparison of students' Cardiorespiratory APP scores when classified by undergraduate GPA (first or second placement)



^o represents outliers

Figure 6.
Boxplot of comparison of students' Neurological APP scores when classified by undergraduate GPA (third or fourth placement)

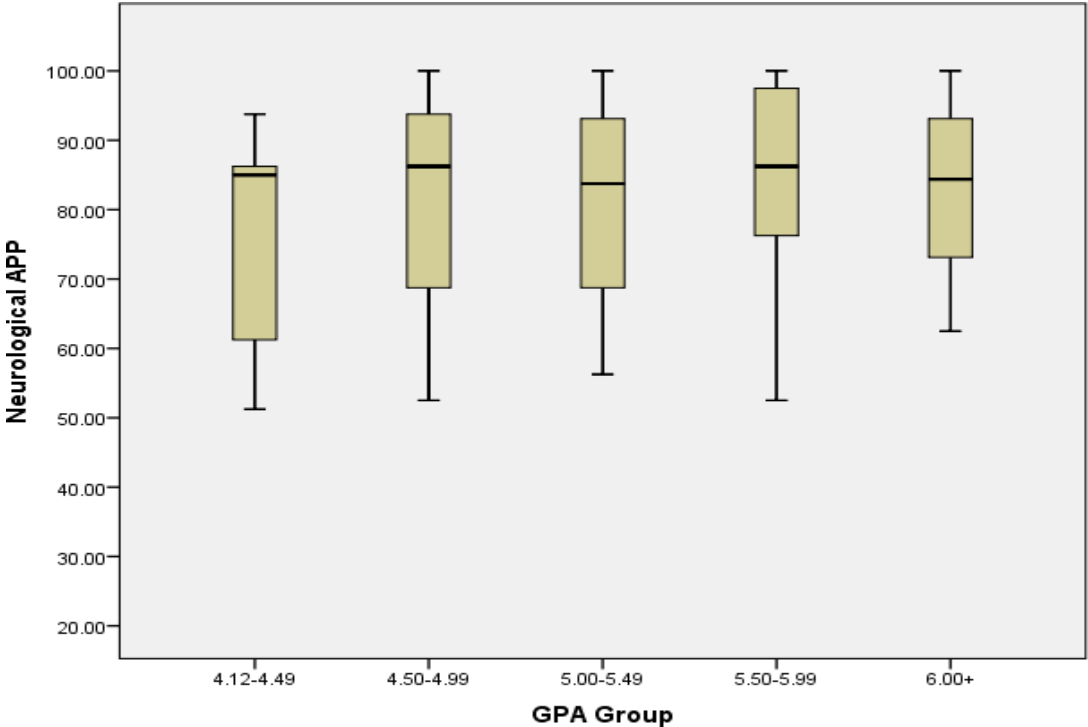
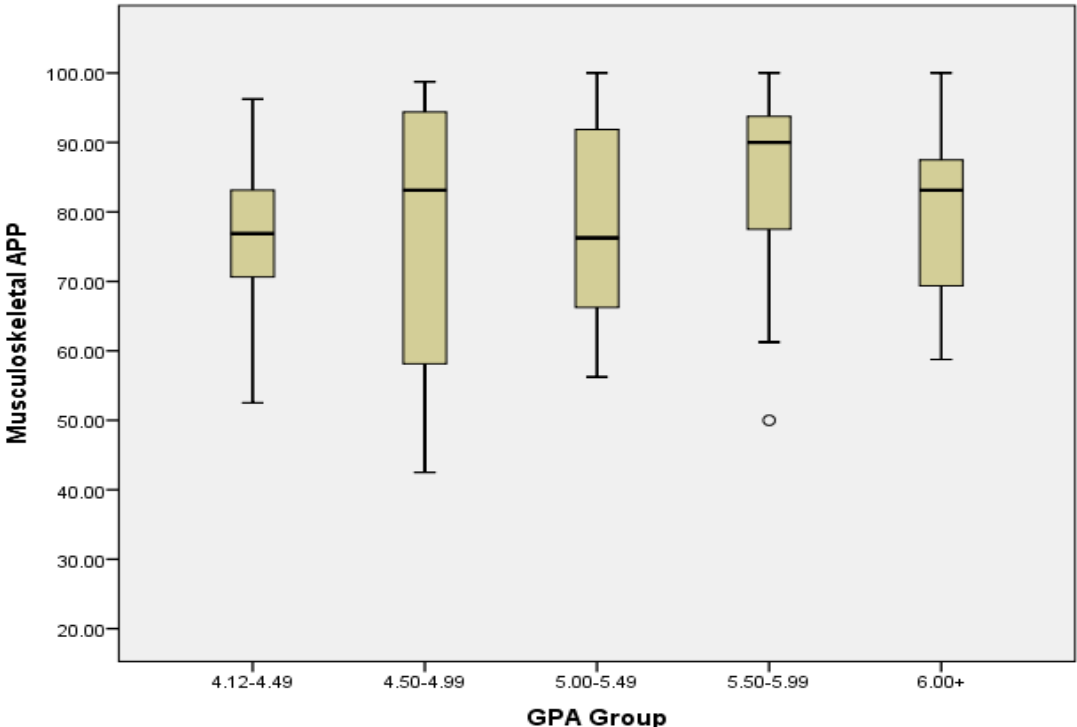


Figure 7.
Boxplot of comparison of students' Musculoskeletal APP scores when classified by undergraduate GPA (third or fourth placement)



○ represents outliers

VI Discussion

The aims of this study were to explore the relationship between undergraduate academic performance as measured by UGPA and the clinical and academic performance of physiotherapy students, and to determine if there were differences in performance between groups of students whose UGPA may be higher or lower than common GPA cut-offs for entry into postgraduate physiotherapy programs. The authors did not investigate relationships between other selection measures utilised by the host institution (personal statements and semi-structured interview). Due to the range of UGPA scores within the study cohort (4.12-6.81 out of 7) and the normal distribution of these scores, relationships existing between UGPA and the dependent variables should be evident even in the presence of other selection measures used to admit students into the host program.

This study found no significant relationships between students' UGPA and their early academic or clinical performance in a postgraduate physiotherapy program. These findings are surprising given that the ability of entry GPA to predict the future performance of medical students is well accepted within the medical profession. Much of the literature supporting that acceptance is conducted within undergraduate medical programs and the GPA utilised are school-leaving scores. However, contemporary literature also reports significant relationships between UGPA and postgraduate academic and/or clinical performance in entry-level programs not only in the medical (Dixon, 2012; Sladek, Bond, Frost, & Prior, 2016) but also the speech and language (Baggs, Barnett, & McCullough, 2015) professions. In these studies, (Baggs et al., 2015; Sladek et al., 2016) clinical performance was not measured by a tool with demonstrated validity or reliability, or that is widely used amongst the medical or speech and language professions. The present study used the APP to measure clinical performance, a valid and reliable instrument (Dalton et al., 2011; Dalton et al., 2012) which is consistently used across Australian physiotherapy education programs. The APP is administered by clinical educators who are usually not formally affiliated with the education provider. Clinical educators are assessing student performance against a consistent benchmark standard – that of a new graduate on their first day employment (Dalton et al., 2009). This standard is set by the Australian physiotherapy profession, and so the finding that UGPA is not related to students' performance in clinical practice may be generalisable to programs beyond the host institution. However, to confirm this supposition further research using larger sample sizes and across multiple institutions would be of benefit.

At the time of the present study, seven Australian postgraduate entry-level programs specified minimum UGPA requirements to be eligible for admission, which ranged from 4.5-5.5. This study found there was no significant difference in mean pre-clinical coursework or clinical performance scores between students when grouped by their UGPA. Given that there was no difference in average clinical performance even between the lowest and highest UGPA groups, this suggests that using UGPA may not be an appropriate method to rank applicants to determine entry into competitive programs. It also suggests that minimum GPA requirements into postgraduate programs could be reviewed and potentially revised. It is worthy of note that 97.5% of students within this study successfully graduated from the program, despite 54.5% having an UGPA lower than 5.5. A GPA of 5.5 has been highlighted as this is the highest minimum GPA entry requirement for the postgraduate physiotherapy programs currently on offer within Australia. However, three

programs require a 'competitive GPA' suggesting that students with lower UGPAs may be not be successful at gaining entry into these programs. Competitive or higher minimum UGPA requirements may prevent applicants with the personal and academic attributes to succeed within postgraduate physiotherapy education from being eligible for admission. There is some evidence that traditional measures of achievement discriminate against defined groups (James et al., 2010), so a competitive or an unnecessarily high GPA requirement may bias against suitable applicants from minority or low socio-economic backgrounds from accessing postgraduate physiotherapy education.

Once academic pre-requisites have been met, UGPA may not be appropriate to be used as the sole admission criterion to select students into postgraduate physiotherapy programs. Other measurement tools should therefore be considered for use alongside UGPA. As UGPA is a measure of academic achievement, additional measures utilised should aim to measure other attributes that will be required by the student along their physiotherapy education and training pathway (Prideaux et al., 2011).

Admission measures currently used by postgraduate physiotherapy programs in Australia other than UGPA include semi-structured interviews, Multiple Mini Interviews (MMIs) and personal statements. The evidence supporting the validity and reliability of semi-structured admission interviews is not robust, however there is some evidence to suggest that admission interview scores are related to students future performance in undergraduate physiotherapy (Edgar et al., 2014; Watson et al., 2000) and medical schools (Sladek et al., 2016). A 2013 systematic review on the use of MMI's for student selection in health profession training concluded that the MMI is reliable, acceptable and feasible (Pau et al., 2013) suggesting the MMI could be considered by programs to determine its appropriateness for implementation in view of their applicant demographic. There is limited evidence for the predictive validity of letters of reference or personal statements for the future performance of health professional students (Patterson et al., 2016; Siu & Reiter, 2009). The Ottawa 2010 Conference consensus statement on assessment and selection for health care students identified emotional intelligence and personality testing as interesting areas for further development (Prideaux et al., 2011). A 2016 systematic review (Patterson et al., 2016) into the effectiveness of selection methods within medical education identified positive evidence for the predictive validity of personality and emotional intelligence tests, however cautioned against their use without considering the impact on the diversity of the medical profession. The same review also identified that there was a good level consensus for the use of situational judgment tests as an acceptable criterion for selection into medical school. The physiotherapy profession would benefit from consideration and investigation into the use of additional selection criterion such as MMI's, situational judgement tests, personality and emotional intelligence testing.

The present study is limited to the investigation of a single measure utilising a sample from a single institution. There are always challenges in generalising the findings of research conducted on a study population from a single institution. Certainly, there is likely to be variation in methods and timing of the teaching and assessment of core curricula between postgraduate physiotherapy programs which may limit the generalisability of the finding that UGPA was not related to students' early coursework performance. There may also be variations in the amount of support available to students while they are in the clinical environment. The host program has in place a comprehensive clinical support structure. Early support and intervention is offered to students identified as being at risk either before they enter into the clinical environment or as the placement progresses. This additional support offered by university academics is designed to enhance student performance in clinical practice and therefore may contribute to an increase in APP scores at the end of the placement.

VII Implications for Practice

The findings of this study suggest that UGPA, when used as one component of selection, is not related to student's future performance. Therefore, UGPA may not be the most appropriate method of selecting students into post-graduate entry-level physiotherapy education programs.

Further research is needed in this area utilising larger sample sizes across multiple institutions to confirm these findings and ensure they are applicable to the wider physiotherapy program outside the host institution.

Students who performed strongly at an undergraduate level did not perform better, either academically or clinically, when compared to their peers with lower UGPAs. This may have implications for planned staffing and support structures within post-graduate physiotherapy programs. A cohort with strong prior academic performance on admission may still contain students needing additional support and enhancement throughout the program. This study suggests that support staffing should not be planned based on a cohorts' perceived academic strength. It also suggests that students should not be categorised either into academic streams, or judgements made about their expected clinical performance based on their UGPA.

The finding that there was no difference in either clinical or academic performance between students with UGPAs ranging from 4.12-6.81 indicates that there is a need to reflect on the appropriateness of minimum UGPA requirements. Individual institutions should consider the purpose served by a minimum UGPA requirement. UGPA did not predict success in a post-graduate physiotherapy program, suggesting that minimum GPA requirements could be reviewed and potentially lowered while still retaining the quality of graduate desired by the physiotherapy profession. Limitations on cohort size may require methods of controlling admissions into a program. Minimum UGPA is one method of limiting those who are eligible to enter into a program, however this may result in students who are equipped to successfully complete the program being ineligible to enter. This could feasibly impact on the diversity of the student cohort and the future physiotherapy profession.

The host institution will continue to utilise additional selection measures to admit students into their program. It is clear that there is a strong need for further research into admission and selection measures for postgraduate physiotherapy programs, investigating not only the measures currently used but also emerging areas of interest such as personality and emotional intelligence testing. Entry into post-graduate physiotherapy programs is competitive and high-stakes for all involved, so it is essential that the criteria used to select-in and rank applicants for admission are valid measures of the attributes that are both required and desired to produce the highest quality health professionals.

VIII Conclusion

In Australian postgraduate entry-level physiotherapy education there is a trend toward the use of UGPA as the sole selection criterion for program admission. In this study population UGPA, when used as one component of selection, was not related to students' early academic or clinical performance in core areas of practice. These findings indicate a need to reconsider the use of UGPA as the sole selection criterion and support the inclusion of other criteria to select students into competitive programs. There were no significant differences in the clinical or coursework performance of students when grouped according to their UGPA. This suggests that if minimum GPA requirements for entry into postgraduate physiotherapy programs are to be retained, they should be reviewed to ensure all suitable applicants with the personal and academic attributes for success within the physiotherapy profession meet program eligibility criteria.

Erratum: This article was updated on May 21, 2021 to correct errors in the original dataset. Correction of these errors resulted in changes to values and associated text relating to the variables APP Mean and Cardiorespiratory APP in Table 2, Table 3, Figure 2 and Figure 5. The changes had no effect on the conclusion or implications for practice. The original version of the article may be found in the supplemental materials.

Appendix 1

Listed below are the official university websites accessed on 10th April 2018 to determine the entry requirements for postgraduate entry-level physiotherapy programs currently offered within Australia:

1. Bond University Doctor of Physiotherapy.
https://bond.edu.au/program/doctor-physiotherapy#entry_requirements
2. Curtin University Masters of Physiotherapy.
http://courses.curtin.edu.au/course_overview/postgraduate/Master-Physiotherapy
3. Flinders University Masters of Physiotherapy.
<http://www.flinders.edu.au/courses/rules/postgrad/mpt.cfm>
4. Griffith University Masters of Physiotherapy.
<https://degrees.griffith.edu.au/Program/5320/HowToApply/Domestic#can-i-apply>
5. La Trobe University Masters of Physiotherapy. <https://www.latrobe.edu.au/courses/master-of-physiotherapy-practice>
6. Macquarie University Doctor of Physiotherapy.
<https://courses.mq.edu.au/2018/domestic/postgraduate/doctor-of-physiotherapy/entry-requirements#content>
7. The University of Melbourne Doctor of Physiotherapy.
<http://mdhs-study.unimelb.edu.au/degrees/doctor-of-physiotherapy/entry-requirements>
8. The University of Queensland Masters of Physiotherapy.
<https://future-students.uq.edu.au/study/program/Master-of-Physiotherapy-Studies-5267>
9. The University of Sydney Masters of Physiotherapy.
<https://sydney.edu.au/courses/courses/pc/master-of-physiotherapy.html>
10. University of Canberra Masters of Physiotherapy.
http://www.canberra.edu.au/coursesandunits/course?course_cd=768AA
11. UTS Masters of Physiotherapy.
<https://www.uts.edu.au/future-students/find-a-course/master-physiotherapy>

References

Australian Health Practitioner Regulation Agency. (2013). Approved Programs of Study. Retrieved from <http://www.ahpra.gov.au/Education/Approved-Programs-of-Study.aspx?ref=Physiotherapist> on 06/04/2018

Baggs, T., Barnett, D., & McCullough, K. (2015). The Value of Traditional Cognitive Variables for Predicting Performance in Graduate Speech-Language Pathology Programs. *Journal of allied health, 44*(1), 10-16.

Commission on Accreditation In Physical Therapy Education. (2018). Aggregate Program Data 2017-2018 Physical Therapist Education Programs Fact Sheets. Retrieved from www.capteonline.org/resources on 06/04/2018

Council of Canadian Physiotherapy University Programs. (2009). *Entry-to-Practice Physiotherapy Curriculum: Content Guidelines for Canadian Univeristy Programs*. Council of Canadian Physiotherapy University Programs Retrieved from <http://www.physiotherapyeducation.ca/PhysiotherapyEducation.html>. on 06/04/2018

Dalton, M., Davidson, M., & Keating, J. (2011). The Assessment of Physiotherapy Practice (APP) is a valid measure of professional competence of physiotherapy students: a cross-sectional study with Rasch analysis. *Journal of Physiotherapy, 57*(4), 239-246.

Dalton, M., Davidson, M., & Keating, J. L. (2012). The assessment of physiotherapy practice (APP) is a reliable measure of professional competence of physiotherapy students: a reliability study. *Journal of Physiotherapy, 58*(1), 49-56.

Dalton, M., Keating, J., & Davidson, M. (2009). Development of the Assessment of Physiotherapy Practice (APP): A standardised and valid approach to assessment of clinical competence in physiotherapy. *Australian Learning and Teaching Council (ALTC) Final report*, 6-28.

Dixon, D. (2012). Prediction of Osteopathic Medical School Performance on the basis of MCAT score, GPA, sex, undergraduate major, and undergraduate institution. *The Journal of the American Osteopathic Association*, 112(4), 175-181.

Edgar, S., Mercer, A., & Hamer, P. (2014). Admission interview scores are associated with clinical performance in an undergraduate physiotherapy course: an observational study. *Physiotherapy*, 12(14), 00028-00025.

Howard, L., & Jerosch-Herold, C. (2000). Can entry qualifications be used to predict fieldwork and academic outcomes in occupational therapy and physiotherapy students? *The British Journal of Occupational Therapy*, 63(7), 329-334.

James, D., Yates, J., & Nicholson, S. (2010). Comparison of A level and UKCAT performance in students applying to UK medical and dental schools in 2006: cohort study. *BMJ*, 16(340).

Kulatunga-Moruzi, C., & Norman, G. R. (2002). Validity of admissions measures in predicting performance outcomes: the contribution of cognitive and non-cognitive dimensions. *Teaching and Learning in Medicine*, 14(1), 34-42.

Mercer, A., & Puddey, I. B. (2011). Admission selection criteria as predictors of outcomes in an undergraduate medical course: A prospective study. *Medical Teacher*, 33(12), 997-1004.

Morris, J., & Farmer, A. (1999). The predictive strength of entry grades and biographical factors on the academic and clinical performance of physiotherapy students. *Physiotherapy Theory & Practice*, 15(3), 165-173.

O'Connor, A., McGarr, O., Cantillon, P., McCurtin, A., & Clifford, A. (2017). Clinical performance assessment tools in physiotherapy practice education: a systematic review. *Physiotherapy*.

Patterson, F., Knight, A., Dowell, J., Nicholson, S., Cousans, F., & Cleland, J. (2016). How effective are selection methods in medical education? A systematic review. *Medical Education*, 50(1), 36-60.

Pau, A., Jeevaratnam, K., Chen, Y. S., Fall, A. A., Khoo, C., & Nadarajah, V. D. (2013). The Multiple Mini-Interview (MMI) for student selection in health professions training - a systematic review. *Medical Teacher*, 35(12), 1027-1041.

Payton, O. D. (1997). A meta-analysis of the literature on admissions criteria as predictions of academic performance in physical therapy education in the United States and Canada: 1983 through 1994. *Physiotherapy Canada*, 49(2), 97-102.

Prideaux, D., Roberts, C., Eva, K., Centeno, A., Mccrorie, P., Mcmanus, C., Patterson, F., Powis, D., Tekian, A., Wilkinson, D. (2011). Assessment for selection for the health care professions and specialty training: consensus statement and recommendations from the Ottawa 2010 Conference. *Medical Teacher*, 33(3), 215-223.

Salvatori, P. (2001). Reliability and validity of admissions tools used to select students for the health professions. *Adv Health Sci Educ Theory Pract*, 6(2), 159-175.

Siu, E., & Reiter, H. I. (2009). Overview: what's worked and what hasn't as a guide towards predictive admissions tool development. *Advances in Health Sciences Education*, 14(5), 759.

Sladek, R. M., Bond, M. J., Frost, L. K., & Prior, K. N. (2016). Predicting success in medical school: a longitudinal study of common Australian student selection tools. *BMC Med Educ*, 16, 187.

Thieman, T. J., Weddle, M. L., & Moore, M. A. (2003). Predicting academic, clinical, and licensure examination performance in a professional (entry-level) master's degree program in physical therapy. *Journal of Physical Therapy Education*, 17(2), 32-37.

Utzman, R. R., Riddle, D. L., & Jewell, D. V. (2007). Use of demographic and quantitative admissions data to predict academic difficulty among professional physical therapist students. *Physical Therapy*, 87(9), 1164-1180.

Watson, C. J., Barnes, C. A., & Williamson, J. W. (2000). Determinants of clinical performance in a physical therapy program. *Journal of Allied Health*, 29(3), 150-156.