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Is a students' ability to critically self-reflect, related to their performance on physiotherapy clinical placements?

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Is a students' ability to critically self-reflect, related to their performance on physiotherapy clinical placements?

Abstract

Background. The relationship between students' reflective ability and performance on physiotherapy clinical placement is currently unclear.

Objectives. To investigate: i) if a relationship exists between students' critical reflective ability and performance on physiotherapy clinical placement; and whether these relationships differ by ii) Critical reflective task (CRT) rank grade or, iii) by gender.

Design. An observational cohort study design.

Methods. Critical Reflection Task (CRT) marks and clinical placement (APP) scores from 196 (F=94; M=102) post-graduate, entry-level physiotherapy students were analyzed.

Results. A significant moderate predictive relationship was found between CRT marks and APP scores ($r=.411$, $p<.001$) with the CRT accounting for 16.9% of the variance in APP scores ($r^2=.169$, $SEE=12.79$). There was a weak positive correlation between 'CRT rank grade' and APP scores ($r_s=.371$, $p<0.001$). Significant differences in APP scores existed between groups based on 'CRT rank-grades' with students achieving a 'High Distinction' on CRT achieving significantly higher mean APP scores than those in other grade groups. Females had significantly higher mean CRT grades than males (female mean= $79.73\pm 13.34\%$; male mean = $76.46\pm 15.09\%$; $t(862.12)=3.38$, $p=.001$). The relationship between CRT and APP was stronger for males than females across all core subjects. CRT grades for males accounted for a higher percentage of the variance of the APP grades than for females.

Conclusions. A significant positive relationship between students' critical-reflective ability and clinical practice performance (aligned to physiotherapy practice thresholds) exists. Further research is needed to determine whether facilitating students' self-reflection skills may enhance clinical performance for health professional students.

1. Introduction

In order to become a registered physiotherapist in Australia prospective health professionals must complete a physiotherapy education program, which is accredited by the Australian Physiotherapy Council (APC). The APC examines entry-level physiotherapy programs in Australia to ensure that they are meeting the Physiotherapy Practice Thresholds for Australia and Aoteroa New Zealand (Physiotherapy Board of Australia & Physiotherapy Board of New Zealand, 2015). One specific threshold refers to the physiotherapists role (and associated key competencies) of being a *reflective practitioner and self-directed learner*. This role describes attributes such as the physiotherapist's ability to assess their practice, take action to improve their practice, evaluate their learning needs, engage in professional development and recognize when to seek professional support.

Critical self-reflection is widely considered an essential element of practice in all healthcare professions (Bandura, 1977; Epstein, 1999; Mann, Gordon, & MacLeod, 2009). The physiotherapy practice thresholds are in line with standards from other health professions (e.g. medicine, nursing and occupational therapy) that emphasize the role of self-reflection to enable identification of ongoing learning needs and professional identity in regards to values, attitudes and beliefs throughout the health professional's career (Boud, Keogh, & Walker, 1985; Epstein, 1999; Schön, 1983). For these reasons, and in anticipation of developing self-reflective practitioners, critical self-reflective tasks are commonly included as assessment items in health professional programs and are marked independently of clinical performance. In many programs, they are implemented during clinical placement learning experiences where students are in the process of translating newly developed knowledge into competent and safe practice with authentic clients (Bond University Website).

Previous literature in medical, nursing, physiotherapy and occupational therapy professions has demonstrated; that students can improve their reflective skills over time through journaling (Duke & Appleton, 2000); that reflective journaling throughout clinical practice may help clinical performance (Williams & Wessel, 2004) and; that a greater self-reflective ability is correlated with greater clinical skills performance (Stephens et al., 2012). Furthermore, there is also evidence that students may lack insight into their own clinical skills when compared to an expert assessor's evaluation (Ammentorp et al., 2013; Baxter & Norman, 2011). These findings support the notion that critical reflection may be a worthy practice, to ensure that students understand their level of competency and can use this information to appropriately focus their future learning and development.

It is important to acknowledge that although there is emerging evidence in the field of critical self-reflection, there is considerable variability in methodologies between research studies. As most studies have been conducted within cohorts from a variety of health professional courses, it is important to consider that there is likely to be many variations between studied curricula. This variability in turn limits the generalisability of the literature from any single health profession to other health professions. As a result, there is a need for further evidence to be collected from specific health professions, including physiotherapy.

In addition to variability between different health professional courses, research indicates that self-reflection may differ as a function of gender. Colthart et al. (2008) summarised the current evidence regarding the effect of gender differences on self-reflective ability and found the available literature to be inconclusive or contradictory. In contrast however, there is some evidence that suggests that females may have greater self-reflective ability than males (Belenky, 1986; Csank & Conway, 2004). There has yet to be any research that looks specifically at the effect of gender on the relationship between self-reflective ability and clinical performance for health professional students.

If the pedagogical practice of using critical self-reflection to enhance clinical practice performance is to continue, more research is needed to address the limitations of current literature and to develop a stronger evidence base around this learning process. Currently the literature lacks studies that are conducted within actual clinical environments as most of the literature uses

Objective Structured Clinical Examinations (OSCE) as their assessment of clinical performance (Carraccio & Englander, 2000; Rushforth, 2007; Wass, Van der Vleuten, Shatzer, & Jones, 2001). Although the OSCE is regarded as the gold standard of clinical assessment, it is noted by Rushforth (2007) that the OSCE may not be a true representation of clinical performance due to the short duration of stations and the high pressure environment to which students are subjected. This is in contrast to the actual clinical setting where clinical performance must be sustained over a longer period. Research that incorporates students' clinical performance scores within the actual clinical setting may address this limitation. In a comprehensive literature review by Mann et al. (2009) the authors stated that there is a lack of quantitative evidence that investigates the relationship between students' reflective ability and clinical placement performance. Consequently, the aim of the present study was to explore the relationship between students' reflective ability and their clinical placement performance. Specifically, the study aimed to investigate: i) if a relationship exists between students' reflective ability and their performance on physiotherapy clinical placement (as determined by the Assessment of Physiotherapy Practice (APP) tool); and whether these relationships differ by ii) rank grade (as determined by the Critical Reflective Task (CRT)) or, iii) gender.

2. Methods

A. Participants

An observational cohort study design with 196 participants (F=94; M=102) who were all from a single post-graduate, entry-level physiotherapy program in Australia formed the basis of this study. All participants completed their clinical subjects between 2011-2015. While the sample size of students was limited to the number of students enrolled over the stated years, data from all students within each enrolled cohort, in all core clinical subjects (cardiorespiratory, musculoskeletal and neurological) were included. Participants' data were excluded prior to analysis for any of the following reasons: a) incomplete assessment tasks, b) withdrawal from the subject, or c) disciplinary action influencing grades prior to completion of the clinical subject. Ethical approval for this study was provided by the Bond University Human Research Ethics Committee (RO 15383).

B. Outcome measures

The APC mandates that universities must be able to demonstrate that their students are competent in three core subject areas of physiotherapy across the continuum of care (Australian Physiotherapy Council, 2016). The three core subject areas of physiotherapy are: cardiorespiratory, musculoskeletal (including both inpatient [Orthopaedics] and outpatient care) and neurological.

Data pertaining to each student's critical reflection marks and clinical placement scores (both assessed independently of each other) were collected for the clinical placement subjects in the three core clinical areas. Marks from these placements were determined through a critical reflection assessment task (CRT) and the Assessment of Physiotherapy Practice (APP) (Dalton, Keating, & Davidson, 2009). Each of these measures is discussed below.

The CRT was completed as the student underwent their clinical placement. Each student, during the five-week placement, developed up to six goals per week relating to clinical practice including strategies to achieve those goals within three domains of learning: cognitive, psychomotor and affective. At the end of the week students were required to critically reflect on what they had learnt, what they had done well, what they could have done better in relation to their learning goals, and then outline strategies to enhance further growth as a practitioner. Based on these criteria and according to descriptions previously defined by Desjarlais and Smith (2011), the CRT contains components of self-reflection (i.e. focused thinking to develop insight) as well as self-assessment (i.e. identification of strengths and areas for improvement with an action plan)

therefore the CRT could not be independently defined as either one alone. Each students' CRT was marked by a university academic and marks were determined based on the following criteria:

- i) *Goal Setting* - setting relevant goals, appropriate strategies and evaluation shown;
- ii) *Self-reflection* - description of what had been learnt in regards to the goals, what was done well in relation to own performance, what could have been done better in relation to own performance, identification of areas for further growth; and
- iii) *Professional documentation of the task*.

For the purpose of this study, the University's rank grading standards were then applied to the CRT mark (out of 100), which separated the students into groups according to the following categories: Fail (<50%), Pass (50-64%), Credit (65-74%), Distinction (75%-84%) and High Distinction (85+%).

The APP is an instrument used nationally across Australia and consists of 20 items on which clinical educators evaluate the student's clinical performance and it is marked out of a total of 80 points (Dalton et al., 2009). The APP has been previously determined to be a valid tool for measuring the professional competence of physiotherapy students with moderate to strong inter-rater reliability (Dalton, Davidson, & Keating, 2011; Dalton, Davidson, & Keating, 2012). The APP is completed by the clinical educator, after which the student received an overall mark for their clinical practice performance. Since initiation of this research, the APP has changed some of the language used from the original instrument, however the items still align to assess the same competency skills required of student physiotherapists.

The original APP instrument used 20 items across the following seven domains of practice:

- i) *Professional behaviour* – understanding patient rights and consent, commitment to learning, demonstrating ethical, legal and culturally sensitive practice, demonstrating teamwork;
- ii) *Communication* – communicating effectively and appropriately, clear and accurate documentation;
- iii) *Assessment* – conducting an appropriate patient interview, selecting and measuring relevant health care indicators and outcomes, performs appropriate physical assessment;
- iv) *Analysis and planning* – appropriately interpreting assessment findings, identifies and prioritises patient problems, sets realistic short and long term goals with the patient, selects appropriate intervention;
- v) *Intervention* – performs interventions appropriately, is an effective educator, monitors the effect of intervention, progresses intervention appropriately, undertakes discharge planning
- vi) *Evidence-based practice* – applies evidence-based practice in patient care; and
- vii) *Risk management* – identifies adverse events and minimizes risk associated with assessment and interventions.

C. Data analysis

Data were collected from the electronic databases of a post-graduate entry-level physiotherapy program in Australia, then transferred to a Microsoft Excel spreadsheet and made non-identifiable. Prior to aggregating cohort CRT data by core clinical subjects or aggregating CRT data for each subject, an ANOVA was undertaken to detect if there were any significant differences between individual cohorts within a given core clinical subject, or between clinical subjects themselves. If significant differences existed, Bonferroni post-hoc corrections for multiple comparisons were used to determine where the differences lay with those cohorts / clinical subjects. Any significantly different cohorts / subjects were excluded from aggregation. If no significant differences were detected between cohorts or clinical subjects, data were aggregated for further analysis in order to increase the power of the results.

Pearson's correlations were used to investigate the relationship between students' reflective ability (as measured by the CRT) and their physiotherapy clinical placement performance (as measured by the APP). The strength of findings for the Pearson's correlations were based on those reported previously by Evans (1996) as outlined in Table 1. When Pearson's correlations detected significant relationships, linear regression analysis were undertaken in order to determine the level to which CRT grades could predict clinical placement (APP) performance.

In order to address the second study aim, the data (APP scores and CRT marks) from each of the core clinical subjects were aggregated and the mean APP scores and CRT marks were determined to establish individual rank grades according to their CRT marks only (i.e. Fail, Pass, Credit, Distinction, High Distinction). An ANOVA was undertaken to assess if there were significant differences in APP scores for each 'CRT rank grade'. A Spearman's rho rank correlation was used to assess the correlation between the 'CRT rank grade' and APP scores.

To address the third study aim an independent samples two tailed t-test was conducted to investigate differences between females and males for the CRT marks and APP scores using the aggregated clinical subject data. Pearson's correlations were undertaken to investigate the strength of the relationship between the CRT and APP for the total group and for females and males separately. Where significant Pearson's correlations existed, linear regression analysis were used to determine the level to which CRT marks could predict clinical placement (APP) performance (scores) for each gender. Additionally a multiple regression analysis was undertaken to examine the relative contribution of gender to the relationship between CRT marks and APP scores.

All statistical analyses were conducted using IBM SPSS Statistics 23 (SPSS Inc.: Statistical Package for the Social Sciences (Version 23) [computer software]). The level of significance for this study was set at $p = 0.05$.

3. Results

In the initial dataset there were 196 participants (F=94; M=102). Data from seven participants (F=5; M=2) were removed during manual data cleaning due to meeting the data exclusion criteria detailed above. As such, a total pool of 189 (F=89; M=100) participant results were available for analysis. Participant numbers, means and standard deviations for the CRT and APP are provided in Table 2 and Table 3.

An ANOVA (see Table 4) was conducted prior to aggregating cohort scores for core clinical subjects. No significant differences between cohorts for CRT marks in Orthopaedics, ($f(3)=.493$, $p=.688$), Musculoskeletal outpatients ($f(3)=1.048$, $p=.374$) and Neurological ($f(3)=.565$, $p=.639$) core clinical subjects were found. The only significant differences between cohorts were in the Cardiorespiratory CRT marks ($f(3)= 2.732$, $p= .046$). Due to the more stringent level of significance adopted in the Bonferroni post-hoc analysis, the analysis failed to identify where these differences lay even though the ANOVA revealed significant differences overall. On this basis, cardiorespiratory CRT data were not included in the aggregated data, which was used throughout all other analyses. No significant differences for APP scores were identified across cohorts for all clinical subjects (Cardiorespiratory $f(3)=.722$, $p=.540$, Orthopaedics $f(3)=.691$, Musculoskeletal Outpatients $f(3)=1.234$, $p=.301$, $p=.559$, and Neurological $f(3)=1.903$, $p=.133$). An ANOVA was undertaken to examine differences between the CRT marks of the core clinical subjects and revealed no statistical differences between the clinical subjects of Orthopaedics, Musculoskeletal Outpatients and Neurological ($f(2)=2.370$, $p=.095$). Therefore, data from these clinical subjects were aggregated for further analysis.

Addressing the first of our study aims, the Pearson's correlations of aggregated cohort data for individual clinical subjects revealed weak to moderate significant positive relationships (see Table 4). Individually some clinical subjects demonstrated moderate to strong relationships across the cohorts (see Table 4). Using the aggregated CRT and APP data, Pearson's correlations revealed a moderate significant positive relationship between the CRT marks and APP scores ($r=.411$, $p<.001$) (see Table 4). Furthermore, linear regression analysis demonstrated

that overall the CRT accounted for 16.9% of the variance in APP scores ($r^2 = .169$, $p < .001$) amongst the study cohort, with a standard error of the estimate of 12.79.

Addressing the second aim of our study, the results of the Spearman's rho correlation showed a weak but significant positive correlation between 'CRT rank grade' and APP scores ($r_s = .371$, $p < 0.001$). Figure 1 demonstrates the distribution of the 'CRT rank grade' in comparison to the APP scores using the aggregated data.

Addressing the third of our study aims, independent samples t-tests indicated that significant differences existed between female and male participants for the mean CRT marks; female ($M = 79.73\% \pm 13.34$) and male ($M = 76.46\% \pm 15.09$); $t(862.12) = 3.38$, $p < .001$; unequal variance). There were no statistically significant differences between female and male participants for the APP scores using grouped data. Pearson's correlations between the CRT marks and APP scores for male participants, found that the relationship was stronger than for female participants for all clinical subjects ranging from weak to strong significant positive correlations (see Table 5). Females demonstrated significant weak to moderate positive correlations between CRT marks and APP scores across all subjects, with the exception of the Cardiorespiratory clinical practice subject, which did not display a significant relationship with CRT marks. Linear regression analysis determined that the CRT marks for male participants accounted for a higher percentage of the variance of the APP scores than for female participants (see Table 5). However, linear regression also showed that for each clinical subject, the CRT was able to account for a portion of the variance of the APP score ranging from 8.70 – 36.80% across the clinical subjects for both male and female participants. Notably for male participants in the Neurological subject, the CRT accounted for 36.80% of the variance in APP scores, whereas CRT accounted for 21.50% of variance in APP scores for females in the same clinical subject. Although the relationships differed between males and females, multiple regression analysis demonstrated that gender alone did not significantly contribute to the relationship in any clinical subject except Musculoskeletal Outpatients ($\beta = .207$, $SE = 2.437$, $p = .018$). Furthermore, when exploring the differences between males and females, a stronger relationship between APP score and CRT rank grade for male participants ($r_s = 0.418$, $p < 0.001$) was found when compared to female participants ($r_s = 0.302$, $p < 0.001$).

4. Discussion

The purpose of this study was to investigate: i) if a relationship exists between students' reflective ability and their physiotherapy clinical placement performance (as determined by the Assessment of Physiotherapy Practice (APP) scores); and whether these relationships differ by ii) rank grade (as determined by the CRT marks) or, iii) gender. The present study revealed a positive relationship between CRT marks and APP scores in all core placements ($r = .025 - .787$, $p < 0.05$). The strength of the relationship did however differ between clinical subjects (see Table 4). After aggregating the CRT and APP data by cohort, a significant and moderate positive correlation was found for both the Orthopaedics and Neurological subjects, with a weak positive correlation for the Musculoskeletal Outpatients subject. When the CRT and APP data were aggregated by core subjects, a significant and moderate predictive relationship was found between the CRT marks and the APP scores, suggesting that the CRT result could predict, to a moderate extent, the overall clinical performance of a student as measured by the APP. These novel findings address some of the limitations of previous reported studies in this field.

The findings of the present study differ from those of previous research, which suggest that discrepancies exist between students' insight into their abilities and expert assessment of their skills, with findings reporting a lack of insight regarding clinical performance from students (Ammentorp et al., 2013; Baxter & Norman, 2011). Studies by Ammentorp et al. (2013) and Baxter and Norman (2011) found that students lacked insight to their own clinical skills proficiency when compared to the expert assessor, which suggest that students were unable to accurately identify the strengths and weaknesses of their clinical performance. Differences in methodologies between the aforementioned studies of Ammentorp et al. (2013), Baxter and Norman (2011) and the present study may partly explain the variations in findings. However the attributes of the CRT

used in our study; being that of a combined reflection and self-assessment task (i.e. critical reflection) may also partially explain why the present study resulted in different findings to previous research.

It should also be noted that previous research did not directly explore the relationship between critical reflection and clinical assessment in an authentic clinical setting but, rather they focused on the ability of the student to accurately self-assess their clinical skills compared to an expert using an OSCE. Therefore, these studies assessed a student's self-assessment of clinical skill versus an expert assessor's grade of the student's skill. Conversely, the present study examined the relationship between a student's marks for a critical self-reflection on their clinical performance within a true clinical environment and the objective assessment of clinical practice (i.e. APP) by a clinical educator from that facility. The differences in outcome measures used (OSCE vs true clinical setting) may explain the observed differences in findings from previous research.

The second part of the study aimed to investigate whether better critical reflectors (as determined by the CRT rank grades) achieved higher APP scores compared to those who were deemed poorer critical reflectors. There was a significant weak relationship between students' CRT rank grade category and their APP scores. Significant differences in APP scores existed between groups based on 'CRT rank grades', with students achieving a High Distinction on CRT attaining significantly higher mean APP scores than those in the Pass, Credit and Distinction grade groups (see Figure 1). These results suggest that students who have superior critical reflection skills potentially perform better on clinical placements. Previous research regarding how a student or practitioner reflects, is largely based on the 'reflection-on-action' and 'reflection-in-action' theories (Schön, 1983). These theories outline the process by which novice and experienced practitioners process and reflect on their practice either during or after a learning experience (Schön, 1983). A review of the literature by Paterson and Chapman (2013) suggested that these processes lead to increased clinical reasoning and clinical knowledge. However, there is still a lack of comparative research that looks at the quantitative benefits that reflection has on clinical performance (Mann et al., 2009; Paterson & Chapman, 2013) and in particular critical reflection. Whilst unable to determine causation between the CRT and APP, the results of the present study indicate that there is a relationship between better critical reflective ability (CRT) and better clinical performance (APP). The strength of this relationship, while significant, is weak, which highlights that a student's APP scores may be influenced by many factors (i.e. student-educator relationship, timing of placement, educator training, student preparedness, clinical area, environment, and clinical experience of the student etc. (Morris, 2007)). Studies within the education sector indicate that self-regulation and utilising self-reflection can be successfully taught to students of all grade levels to help aid academic coursework success (Zimmerman & Schunk, 2001). Therefore, it is not unreasonable to suggest that programs that teach and nurture self-reflection and in particular critical self-reflection may be able to positively impact clinical proficiency during clinical placements (Blatt, Plack, Maring, Mintz, & Simmens, 2007; Stephens et al., 2012).

In line with the third aim of the study, the present study found that although females received significantly higher CRT grades than males, there were no significant differences between male and female scores on the APP. The reason for this finding remains to be determined. A potential explanation is that females may be inherently more reflective and thus receive better grades in reflection-based tasks. For example, previous literature suggests that females actively seek self-understanding through engaging in self-reflection more often than males (Belenky, 1986; Csank & Conway, 2004). In addition, a study of medical students also found that female students gained higher reflection scores than males (Boenink, Oderwald, De Jonge, Van Tilburg, & Smal, 2004). Considering this, there is a suggestion that males overestimate their abilities and grades compared to females, who underestimate them (Colthart et al., 2008). It is unclear if this is due to levels of reflection elicited between females and males, however, it has been reported that females engage in self-reflection more than males and this could potentially lead to a greater understanding of their weaknesses and strengths which are inherently self-assessment items

(Csank & Conway, 2004). This reported learning step could perhaps be a major driver for clinical performance in females but less so in males, suggesting that it could be appropriate to use different pedagogical approaches for females versus males when developing clinical skill competency. Conversely, a study by Bidjerano (2005) investigated undergraduate education students and found that there were no differences between females and males for the learning strategy of critical thinking, however females surpassed male students with their ability to use learning strategies such as elaboration, organization, metacognition and effort regulation. This finding by Bidjerano (2005) is supported by a number of previous studies using school aged students (Wolters, 1999; Zimmerman & Martinez-Pons, 1990). The above-mentioned studies (Bidjerano, 2005; Wolters, 1999; Zimmerman & Martinez-Pons, 1990) provide evidence that the differences seen between females and males may be due to the skills surrounding completing an assessment task rather than the skill of reflection itself. For example, were the females in the present study more likely to engage in organization and planning to produce a better critical reflection report than males, independent of the level of actual reflection or self-assessment achieved mentally? Future research could investigate the steps undertaken to complete the CRT to inform this hypothetical question and may provide academics with a better understanding of the different pedagogical approaches to facilitating critical reflective practice in both female and male students.

This study also aimed to determine if the strength of the relationship between the CRT marks and APP scores differed between females and males. In the present study, a stronger positive relationship between CRT and APP was found to exist in male students when compared to female students (see Table 5). The findings of the present study also demonstrated that the ability of the CRT to predict the APP scores was higher within the male student population, meaning that the CRT marks accounted for more of the variance in APP scores in males than in females with gender significantly contributing to the relationship for the Musculoskeletal Outpatients subject. These findings indicate that the CRT may be more meaningful for males if they wish to improve their APP scores. Additionally, with the CRT accounting for 4.8 – 36.8% of the variability in APP scores for females and males combined, there may be a role for using CRTs to enhance clinical performance particularly in those subjects with very strong clinical reasoning components rather than simple application of clinical protocols. To the best of the author's knowledge, there is currently no empirical literature, which explains why different core subjects have more or less variability in APP scores when the CRT task is consistent. While the findings of this report are important to the potential implementation of teaching critical reflection (i.e. a combined process of reflection and self-assessment) to improve clinical performance, it is important to remember that APP scores may be impacted by many other factors (i.e. timing of placement, student preparedness, clinical area and environment etc.) (Paterson & Chapman, 2013). This research indicates that there could be a role for teaching critical reflection to improve clinical performance as a controllable variable in the clinical environment.

There were several limitations within this study: i) A single critical reflection task from one university was used. This reflection task had not been previously validated for this purpose due to a lack of a gold-standard tool for comparison; ii) It was beyond the aims of this study to investigate the effect of using CRT's to improve APP outcomes therefore future research should explore this relationship; iii) External factors (i.e. educator gender, educator experience, educator values, environment, student-educator relationship, timing of placement, clinical area) that had the potential to influence the relationship between CRT and APP were not examined or controlled for within this research and this methodological step should be considered in future research; iv) Gender differences in strategies to complete the CRT assessment were also not examined in this research and could be investigated to enhance knowledge for gender specific learning outcomes, and; v) The effect of actively teaching students to critically reflect about clinical performance was not examined and future studies could explore this new area of research.

5. Conclusion

In conclusion, the present study suggests that there is a significant moderate positive relationship between a students' critical reflection ability and their clinical performance on physiotherapy placements. Achieving higher CRT grades is related to receiving higher clinical performance scores for physiotherapy students. In this study, female students generally achieved higher critical reflection grades than male students; however, the relationship between critical reflection and clinical performance was stronger for males than females, with critical reflection grades accounting for more variability in clinical performance scores for males than females. This study supports the use of critical self-reflection within the health professional education setting for learning and applying practical skills that are required to meet physiotherapy practice thresholds and to gain registration as a health practitioner. The findings of the present study also signal the need for further research to determine whether facilitation to improve critical self-reflection may enhance clinical performance for health professional students.

Table 1.

Verbal description of strength of Pearson's correlation and r^2 values. (Evans, 1996)

Pearson's correlation value – r value	r^2	Verbal description
.00-.19	0 - .039	Very weak
.20-.39	.04 - .159	Weak
.40-.59	.16 - .359	Moderate
.60-79	.36 - .639	Strong
.80-1.0	.64 - 1.00	Very strong

Table 2.

Participant numbers, means and standard deviations for the Critical Reflection Task and Assessment of Physiotherapy Practice by aggregated data and gender.

Core Clinical Subject	Aggregated data			Female			Male		
	n	CRT Mean % (SD)	APP Mean % (SD)	n	CRT Mean % (SD)	APP Mean % (SD)	n	CRT Mean% (SD)	APP Mean % (SD)
Cardiorespiratory	134	72.06 (11.93)	77.15 (13.97)	62	73.16 (12.02)	77.32 (13.33)	72	71.11 (11.86)	76.997 (14.59)
Musculoskeletal Inpatients (Orthopaedics)	134	77.50 (12.93)	78.96 (14.34)	62	79.70 (11.56)	80.10 (13.56)	72	75.61 (13.80)	77.976 (14.99)
Neurological	121	76.46 (12.77)	82.35 (13.34)	56	76.47 (12.10)	83.95 (11.87)	65	76.46 (13.41)	80.96 (14.43)
Musculoskeletal Outpatients	121	79.93 (12.47)	81.13 (14.17)	56	81.541 (11.06)	78.60 (14.40)	65	78.54 (13.50)	83.31 (13.71)
Aggregated Core Clinical Subject Data	376	77.95 (12.78)	80.75 (14.00)	174	79.25* (11.70)	80.86 (13.44)	202	76.82 (13.57)	80.65 (14.51)

* Significant difference when compared to other gender (significance level 0.05)

Table 3.

Participant numbers, means and standard deviations for the Critical Reflection Task and Assessment of Physiotherapy Practice reported by rank grades.

Rank Grade	Fail			Pass			Credit			Distinction			High Distinction		
	n	CRT mean %(SD)	APP mean %(SD)	n	CRT mean %(SD)	APP mean %(SD)	n	CRT mean %(SD)	APP mean %(SD)	n	CRT mean %(SD)	APP mean %(SD)	n	CRT mean %(SD)	APP mean %(SD)
Cardiorespiratory	5	42.79 (1.96)	67.75 (18.55)	27	59.23 (3.84)	73.38 (13.91)	50	70.08 (2.77)	75.90 (14.25)	33	78.80 (2.85)	81.14 (12.53)	19	91.48 (4.15)	81.32 (12.48)
Musculoskeletal Inpatients (Orthopaedics)	1	38.57	68.75	18	58.29 (4.55)	67.43 (15.87)	40	69.79 (2.63)	76.56 (12.52)	31	78.76 (2.81)	79.76 (15.55)	44	92.36 (5.01)	85.51 (10.83)
Neurological	1	45.71	65.00	23	57.88 (4.43)	71.01 (15.31)	29	70.66 (2.38)	76.90 (12.81)	36	80.08 (3.02)	88.17 (9.04)	32	91.96 (4.53)	89.38 (7.74)
Musculoskeletal Outpatients	0	a.	a.	14	55.86 (4.38)	75.36 (18.26)	20	69.26 (2.82)	78.69 (14.78)	42	79.83 (2.78)	78.24 (13.34)	45	92.25 (4.08)	86.69 (11.67)
Aggregated clinical subject data	2	42.14 (5.05)	66.88 ^{*†‡} (2.65)	55	57.50 (4.48)	70.98 [‡] (16.25)	89	69.95 (2.62)	77.15 [‡] (13.02)	109	79.61 (2.89)	81.95 (13.45)	121	92.22 (4.52)	86.97 [†] (10.48)

a. – no available data

Rank Grades: Grade determined by Critical Reflection Task mark converted to a percentage.

* Significantly different from credit, $p < 0.05$.

† Significantly different from distinction, $p < 0.05$.

‡ Significantly different from high distinction, $p < 0.05$.

Table 4.

The relationship between Critical Reflective Task and Assessment of Physiotherapy Practice scores by individual cohorts and aggregated cohort data.

Critical Reflective Task (by core clinical subjects)	Assessment of Physiotherapy Practice						
	Cohort 1 r (p value)	Cohort 2 r (p value)	Cohort 3 r (p value)	Cohort 4 r (p value)	Cohort 5 r (p value)	Cohort 6 r (p value)	Aggregated Cohort data r (p value)
Cardiorespiratory	a.	a.	.025 (.904)	.291 (.100)	.518 (.001)	.194 (.229)	b.
Musculoskeletal Inpatients (Orthopedics)	a.	a.	.589 (.002)	.536 (.001)	.254 (.134)	.388 (.013)	.401 (< 0.001) (n=140)
Neurological	a.	.787 (< 0.001)	.436 (.029)	.461 (.007)	.531 (.001)	a.	.547 (< 0.001) (n=126)
Musculoskeletal Outpatients	a.	.350 (.073)	.305 (.138)	.162 (.366)	.413 (.012)	a.	.311 (.001) (n=125)
Aggregated core clinical Subject data	a.	.557 (<0.001) (n=54)	.354 (<0.001) (n=100)	.358 (<0.001) (n=132)	.420 (<0.001) (n=144)	.293 (.008) (n=80)	.411 (<0.001) (n=510)

r = Pearson's correlation

a. = No data available for this period

b. = Data not grouped due to significant variability within cohort data based on ANOVA.

NOTE: Numbers of students per cohort are not provided in order to maintain cohort anonymity

Table 5.

Relationships between Critical Reflective Task and Assessment of Physiotherapy Practice Scores by subject area and gender.

Critical Reflective Task (by clinical subject)	Assessment of Physiotherapy Practice					
	Female			Male		
	n	r (p-value)	r ²	n	r (p-value)	r ²
Cardiorespiratory	62	.219 (.087)	.048	72	.318 (.006)	.101
Musculoskeletal Inpatients (Orthopaedics)	62	.325 (.010)	.106	72	.441 (< .001)	.194
Neurological	56	.464 (< .001)	.215	65	.607 (< .001)	.368
Musculoskeletal Outpatients	56	.295 (.027)	.087	65	.374 (.002)	.140

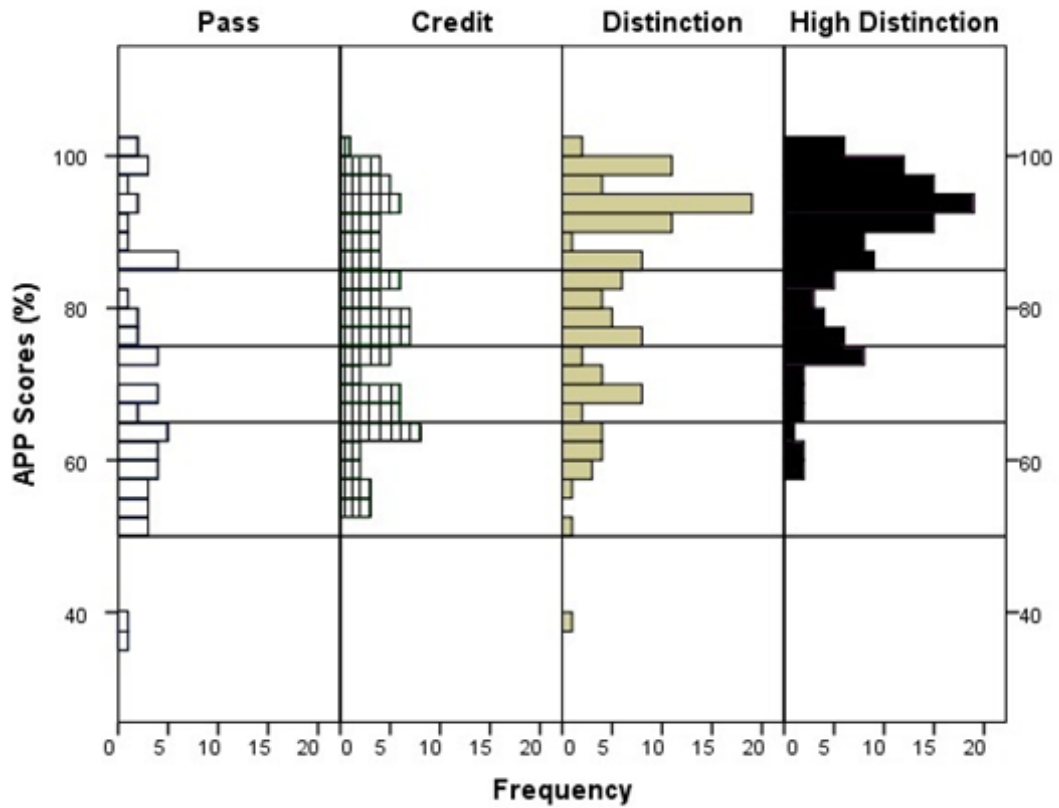
n= number of participants

r = Pearson's Correlation

r²= Squared correlation coefficient

Figure 1.

The distribution of Critical Reflective Task results for each rank grade against the Assessment of Physiotherapy Practice scores.



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