Thank you for using the University at Albany’s Interlibrary Loan Service

NOTICE WARNING CONCERNING COPYRIGHT RESTRICTIONS

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted material. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specific conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement. This institution reserves the right to refuse a copying order if, in its judgment, fulfillment of the order would involve violation of copyright law.

Questions?

Call 442-3613 from 10:00 ~ 4:30 (weekdays)

or

Send email to libill@albany.edu
Providing opportunities for student self-assessment: the impact on the acquisition of psychomotor skills in occupational therapy students

Julie Jay & Antonette Owen

To cite this article: Julie Jay & Antonette Owen (2016) Providing opportunities for student self-assessment: the impact on the acquisition of psychomotor skills in occupational therapy students, Assessment & Evaluation in Higher Education, 41:8, 1176-1192, DOI: 10.1080/02602938.2015.1071317

To link to this article: http://dx.doi.org/10.1080/02602938.2015.1071317
Providing opportunities for student self-assessment: the impact on the acquisition of psychomotor skills in occupational therapy students

Julie Jay* and Antonette Owen

Occupational Therapy Department, School of Therapeutic Sciences, University of the Witwatersrand, Johannesburg, South Africa

The Occupational Therapy department at the University of the Witwatersrand in South Africa is responsible for ensuring students achieve psychomotor skill proficiency, as it is an essential component of health care practice. The aim of this study was to determine whether the introduction of opportunities to afford self-evaluation better prepared students for psychomotor skill performance during clinical fieldwork. A quantitative analytical longitudinal design was used with a sample of second-year BSc occupational therapy students from 2007–2010. Self-assessment opportunities were introduced to students in 2009, enabling the comparisons of students’ performance based on Fitts and Posner’s motor skills learning theory. The results indicated that the pre-intervention group demonstrated poor psychomotor skill ability compared to the intervention group, concluding that students require deliberate opportunities to practice self-evaluation skills in their early years of study.

Keywords: psychomotor skills; self-assessment; deliberate practice; feedback

Introduction

Many health care professionals use psychomotor skills in their daily practice; hence, much time is spent on the teaching and learning of these skills within higher education. Psychomotor skills within occupational therapy are one of the important proficiencies needed by therapists in the assessment of a client’s dysfunction. Psychomotor skills’ assessment often requires specific hands-on and standardised methods (American Occupational Therapy Association 2014). Within the psychomotor skill teaching and learning module, most educators will aim for students to have a rudimentary knowledge of the skill, which is often done in a classroom setting. This is to ensure knowledge and skill acquisition before students enter the complex clinical setting (Hodge and Oates 2005; Cole and Wessel 2008). Ensuring students are then ready to safely apply these skills within the clinical setting requires careful assessment of their knowledge and skill performance. This is, however, met with challenges within current higher education contexts, where time and resource demands often outweigh the opportunity for considered assessment processes.

Current higher education demands also require promotion of independent self-evaluation by students, which can be particularly challenging in their initial years of study (Boud, Lawson, and Thompson 2013). Educators who teach psychomotor

*Corresponding author. Email: julie.jay@wits.ac.za

© 2015 Taylor & Francis
skills to students within their early years of study often face the challenge of trying to balance skill proficiency, which requires a high level of teacher dependence, with developing self-evaluation in students. In order to enable the development of both of these, educators need to ensure that assessments are not just used for evaluation purposes but for learning purposes as well. This should ultimately support improved student outcomes as well as an improved student experience (Taras 2002).

This study aimed to understand the most effective method of assessing students’ psychomotor skill proficiency, whilst attempting to support self-evaluation amongst students in the second year of the occupational therapy undergraduate programme at the University of the Witwatersrand (WITS). The departmental lecturers introduced a new process of psychomotor skills assessment in the attempt to facilitate more deliberate practice, feedback and evaluation opportunities amongst students. Data to establish skill proficiency were gathered retrospectively from evaluations written by supervisors of the students’ performance on clinical placement. Data before and after the intervention were used to establish if, by facilitating deliberate practice and specific feedback, student outcomes were improved. This paper will also address the challenges of incorporating self-evaluation skills in students in their early years of study.

Literature review

Occupational therapy scope and the need for psychomotor skill acquisition

Occupational therapy as a profession has a wide knowledge base, and focuses on the performance of everyday activities. In occupational therapy, health is not viewed as the lack of disease but rather being able to participate in meaningful occupations (Dickie 2014). A part of an occupational therapist’s role is to understand what may limit this participation, which is done through occupational analysis. This analysis consists of observing what contextual, task or personal factors impede or promote occupational performance. Dysfunction within a person’s context, body structures and skill will lead to dysfunction in occupation, which will in turn lead to a reduction in well-being and health (Crepeau et al. 2014). Occupational therapy may seem misleadingly simple, but its complexity lies in understanding the issues that influence a persons’ participation, and how to construct interventions that will assist the person in carrying out their life’s occupations (Duncan 2011).

Occupational therapists are required to observe and analyse a persons’ underlying body functions to understand the connections between the various functions that enable or hinder a person’s performance in their everyday occupations. This often requires hands-on psychomotor assessment, which is required to be executed in a standardised way. Psychomotor skills can be understood as the relationship between cognitive functions and physical movement. These skills are demonstrated through the characteristics of physical movement, which include actions which demonstrate fine and gross motor skills. When learning psychomotor skills, individuals progress through the cognitive stage, the associative stage and the autonomic stage as described by Fitts and Posner (1967). Examples of the body functions assessed in occupational therapy include, amongst many, muscle strength, coordination and balance. (American Occupational Therapy Association 2014).

Several general abilities are required for effective assessment and intervention in occupational therapy; namely good observation skills and the ability to produce consistent, accurate and replicable results (Duncan 2011). This requires occupational
to acquire consistent and reliable psychomotor skills with which to carry out these structured assessment techniques, as part of their competencies of being an occupational therapist. As these abilities are integral to the role of the occupational therapist, a substantial part of clinical education is focused on the development of psychomotor skill proficiency. Learning these assessment techniques relies on a mastery of psychomotor skills, which are most commonly practiced in a classroom setting prior to students entering the clinical environment (Hodge and Oates 2005).

**Theories of skill acquisition**

There are several theories around knowledge and skill acquisition, with one of the most recognisable being Bloom’s Taxonomy that identifies three domains of learning: cognitive, psychomotor and affective (Bloom 1956). Most models of skill and expertise also identify different stages of development from novice to expert, with many current clinical education models being variations on these themes (Ericsson 2008). The motor skills learning theory by Fitts and Posner (1967) identifies skill acquisition as requiring an initial increased cognitive load to ensure understanding before automatic skill performance. During the initial stages of skill learning (phase 1 – cognitive), attention is mainly given to understanding and carrying out the task in question. Initial interaction involves a strong emphasis on the cognitive–attentional system with performance being prone to errors. With consistent practice, psychomotor skill speed and accuracy increase and attentional demands are reduced, so enabling the student to move to a second stage, where less cognitive activity is required (phase 2 – associative). The final stage of performance can be described as being autonomous (phase 3 – automatic), where consistent practice results in speedy and accurate performance. This phase often allows for the task to be completed adequately, even when attention is simultaneously dedicated to other tasks such as problem-solving and communication (Fitts and Posner 1967; Wulf 2007).

Whilst transitioning through these stages of skill acquisition, it is understood that students tend to rely on various external (non-student) and intrinsic (student) factors. There is a variety of literature that explores the interaction between these factors; however, it appears there is some reported variability in student-related factors, such as motivation and innate ability, on outcomes (Ericsson 2004; Suksudaj et al. 2012). One would assume that motivation is an essential component in learning motor skills (Yarrow, Brown, and Krakauer 2009); however, it appears students also depend considerably on external (non-student) variants to assist them in their skill acquisition (Willis et al. 2012).

Students require an environment to assist them with learning. Ericsson and colleagues describe deliberate practice and feedback as an essential component in improving current levels of performance. Deliberate practice can be understood as activities organised by educators that are specifically planned to improve current performance levels (Ericsson, Krampe, and Tesch-Römer 1993; Ericsson 2008). The effect of training and feedback for improving performance has been demonstrated in various studies, where students who are given guided practice with feedback show improved ability to assess and diagnose (Ericsson 2004). To promote further skill mastery, this practice needs to be coupled with specific outcomes or proficiencies that the student must attain. This promotes repetitive performance and rigorous assessment and feedback which provide students with the external motivation to master the required skills (Willis et al. 2012).
Educational theorists have identified the need for providing specific conditions for feedback to support a successful outcome. Students are said to require knowledge of the standards, which then enables them to compare the set standards to their own work. Lastly they should take action to close the gap between the standards provided and their own work (Sadler 1989; Rust, O’ Donovan, and Price 2005). These sets of standards are also influenced by time. Feedback during the event, or too soon or too late after the event, renders it useless, as students have not had time to process the information or have lost interest. Timing is also influenced by contexts and resources, which may limit the educator in facilitating timely feedback (Rust, O’ Donovan, and Price 2005). The literature supports that educators should create opportunities for deliberate practice and feedback, thereby allowing students to make the necessary changes to improve their performance (Ericsson 2008).

The literature highlights evidence to support student performance which is fairly reliant on teacher dependence. This provides some contradiction with popular higher education practice of decreasing teacher dependence, so enabling the student to take more of a lead in managing and evaluating their own learning. Evidence does, however, suggest that being able to monitor and evaluate their own performance is a skill like any other that requires time and practice to develop (Boud, Lawson, and Thompson 2013). Certain conditions are needed for self-evaluation to develop; specifically for students in their early years of study who are too inexperienced to judge their own performance (Boud and Falchikov 1989). Once-off self-assessment is unlikely to build the ability for self-evaluation, as students require continuous opportunities and engagement to develop this skill (Taras 2002; Boud, Lawson, and Thompson 2013). These opportunities initially need to be provided by teaching staff to assist students in developing the skill of self-evaluation.

**Putting theory into practice**

The occupational therapy department at WITS adopted a problem-based learning approach in year one to four of the undergraduate curriculum in 1995. Problem-based learning is a specific teaching method in which the solving of a problem establishes the learning objectives as directed by students (Kahn and O’ Rourke 2005). This approach aims to promote skills such as self-evaluation. It involves a variety of learning opportunities, such as skills laboratories and enquiry seminars, to compliment the solving of the ‘problem’ (Savin-Baden and Howell Major 2004). In the spirit of self-directed learning, the second-year occupational therapy students, once given these learning opportunities, were left to manage their own consolidation of the psychomotor skills and their concurrent learning objectives. Time was allotted in the timetable for self-directed study and practice of the psychomotor skills, with access to lecturing staff and videos for reference if they needed. Students were also provided with an assessment manual to assist them in learning and performing the principles of each specific assessment.

However, it became apparent that students, in this early stage of their studies, did not have the ability to manage their own time as well as evaluate their own performance. Students were becoming overwhelmed on clinical placement, as they were too reliant on the use of the assessment manual, rather than performing the psychomotor skills more independently. Students were using the clinical placement to improve their cognitive knowledge of the skill, rather than developing skill
mastery to enable other proficiencies. In 2009, the lecturing staff introduced more specific opportunities to promote deliberate learning and feedback, and so to aid the students in their ability to evaluate their skills. It was anticipated that this approach would promote better student competence and overall outcomes. It was hoped that an intervention of this nature would also instil more confidence within the students, which would assist them in transitioning into the clinical environment (Duvivier et al. 2012).

**Ethical practice requirements**

It must be noted that the exploration of student competence also follows an ethical theme. Students who are not sufficiently equipped with the appropriate psychomotor skills can compromise patient safety when assessing them in a clinical setting. Students who are too reliant on additional aides, such as an assessment manual, in performing psychomotor skills demonstrated reduced speed and efficiency. This can compromise their ability to meet the requirements of the clinical placement in a timely manner, which then leads to anxiety. An anxious student can lead to high levels of anxiety in a patient as a result of counter transference.

It is, therefore, an ethical obligation of the WITS occupational therapy department to ensure that students are sufficiently prepared before they go on fieldwork. The work of Tabi and Mukherjee (2003) identified that clinical fieldwork programmes should show some value to all partners, and students must be made aware of their own responsibility in this partnership. We recognise that students may primarily be focused on their own learning, and may require support and guidance about how their learning objectives and experience fit into the larger context of the partnership. The credibility of the WITS educational programme and the occupational therapy profession as a whole was at stake.

**Problem statement**

Feedback from supervisors indicated that second-year occupational therapy students were unable to competently perform physical assessments when in the clinical setting. In an attempt to improve student performance, opportunities for deliberate practice and feedback were introduced in 2009 in the teaching and learning of psychomotor skills in a bid to improve students’ ability to evaluate their own performance. This required students to demonstrate skill proficiency to lecturing staff in all psychomotor assessment skills prior to carrying out these assessments within a clinical setting. But it was unknown whether this intervention was facilitating an improvement in student performance.

**Aim of this study**

To determine whether introducing self-evaluation opportunities for students, through the introduction of a psychomotor skills proficiency test prior to fieldwork, better prepared students for entering the clinical fieldwork environment.
Objectives

(1) To compare student performance before-and after the introduction of the psychomotor skills proficiency test, based on the qualitative comments from their clinical supervisors.

(2) To determine whether a psychomotor skill proficiency test better prepares students for clinical fieldwork, compared to students who were not required to demonstrate psychomotor skill proficiency prior to attending fieldwork.

Methodology

This study comprised of a retrospective record review, incorporating content analytic principles to establish change before and after the intervention. The supervisor comments were collected and analysed to answer the research question (Kielhofner 2006). The study population identified for this study included all second-year BSc occupational therapy students from 2007–2010 who passed their second year. This was to enable a two-year comparison cohort before and after the intervention.

Ethical permission was granted by the Human Research Ethics Committee (M140864). Ethical requirements stated that the students’ evaluations that were going to be analysed had to be limited to those that had graduated from the university since the commencement of the study, so that the results would in no way influence student pass rates and evaluation of performance.

The intervention

This study considered the performance of second-year occupational therapy students during their fieldwork, with a particular focus on their assessment skills within the physical domain.

At the time of this study, physical assessment skills were taught to the second-year occupational therapy students over a 47 hour block, which included small group problem-based learning sessions, enquiry seminars, skills laboratories and self-study time. Students were given four cases or problems to solve, and then taught how to carry out the corresponding physical assessment skills. This was supported by them having access to a paper-based manual as well as lecturing staff when needed. Prior to 2009, students were responsible for consolidating their own knowledge and ability in terms of carrying out psychomotor skills. Other than a written test, they were sent out on fieldwork without any assessment of their proficiency to perform the psychomotor skills. They were required to perform the assessment on the client, with feedback from a supervisor when possible, and then tested on their proficiency in their psychomotor skills after fieldwork was completed.

An opportunity for deliberate practice

A psychomotor skills proficiency test was introduced in 2009 to assist with the ethical concerns that students were not prepared for client contact. In this approach, following completion of the teaching programme, all students had to undergo a psychomotor skills proficiency test as a prerequisite to attending fieldwork. Students
were required to achieve an 80% pass rate. If a student did not achieve the pass mark on specific psychomotor skills they could then practice the skill, and were given a second opportunity to be retested the following day. This process continued until an 80% pass mark was achieved. Students were not allowed to attend the first block of fieldwork until they achieved the 80% pass rate. They would then receive a grade of ‘0’ for one of their fieldwork placements. It was anticipated that this requirement would facilitate the deliberate practice time that students appeared to be lacking.

**Feedback**

During this psychomotor skills proficiency test, students have to perform specific assessments on each other, and their performance is rated by lecturing staff in a round-robin format. Each assessment has its own evaluation rubric, depicting the principles that are unique to that specific psychomotor skill. These rubrics were developed by the physical occupational therapy team at WITS (see Appendix 1). As each student’s performance is individually rated on the rubric, feedback with regards to their performance is individualised, and they have this as a reference for further improvement.

**Evaluation of psychomotor skills on fieldwork**

Students are evaluated on their psychomotor skills and core clinical skills by university supervisors during fieldwork. This evaluation covers key skills and behaviours, such as therapeutic and interpersonal relationships, professional behaviour, clinical skills and specific psychomotor skills. Supervisors use an evaluation form that rates key skills on a seven-point Likert-type scale, which are then summed for the overall fieldwork competency mark. Under each skill area, there is space for qualitative comments to be written down by the fieldwork supervisor, which are then summarised into a ‘strengths and weakness table’ at the end of the form. This is to assist with giving feedback to the students to assist with improving performance.

**Data collection**

Initially the researchers collected year-end marks of the pre-intervention group (pre-2009) and the intervention group (post-2009), to enable parametric testing on the normally distributed data to ensure the two comparison groups were similar. The researchers then collected the supervisor comments on the strengths and weakness table from each student evaluation form.

**Reliability**

Reliability is typically related to how circumstances under which data were collected effect the accuracy of the data obtained (Kielhofner 2006). The data collection categories were predefined on an existing model. A structured matrix of analysis was formulated on the three stages (cognitive, associative and automatic) of Fitts and Posner’s motor learning model. All the data pertaining to psychomotor skills were reviewed for content and coded for association with the identified categories (Polit and Beck 2004). The two researchers devoted substantial time familiarising
themselves with the theory and model constructs in the early stages of the study. To further enhance reliability of data collection, they devoted specific time to come together and agreed through discussion on the allocation of each supervisor comment to the appropriate category.

The researchers collected the student marks through accessing the universities administrative marks system, where all student marks are kept on an online database. This supported accuracy of data collection, as the rigorous uploading method requires checking by three separate staff to confirm the correct student mark is recorded.

**Data analysis**

The researchers initially had to clean up the data, by removing repeating students so as not to influence the results. The raw data were initially grouped based on year of study, and then all supervisor comments were transcribed onto the database.

Comparative data analysis in educational research poses considerable challenges, as extraneous variables carry considerable influence. Small class sizes and the challenge of not having a truly randomised group often lead to the unsatisfactory outcome of no statistical significance (Barnard Ashton, Koch, and Rothberg 2014). Whilst the researchers would have liked to compare student grades, the data available could not isolate improvement based solely on the intervention. As a result, the researchers simply chose to identify a change in performance by counting the passes and failures in each cohort group, and comparing them from before and after the intervention.

As some of the supervisor comments pertained to other clinical skills, such as professional behaviour and interpersonal skills, the researchers created additional codes and categories, based on the principles of inductive content analysis. These ‘outliers’ were transcribed separately from those pertaining to psychomotor skills and given their own codes. However, for the purposes of this paper, only the information pertaining to psychomotor skill proficiency will be discussed.

**Supervisor comments analysis**

Using a deductive approach, the researchers identified comments in the data pertaining to psychomotor skills learning. Through interpretation, the researchers allocated the supervisor comments to one of the three stages based on the structured matrix of Fitts and Posner’s motor learning model. The first category of this model describes the cognitive stage of learning a motor skill, and carries descriptors around movements being slow, inconsistent and inefficient, as well as being mostly consciously controlled (Fitts and Posner 1967; Wulf 2007). The researchers interpreted comments from clinical educators that closely fitted with these descriptors. These included comments that specifically related to motor skill, such as ‘poor speed of assessments’, ‘poor skill in assessment’ and ‘poor physical handling’. The researchers also deduced that certain comments relating to other aspects of the task, such as the ‘poor ability to interpret the assessment findings’ and ‘difficulty in accurately observing the clients performance’ would also fit into this category. This was supported by the literature identifying that students are unable to divide their attention to other aspects of the task, if they are too cognitively occupied with the actual process of doing the skill which requires considerable attentional capacity (Wulf 2007).
The second stage of Fitts and Posner’s model, the associative stage, describes motor movement as being fluid, reliable and efficient, where only some parts of the movement are controlled consciously with some aspects being controlled automatically. Less cognitive activity is therefore required. The researchers reasoned that at this stage students should be demonstrating increased speed and accuracy in performing the assessment, and this increased knowledge of the assessment process should enable the student to identify accurate observations and direct more attention to other aspects of performance (Fitts and Posner 1967; Wulf 2007). Students may still have difficulty adapting the assessment to the client, as well as summarising and reasoning through the most important observations made whilst assessing the client. Examples of comments in this category included, ‘good/adequate knowledge of assessment’, ‘comprehensive assessment’ and ‘good observation skills’.

The third stage of the organisation matrix included descriptors from the autonomous stage of motor learning. At this stage, motor skills should be performed mostly automatically, where movement execution requires little attention and is accurate, consistent and efficient (Fitts and Posner 1967; Wulf 2007). The researchers reasoned that, along with the demonstration of this automatic movement, students can therefore start to demonstrate reasoning skills, where they are focusing their cognitive activity on interpreting what they have observed, as well as efficiently being able to adapt the assessment technique to the client. Comments included ‘good interpretation of assessments’, ‘student integrates theory and practice’ and ‘good ability to identify and interpret what you assess’.

Results

Student marks, similarity of cohorts

Based on the probability value (0.94 > 0.05) established using the Student t-test for unequal groups, the pre-intervention group and intervention group were comparable. This was so as there was no significant difference between the groups for overall academic performance with a mean year-end mark of 62.87, and a small standard deviation of 0.06. Hence, the two groups could be compared for before and after the intervention of introducing the psychomotor skills assessment test. The researchers then observed the differences between the pass and failure rate between the two cohorts (see Table 1). It was noted that before the intervention, there was an average of a 90.3% pass rate, whereas after the intervention there was a 100% pass rate overall.

Table 1. Summary of pass/failure rate 2007–2010 second-year B.Sc occupational therapy students.

<table>
<thead>
<tr>
<th></th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>Total students per year</td>
<td>41</td>
<td>52</td>
</tr>
<tr>
<td>Failures on FW per year</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>% per class that passed</td>
<td>84.4</td>
<td>94.3</td>
</tr>
<tr>
<td>% per class that failed</td>
<td>14.6</td>
<td>5.7</td>
</tr>
<tr>
<td>Pass rate</td>
<td>90.3%</td>
<td></td>
</tr>
</tbody>
</table>
Supervisor comments cognitive skills

The researchers identified comments made regarding students’ performance pertaining to motor skills learning, and allocated the comments to one of the three categories described by Fitts and Posner’s motor learning model. This data was then analysed using descriptive quantitative analyses using frequencies and percentages (see Figure 1).

Cognitive stage

Pre-2009, the majority of the comments, 67.3% (68 of 101 comments) fell within the cognitive stage. After the intervention (2009), 26.5% (17 of 64) of comments fell into the cognitive stage, supporting the theory that, if students are too cognitively occupied with the actual process of doing the skill, the supervisors felt they were unable to move onto the next stage to start interpreting what they are seeing.

Associative stage

Pre-2009, limited comments, 22.7% (23 of 101 comments), fell into the associative stage. Post-2009, the majority of the comments, 54.6% (35 of 64 comments), fell within the associative stage. It was apparent that the supervisors identified that students in the intervention group demonstrated increased speed and accuracy in performing the assessment. This increased knowledge of the assessment process enabled the students to identify accurate observations. Due to the increased automatic nature of skill, more attention can be directed to other aspects of performance (Wulf 2007).

Autonomous stage

Pre-2009, even less of the comments, 9.9% (10 of 101), fell within the autonomous stage. However post-2009, 18.75% (12 of 64 comments), fell within the autonomous stage.
stage. At this stage, motor skills should be performed mostly automatically, where movement execution requires little attention and is accurate, consistent and efficient. The researchers reasoned that, along with the demonstration of this automatic movement, students can start to demonstrate clinical reasoning skills, where they are focusing their cognitive activity on interpreting what they have observed, as well as efficiently being able to adapt the assessment technique to the client (Boyt Schell and Schell 2008).

Discussion

From the study, it is apparent that students’ performance of psychomotor skills during physical assessment tended to show improvement when they were given opportunities to ensure deliberate practice as well as feedback. More than half the total comments (67.3%, 68 of 101 comments) on students’ behaviours fell within the cognitive stage of motor learning prior to the intervention. Most students were not able to accurately evaluate whether they were skill proficient before attending fieldwork. This jeopardised their learning opportunity in the clinical setting, as they were using this opportunity to gain knowledge of the skill, rather than allowing for the other learning opportunities offered. This supports the literature, which identifies that students in their early years of study require support in managing their self-evaluation through planned activities to facilitate practice (Boud and Falchikov 1989; Boud, Lawson, and Thompson 2013). It can also be reasoned that extrinsic factors, such as setting parameters to ensure deliberate practice, are essential as motivation and other intrinsic student factors to practice newly learnt skills do not guarantee student success (Suksudaj et al. 2012).

With the introduction of the psychomotor skills proficiency test, there was a shift from the majority of supervisor comments falling in the cognitive phase to 54.6% (35 of 64 comments) falling within the associative stage. The performance of the psychomotor skill is starting to occur at a subconscious level. This allowed the students to focus on the development of observation skills, adapting the assessment to the patient and the context. This supports the literature in highlighting that, by having skill proficiency, there is further prospect for metacognitive processes to occur (Willis et al. 2012). With the introduction of the psychomotor skills proficiency test, students were mandated into practicing the skill as the implications of not being skill proficient had serious consequences on their opportunity to attend fieldwork, and ultimately their final grade. Expert performance can be linked to participation in activities designed by teachers to improve performance. These deliberate practice interventions also allow for further opportunities for feedback which the students so value, allowing students to consolidate their skill through repeated performance and self-evaluation (Ericsson 2008).

Student feedback has been highlighted as an essential element in ensuring learning, and is also an area of great importance identified by students (Taras 2002). The evaluation rubric, designed by the teaching staff, based on the assessment principles taught in the skills laboratories, allowed for transparency in the assessment process. This aided learning by providing consistent feedback (Reddy and Andrade 2010). Sadler developed well-known parameters for ensuring that feedback results in a learning experience; students require: (1) knowledge of the standards, (2) they need to compare standards to their own work, and then (3) they need to take action to close the gap (Sadler 1989; Rust, O’ Donovan, and Price 2005). In support of these
parameters, the rubrics are made available to students before the psychomotor skills proficiency test. Students are then aware of the parameters of the assessment and can prepare accordingly. Awareness of the proficiencies required allowed students more opportunity to self-evaluate their skill against the criteria required. By ensuring each student has their own personalised evaluation on the rubrics, they are also then able to compare the standards to their own work.

An opportunity to ensure that students take the steps to close the gap is facilitated through offering a retest period. This was done on the understanding that, even with deliberate practice, students may still not efficiently be able to self-evaluate their knowledge and performance, and can only act on these ‘gaps’ once provided with feedback. For students who still failed to demonstrate proficiency in the retest, the written rubric provided evidence of where knowledge gaps were perpetuating to assist with further teaching and learning around the skill (Taras 2002).

It must be noted that items on the rubrics only facilitated the knowledge of the psychomotor skill at a cognitive level (see Appendix 1). This was done intentionally to ensure skill proficiency at a basic level was supported within the classroom environment, as it is the clinical environment where further skills around observation, reasoning and adaptation are enabled (Cole and Wessel 2008). Criteria listed on the rubrics were also of low inference, to support understanding by the students and to facilitate reliability between those marking the items (Reddy and Andrade 2010). Provision was, however, made for global rating by the ‘experts’ to assist with evaluating student’s confidence in performing skills.

This study also highlights the challenges experienced with clinical assessment by students when transitioning classroom knowledge and skills into a clinical context. If a student’s attention is focused on simply achieving cognitive mastery of a skill, their chances of developing other essential clinical skills are compromised (Wulf 2007). It is beneficial to view this from the student perspective, where confidence is manifested in the student who feels competent in their psychomotor skill ability, and so has the flexibility to focus on other clinical skills. This then allows for the analysis and interpretation of information, rather than the practice of skill, which may lead to demonstration of the personal attributes, such as communication, reasoning and problem-solving, so valued by educators. By having confidence in their skills of physical assessment of patients, they are more self-confident in their dealings with staff and patients, which may also address the ethical concerns of conserving patient safety (Duvivier et al. 2012).

It must be noted that before and after the intervention, only a small portion of supervisor comments fell within the automatic stage, 9.9% (10 of 101) and 18.75% (12 of 64 comments), respectively. This would be expected of students at this level of study with their first exposure to clinical scenarios. The autonomous stage of psychomotor skill proficiency is representative of the ability to complete the task competently while attention is simultaneously devoted to other tasks such as problem-solving (Wulf 2007). It would be naïve to assume that students would be able to achieve this whilst in the early stages of skill attainment, as it has been proven that these metacognitive skills develop with experience (Boyt Schell and Schell 2008). Studies have identified that gaining expertise in a field is a long process requiring repeated practice and feedback (Ericsson 2008). Students at this stage of learning have simply not had the opportunity for this clinical exposure. Students who do display these attributes possibly possess some innate ability.
Limitations
As this study was carried out retrospectively, there are some limitations that need to be acknowledged. The researchers were limited by what data were available, and could not formulate specific investigations into other comparative issues which may have made the study richer in its depth and understanding of the student experience. It would have been valuable to account for the students’ perceptions towards both approaches; however, the retrospective nature of the research did not allow for this. It must also be acknowledged that the sample numbers are small, as the researchers were limited in their sample group.

Conclusion
This study aimed to ascertain if student performance improved with increased opportunities to facilitate self-evaluation in students. Overall, the results suggest that students demonstrate better proficiency in psychomotor knowledge and skills when given opportunities for self-evaluation, through deliberate practice and feedback. These interventions possibly assisted students in ensuring improved cognitive knowledge of the skill. This may then allow them the opportunity to develop more advanced skills such as problem-solving, reasoning and integration of information. Whilst this intervention predictably improved students’ performance overall, as has been confirmed by other studies on this topic, it does present with supporting evidence from a novel context in higher education. The findings of this study emphasise the importance of encouraging self-evaluation in students’ throughout their university career.

It is important to note that this is a specific professional skill that needs to develop with practice. Students require deliberate opportunities to practice this skill in their early years of study, and possibly in the learning of novel psychomotor skills throughout their educational journey. Future research into students’ perceptions of deliberate opportunities for self-evaluation and the impact on student outcomes would provide valuable information in supporting educational practices. Further reliability and validity testing of the marking guidelines would also aid in supporting more accurate assessment and evaluation of student performance.

Disclosure statement
No potential conflict of interest was reported by the authors.

Notes on contributors
Julie Jay is a lecturer in the Department of Occupational therapy, School of Therapeutic Sciences, University of the Witwatersrand. Her special interests are teaching and learning in higher education health sciences and Occupational Science. Her publications include “Problem based Learning – a review of students’ perceptions in an Occupational Therapy Undergraduate curriculum, South African Journal of Occupational Therapy, 2014”.

Antonette Owen is a tutor in the Department of Occupational therapy, School of Therapeutic Sciences, University of the Witwatersrand and also a reviewer for the South African Journal of Occupational Therapy and Australian Journal of Occupational Therapy. Her special interests are Occupational Science and adult physical rehabilitation. Her publications include Factors influencing model use in occupational therapy, South African Journal of Occupational Therapy, 2014.
References


Appendix 1. Example of evaluation rubric

Psychomotor skills proficiency test marking guideline

Name: Date: 

A) Muscle strength

<table>
<thead>
<tr>
<th>Task</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greets the patient</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Explain what you are going to do</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Move the joint though a passive Range Of Motion to establish if there is full Range</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>First test muscles against gravity, but if unable then re-position to gravity eliminated plane</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Stabilize the client proximally to the movement</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Ask / demonstrate the movement for the client to perform</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Observe and palpate</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Apply resistance if appropriate</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Grade muscle strength</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Gives adequate feedback</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Total /20

Bonus mark Question (N/A if student scores full marks above)

| Knowledge of precautions:                                           | 1    | 0    |
| Do not apply resistance to newly sutured tendons/ amputations.      |      |      |
| Do not over fatigue Guillaine Barre/ muscular dystrophy clients.    |      |      |
| Do not move the joints / test muscle strength over joints that have recently been grafted. |      |      |
| Be aware of increasing tone                                         |      |      |
| No “break techniques” for cardiac clients.                          |      |      |

B) Global rating

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>The student performed the skill competently and confidently</td>
<td>5</td>
</tr>
<tr>
<td>Good</td>
<td>The student performed the skill competently but still appeared a bit uncertain</td>
<td>4</td>
</tr>
<tr>
<td>A bare pass</td>
<td>The student was barely competently but was able to answer questions and/ or identify mistakes</td>
<td>3</td>
</tr>
<tr>
<td>Fail</td>
<td>The student was not competent. He/ she went through the motions but unable to identify mistakes and/ or answer questions</td>
<td>2</td>
</tr>
<tr>
<td>Bad Fail</td>
<td>The student got a few steps right but was confused and disoriented.</td>
<td>1</td>
</tr>
</tbody>
</table>

Total /25 x 4 = %

Circle = Pass Fail

Downloaded by [University of Georgia] at 10:11 27 October 2017
## Assessor scoring guidelines

<table>
<thead>
<tr>
<th>Good</th>
<th>2</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(a) greeting the patient by saying hello and introducing self</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) Explaining procedure by using terminology appropriate to pt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c) Automatically explains to lecturer what s/he is observing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(d) Demonstrates assessment principles automatically</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average</th>
<th>1</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(a) Just saying hello</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) Explaining procedure using jargon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c) Needs prompting by lecture to report on observations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(d) Needs prompting regarding assessment principles e.g. “are you forgetting anything...”</td>
</tr>
</tbody>
</table>

| Poor | 0 | No demonstration even after prompting |