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Article title

Impact of placement type on the development of clinical competency in speech language pathology students

Abstract

Background: Speech language pathology students gain experience and clinical competency through clinical education placements. However, currently little empirical information exists regarding how competency develops. Existing research about the effectiveness of placement types and models in developing competency are generally descriptive and based on opinions and perceptions. The changing nature of education of speech language pathology students, diverse student cohorts, and the crisis in finding sufficient clinical education placements mean that establishing the most effective and efficient methods for developing clinical competency in students is needed.

Aims: To gather empirical information regarding the development of competence in speech language pathology students, and to determine if growth of competency differs in groups of students completing placements which differ in terms of caseload, intensity and setting.

Methods & Procedures: Participants were students in the third year of a four year undergraduate speech language pathology degree, who completed 3 clinical placements across the year and were assessed with the COMPASS® competency assessment tool. Competency development for the whole group across the three placements is described. Growth of competency in groups of students completing different placement types is compared. Interval level data generated from the students' COMPASS® results were subjected to parametric statistical analyses.

Outcomes and Results: The whole group of students increased significantly in competency from placement to placement across different placement settings, intensities and client age groups. Groups completing child placements achieved significantly higher growth in competency when compared to competency growth of students completing adult placements. Growth of competency was not significantly different for students experiencing different intensity of placements, or different placement settings.

Conclusions and Implications: These results confirm that the competency of speech language pathology students develops across three clinical placements over a one year period regardless of placement type or context, indicating that there may be transfer of learning between placements types. Further research investigating patterns of competency development in speech language pathology students is warranted to ensure that assumptions used to design clinical learning opportunities are based on valid evidence.

What this paper adds

What is already known on this subject

Completing clinical education placements is an important part of learning to be a speech language pathologist. It is assumed that students need to complete placements with a variety of caseloads, intensities and in a range of settings to develop entry-level competence. However current practice has largely been based on opinion and perceptions regarding the effectiveness of clinical placements and research investigating these assumptions is lacking.

What this study adds

This exploratory study is the first in speech language pathology to use empirical data to investigate the development of competency in students, and the impact of different placement types on this development. Caseload was found to have a significant impact on the development of competency, but intensity and setting did not. These results challenge some of the existing opinions and perceptions about the impact of caseload, intensity and setting on competency development. Further research regarding the effectiveness of clinical placements is indicated.

Introduction

There is little evidence available about how allied health students develop clinical competence. Hence allied health curricula are typically designed based on tradition and practical wisdom. This is becoming increasingly problematic across various countries as difficulties in finding appropriate high quality clinical placements are increasing, due to factors such as increases in student numbers, pressures on health systems and changing expectations of new graduates (L. McAllister *et al.* 2010). Internationally, availability of placements and appropriately experienced clinical educators are some of the factors that have the highest influence on choice of clinical education models adopted in speech language pathology curricula (Sheepway *et al.* 2011). These influences require clinical learning opportunities to be increasingly efficient and effective in developing clinical competence. This research aims to contribute to the knowledge base by adding information about how speech language pathology students develop clinical competence over a 12 month period of varying clinical experiences. Specifically we examine how competency develops over time and compare competency development across different clinical placement types and contexts.

Competence

Clinical competence has been defined and conceptualized in different ways, depending on the purpose and context, and the understanding of the nature of competence espoused (Eraut 1994, Gonczi 1994). Nevertheless, competence is

generally understood as a construct that allows health professionals to perform the tasks and roles of the profession in real world contexts (Hager and Gonczi 1996). Most definitions view competence as consisting of knowledge including propositional knowledge (theories and concepts, practical principles) (Eraut 1994) and tacit knowledge (knowledge that we cannot explain easily) (Epstein and Hundert 2002). Definitions also include skills such as problem-solving, communication and pattern-recognition (Hager and Gonczi 1996) as components of competence. However, whilst most definitions agree there is a third component, this is where the definitions differ (Fernandez *et al.* 2012). This intangible component is viewed as personal abilities, or a combination of attitudes and values. These different understandings give rise to three differing constructs of competence: the behaviourist, generic and integrated constructs. The differences between the constructs are important for the way that competence is seen to develop.

The behaviourist construct views competence as set of behaviours that can be observed in the completion of tasks (Norris 1991). This reductionist approach breaks down competence into discrete, easily measurable tasks. It doesn't take into account the interplay between tasks, attributes that contribute to performance or complexities involved in the real world of the practice of health professionals (Gonczi 1994, Norris 1991). In contrast, the generic construct views competence only as the underlying attributes and abilities that are needed for performance. Competence is seen as a psychological construct and includes affective and cognitive skills. Competence is thought to be independent of context (Gonczi 1994). This construct only recognizes the underlying attributes and neglects that professional practice involves performance of actual tasks.

The third conception, called the integrated or holistic approach conceptualizes competence as an interweaving of attributes (knowledge, attitudes, values and skills) with the particular tasks and contexts of professional practice (Epstein 2007, Epstein and Hundert 2002, Gonczi 1994). It brings together the attributes of the individual and other elements needed for competent performance (e.g. ethics, reflection) with the tasks that need to be performed, and recognizes that there is more than one way to perform competently (Gonczi 1994). This construct is the one adopted by the Speech Pathology profession in Australia and underpinned the development of COMPASS® (McAllister *et al.* 2006), the student competency assessment tool used in all Australian professional preparation programs.

Speech pathology competency is conceptualised as arising from combinations of knowledge, skills and personal qualities that contribute to sets of occupational and professional competencies that combine to create competent professional performance (McAllister, 2006; S. McAllister et al 2010, 2011). Therefore, this is the construct of competency used in this research.

Competency Development

The development of competence within speech language pathology is viewed as existing on a continuum from 'novice' to 'expert' with an accepted 'entry level' standard being an agreed point on that continuum (Eraut 1994, McAllister *et al.* 2011). 'This 'entry-level' point divides professionals into categories of either qualified or not qualified to practice, as opposed to being 'competent' or 'not competent' (Eraut 1994). In the development phase of COMPASS®, speech pathologists strongly

confirmed that they believe competence exists on a continuum. The same research also found that levels of performance in students increased with increasing experience, confirming a developmental notion of competency development (McAllister *et al.* 2011).

The descriptors used to rate performance with COMPASS® are derived from an integration of three developmental models. First, that as students move along the continuum they develop in terms of their experience with and ability to deal with complexity (Anderson 1988, Benner 1982, Biggs and Collis 1982). Second, as students progress they move from needing support to understand the clinical situation and draw conclusions about a client (Benner 1982), to identifying the meaningful aspects of a situation and integrating this with their own experiences to generate conclusions and solve problems (Benner 2004, Biggs and Collis 1982). Third, the supervision needs of the students also change from being heavily reliant on the supervisor to taking increasing responsibility for their own learning needs, and eventually to self-supervision (Anderson 1988).

The notion of a developmental continuum is often used in nursing (Benner 1982, Benner 2004) and allied health (Oldmeadow 1996, Spalding 2000) to describe stages of competency development. However, these models do not describe how competency actually develops. A model of the development of expertise has been described in the medical education literature. This model focuses on the way that knowledge is stored, used and retrieved (Van Der Vleuten 1996) as expertise develops. Novice students store information in causal (or semantic) networks, organised by causes and consequences of illnesses (Schmidt *et al.* 1990). These networks become more complex and elaborated as more knowledge is developed

(Schmidt *et al.* 1990). As new knowledge is acquired it is embedded into these networks. It is difficult to embed this new knowledge if there is no existing information to link to (Schuwirth and van der Vleuten 2011). With clinical experience, illness scripts develop (Schmidt *et al.* 1990). This represents a shift from causal networks to organization of knowledge around clinical and contextual information (Van Der Vleuten 1996). Illness scripts organise the information into a specific order and allow easy activation of information at appropriate moments (Van Der Vleuten 1996). As further experience develops these illness scripts are supplemented with instance scripts which are further elaborated and contextualised representations of the knowledge (Schmidt *et al.* 1990, Schuwirth and van der Vleuten 2011). In essence, the development of expertise is seen as developing from a knowledge base acquired from academic learning to a non-analytical ability to handle clinical situations efficiently based on illness scripts developed from clinical experience (Van Der Vleuten 1996).

These models have been used as a framework for clinical education curricula, and preliminary evidence exists to support the framework as a model for developing expertise in speech language pathology (McAllister *et al.* 2011). However, evidence to support developmental models of competency in students is largely lacking (Dall'Alba and Sandberg 2006). Most applications and descriptions of these models are focused on the *expert stage* (Hargreaves and Lane 2001), and little description of the earlier stages exist, particularly at the pre-entry level stages. Specifically, it is not known how a student progresses along the continuum, nor what prompts the progression from one stage or level of competency to the next (Gobet and Chassy 2008, Kinchin *et al.* 2008). Clinical experience, complexity and familiarity of caseload

have been proposed as factors, but their influence is unknown (Benner 2004). These descriptions of competency development do not discuss whether competency regresses in new situations, nor whether competency transfers to new situations or contexts (Hargreaves and Lane 2001).

Learning Transfer

Most allied health curricula assume that competency may not transfer across clinical contexts. For example it is not assumed that a student who can work competently with children is able to work competently with adults. The nature, context and frequency of learning transfer has been the subject of considerable research and debate, however, little agreement has been reached about how, when and, most importantly, whether it actually occurs (Barnett and Ceci 2002).

The classic definition of learning transfer is the ability to apply knowledge or skills gained in one situation to another (Nokes 2009). This behaviourist definition views learning as the accumulation of knowledge and components of skills. Transfer is therefore the extent to which knowledge and skills are utilized in another situation (Collins *et al.* 1992). Research regarding performance of medical students on a clinical case has been found to be only weakly predictive of performance on another (Eva 2003, Wimmers *et al.* 2007). This lack of transfer has been referred to as 'case-specificity' or 'content specificity' (Dory *et al.* 2010, Norman *et al.* 2006) and sometimes is the basis for assumptions about the assessment of competence in medical education.

Assessments of clinical performance that reinforce this view of transfer and competence are typically 'one shot' assessments (Schwartz *et al.* 2012), conducted

through structured assessment tools that are remote from clinical practice. They tend to have predefined parameters of correct or successful performance (Engle 2012). These assessments include the Objective Structured Clinical Examination (OSCE) (Kreiter and Bergus 2007) where students are required to move through a series of stations that assess clinical skills. These may include a Simulated Patient (SP) (Wimmers and Fung 2008) or high-fidelity simulations (Sibbald *et al.* 2011). The assessments typically utilise checklists which have been found to have low reliability, and reward thoroughness rather than increasing levels of developing competence (van der Vleuten *et al.* 2010). Measurement error unrelated to case characteristics has also been proposed as an influential factor in the apparent existence of case-specificity (Kreiter 2008, Kreiter and Bergus 2007, Mattick *et al.* 2008). This view of learning transfer is limited to looking at skills and knowledge in isolation, which ignores context and does not allow students to utilize tools typically available in clinical contexts to aid performance (e.g. colleagues, textbooks, literature) (Bransford and Schwartz 1999). They generally do not reflect the understanding of competence consistent with the holistic and integrated construct.

Some authors believe the term 'transfer' and the classic definition is misleading. Instead they argue that it is the expansion and transformation of prior knowledge through experiencing new contexts and situations (Hager and Hodkinson 2009). The focus is shifted from replication to the facilitation of, and preparation for, future learning (Bransford and Schwartz 1999, Hager and Hodkinson 2009). Transfer is greater when students are better prepared for future learning (Bransford and Schwartz 1999), and transfer may not be evident until the opportunity to learn new information in a new environment occurs (Lobato 2006). Signs of positive transfer

that may be hidden in the classic view of transfer may be more evident through the expansion and transformation perspective (Bransford and Schwartz 1999).

An understanding of learning transfer is an important aspect of understanding clinical learning and the development of competency. Due to the lack of research in this area in the health professions, the nature of, and influences on learning transfer are as yet unknown. A valid and reliable assessment of performance that is consistent with the holistic and integrated conception of competence is required to investigate this phenomenon. The current study will address these issues through the use of the COMPASS® (McAllister *et al.* 2006) competency assessment tool.

Placement Types and Models

As there is little evidence available to determine whether competency transfers, speech language pathology curricula and professional accrediting bodies take a conservative approach and require students to demonstrate entry level competence with a range of adult and child caseloads and in a range of clinical placement settings (SPAA 2001). Therefore, students have to be exposed to a range of experiences and placement types throughout their education. The placement types used most often in speech language pathology are the traditional placement models such as block placements in which students attend the placement site for more than 2 days per week, weekly placements in which students attend the clinical placement site for less than 2 full days per week, and rural placements in which students attend a placement site that is outside a major metropolitan centre (Sheepway *et al.* 2011).

The frequent use of these models correlate with the perceptions of University personnel that these models are the most effective for competency development (Sheepway *et al.* 2011). However, these perceptions about effectiveness of placement models have not been explored with quantitative research, nor compared to other models. Some, including the traditional placement models that are perceived as most effective, have not been researched at all.

Within the speech language pathology literature, Brumfitt and Freeman (2007) examined the perceptions of second year students in a postgraduate entry-level degree about a weekly placement in a university-based clinic with adults with acquired dysarthria. Through pre-placement and post-placement focus groups, the authors explored the views and perceptions of the students. Students felt that they had progressed from a focus on themselves to a focus on their clients, gained a sense of mastery through the continuity of the placement, and gained insights into the impact of the communication disorder on the person and the social implications (Brumfitt and Freeman 2007). However, as perceptions only were gathered, it is unknown whether the students actually achieved meaningful growth in competency or whether this growth is comparable with other placement types.

Placement models which have been researched within other allied health disciplines include rural placements, international placements, interprofessional placements, project placements and role-emerging placements (Dubouloz *et al.* 2010, Prigg and Mackenzie 2002, Sawyer and Lopopolo 2004, Thew *et al.* 2008). However, these have largely been studies describing the models, or opinions and perceptions about successful implementation of the models. Studies investigating competency development in the models are lacking.

Studies in the medical education literature have explored the effect of moving clinical experience out of tertiary hospitals and into rural or community sites (Stein *et al.* 2009, Worley *et al.* 2004). Results in final academic and practical exams showed that there were no significant differences between the groups (Stein *et al.* 2009), or that the students in the non-traditional sites actually achieved better results (Worley *et al.* 2004). The exams used as the measure of competency were conducted outside of the placement site and did not assess the students' performance, so their validity may be questionable. However, as this is the usual way that clinical placements are assessed in these programs, further exploration of competency development in non-traditional placement sites is warranted.

Wimmers et al (2006) researched the differences in number of patients and types of conditions seen, as well as the end-of-clerkship exam and assessment of professional performance in medical students across 14 different hospital sites. They found that placement site had an effect on knowledge gained, but that variation in patient encounters had little consequence for student competence. The volume of experience was found to be less important for performance in exams than features of the clinical environment such as repetition of experiences and quality of supervision (Wimmers *et al.* 2006). This study used performance measures, logbooks of experiences, student ratings of supervision quality as well as exams as part of their measures, which better captured the features of the sites as well as competency development, however the validity and reliability of these measures are unknown. Nevertheless, this study identified aspects of placement sites that may be important in competency development.

Summary and research questions

Models describing students' development of competency are prevalent in the literature, but are largely descriptions only. Very little empirical information about these models exists, and specific information about progression through stages of the models or the influences on progression are lacking. Similarly, little quantitative research exists regarding the effectiveness of clinical placements for developing competency, with the literature being heavily weighted towards qualitative research. Existing research is typically based on opinion and perception, or utilizing assessments outside of actual clinical settings. This research aims to contribute quantitative evidence regarding competency development in speech language pathology students, and the impact of placement types on competency development. In this study 'placement type' refers to caseload, setting and intensity of placements. The study uses a valid and reliable assessment of clinical performance. Specifically, the research questions are:

- Does speech language pathology students' competency change in sequential placements?

- Do different placement types influence growth of students' competency?

Method

This study received ethics clearance from the University's Human Research Ethics Committee.

Participants

Participants targeted for this study were students in the third year of a four year undergraduate speech pathology degree, based in a faculty of health sciences. They were recruited during a regular lecture time by the first author who was not known to the students. Students gave consent for the results of their three third year clinical assessments to be accessed and used in the research. Specific demographic information about the students was not collected for the study, to preserve the anonymity of the students.

A total of 73 students gave consent for their data to be used for the research, representing approximately 89% of the total cohort of 3rd year students (N=82). Students whose data could not be found for at least 2 sequential data points were not included in the analysis. There were 13 students who did not have 2 sequential data points available and therefore their data were not included. Missing data was generally a consequence of not being able to locate forms. There were also 4 students who withdrew from the degree during 3rd year. Therefore, the assessment data for 56 individual students was included in the analysis. All of these students passed their placements in 3rd year. Out of these, 49 had all 3 data points available, an additional 1 had Placement 1 to Placement 2 data only (resulting in 50 students for Placement 1 to Placement 2), and an additional 6 students had data available for Placement 2 to Placement 3 only (resulting in 55 students for Placement 2 to Placement 3).

Third year students were recruited for this study because the range of placements completed over the year allowed comparison between placement types.

Additionally there is variability in competence levels between students at this level (McAllister 2006). The COMPASS® tool has a ceiling at 'entry level' competence, so variability in performance is less likely to be detected as students approach the end of their degree in year 4.

Placements and allocation

In this degree, before entering 3rd year, students have limited hands-on clinical experience with normally-developing and communication-impaired children, and have been exposed to case-based learning throughout teaching, assignments and exams from the beginning of first year (reference - has been removed for review).

All students complete three different clinical education placements throughout third year of this degree. One of these placements is a child placement and the other two are adult placements. Students in this study were allocated to placements by university personnel responsible for the management of clinical education in the speech pathology program, using the usual allocation procedures. These typically take into account student availability, previous placements, and proximity of placement site to students' home or the university campus. Students are allocated on the basis of logistical factors, not on academic or clinical performance. The 56 students in this study completed their placements in one of 3 sequences: adult-child-adult (23 students), child-adult-adult (27 students), or adult-adult-child (6 students). The allocation procedures aim for students to complete their placements in a range of workplace settings, but there are no requirements to experience particular placement intensities or settings. That is, students must

complete the two adult and one child placement, but whether the students experience block or weekly placements, or on campus, school, hospital or disability service placements depends on availability of placements within the workplaces. There were no changes to the allocation procedures or other considerations made for the purposes of this study.

Instrument

The COMPASS® competency assessment tool was used as the data collection tool for this study. COMPASS® is a validated workplace-based assessment of speech language pathology students that uses competency based ratings and focuses on observed qualities of performance (S. McAllister *et al.* 2010). It was developed during a four year research process and validated using students from seven Australian universities (S. McAllister *et al.* 2010). COMPASS® is now integrated into all speech language pathology curricula in Australia, New Zealand and Singapore for assessment of entry level competence (Ferguson *et al.* 2010). The statistical properties of the COMPASS® allow it to be used for empirical research (McAllister *et al.* 2006). COMPASS® is used across settings and with novice to entry level students. The assessment is conducted by the student's clinical educator who is a qualified speech pathologist working with the student over a period of time. This allows observation of the student across a range of cases and days, reducing potential effects of internal and external factors that can affect performance.

The competencies measured by COMPASS® include seven Occupational Competencies which were derived from the Competency Based Occupational

Standards – Entry Level document (CBOS) (SPAA 2001). The CBOS competencies are the occupational activities and related standards of performance that employers and the public can expect of a new graduate speech pathologist. These 7 competencies are: Assessment; Analysis and Interpretation; Planning of Speech Pathology Intervention; Speech Pathology Intervention; Planning, Maintaining and Delivering Speech Pathology Services; Professional, Group and Community Education; Professional Development. Included with these Occupational Competencies in COMPASS® are four Generic Competencies (Reasoning, Communication, Lifelong Learning and Professionalism) which support the development and integration of the Occupational Competencies across workplace performance (S. McAllister *et al.* 2010, SPAA 2001).

Categorising placements

Descriptive information about placements is collected alongside the COMPASS® ratings. This information is categorized according to clinical practice setting, client age group, geographical location and placement intensity. These categories were the basis for grouping placements into types for this study. All placements in this study were classified in three different ways, consistent with the categories now in common use by universities participating in COMPASS® benchmarking and research (Kruger *et al.* 2011):

- Placement caseload. Adult (aged 18 years or over) or child (aged 0 to 17 years).

- Placement intensity. Block (Students attend placement site for 3-4 days per week for 3-4 weeks) or weekly (students attend placement site 1 day per week across a university semester for approximately 12 weeks).

- Placement setting. On campus clinic (services provided in a purpose-built clinic on the University campus), school (services provided at a school), hospital (inpatient and/or outpatient services provided at a health care facility), disability service (services provided at a non-healthcare facility catering for people with physical and intellectual disabilities), other community setting (services provided at settings not included in other categories such as early childhood facilities or community health centres).

Each placement was a combination of these categories. Child placements were in schools, other community settings and in the on campus clinic. School and community placements were weekly placements. On campus child placements were block or weekly. Adult placements were in hospitals, disability settings or in the on campus clinic. Disability setting placements were block placements. Hospital and on campus placements were block or weekly placements.

COMPASS® scoring and analysis

The student is rated on COMPASS® by the clinical educator (CE) who is working with the student across a workplace-based placement over a period of time. For each of the 11 competencies, ratings are given on a Visual Analogue Scale (VAS) from Novice Level to Entry Level. Both general and competency-specific behavioural descriptors are provided to guide the CE's judgement and ratings on the VAS.

The scoring system enables the ratings made by the CE on the VAS to be converted into one of 7 categories representing equal increases in performance on the competency being measured. These rating categories, are converted to interval level data and can then be subjected to parametric statistics (S. McAllister *et al.* 2010).

These rating categories for the 11 COMPASS® competencies can be summed, resulting in a 'raw score' (minimum possible raw score is 11, maximum possible is 77) and converted to an overall Competency Score. This is an interval measure expressed as a scaled score between 144 (min) and 835.25 (max), and/or an overall Zone of Competency (ZOC). The ZOC is an interval measure from 1 to 7 indicating which of the 7 developmental zones of competency the student's competency score places them into (McAllister *et al.* 2006). A detailed description of the development and validation of COMPASS® is beyond the scope of this paper, however McAllister (2006) and S. McAllister et al. (2010, in press) provide detail regarding the development and validation of COMPASS®.

In addition to the VAS ratings, for each competency the CE indicates whether the student has reached the expected level of competency for the placement.

Data analyses

The end-placement rating categories for each student for all 11 competencies were calculated, as well as an overall competency score and Zone of Competency. Table 1 summarises the measures collected for each student for each placement.

INSERT TABLE 1 ABOUT HERE

Change scores were used in the research as the measure for growth of competency. Change scores were chosen to represent change in competency achieved by students from the end of one placement to the end of the next placement. Change scores are therefore not confounded by any pre-existing differences in students' level of competency at the beginning of a placement.

Change scores were derived for each student for the 11 competencies, Competency Scores and ZOCs by calculating the difference in scores from the end of one placement to the end of the next. For example:

- Student A – Competency Score

End Placement 1 = 386.5; End placement 2 = 474. **Change score = 87.5**

- Student B – Rating Category for CBOS

End Placement 1 = 3; End placement 2 = 2. **Change Score = -1**

A change score of 0 represents no change, with larger change scores representing greater change and smaller change scores representing smaller change. Negative change scores were also possible, as demonstrated by Student B above. This indicates the student's observable performance was lower ~~in~~ at the end of the latter placement than the end of the previous placement.

Rating categories, Competency Scores and Zones of Competence derived from COMPASS are interval level data and therefore change scores are interval level data also. The data were legitimately subjected to the parametric statistical analyses as described in Table 2.

INSERT TABLE 2 ABOUT HERE

Results

Competency Development

A one-way repeated measures ANOVA was conducted to compare Competency Scores across the three placements for the whole group of students. Only students with data for all three placements were included in this analyses, resulting in n=49. The means for three placements were significantly different (F(2, 47)=28.863, p=.000), with a large effect size (partial eta squared = .551). Table 3 shows the mean and standard deviations for competency score with corresponding ZOCs in each placement, and figure 1 shows the changes in mean across the three placements.

INSERT TABLE 3 ABOUT HERE

INSERT FIGURE 1 ABOUT HERE

Placement Types and Models

Caseload

Independent samples t-tests were used to compare change scores from the end of Placement 1 to the end of Placement 2 between groups of students completing

placements with different caseloads. Students with competency measures for both placement 1 and 2, allowing for a change score to be derived, were included in these analyses, resulting in n=50. Due to the placement sequences of the groups, 44 of the 50 students experienced different caseloads in Placements 1 and 2. Students who completed a Child placement for Placement 2 achieved mean change scores for overall Competency Score and overall Zone Of Competency (ZOC) that were significantly greater than the students who completed an Adult placement, with large and medium effect sizes respectively.

In terms of individual competencies, students who completed a Child placement had change scores that were significantly greater than students who completed an Adult placement for three Generic Competencies and five Occupational Competencies, with effect sizes ranging from medium to large. That is, there were significant differences between the two groups' change scores for:

- Generic Competency 1 (Reasoning)

- Generic Competency 2 (Communication)

- Generic Competency 4 (Professionalism)

- CBOS 3 (Planning of Speech Pathology Intervention)

- CBOS 4 (Speech Pathology Intervention)

- CBOS 5 (Planning, Maintaining and Delivering Speech Pathology Service)

- CBOS 6 (Professional, Group and Community Education)

- CBOS 7 (Professional Development)

Table 4 contains a summary of the comparisons between change scores in Child and Adult placements from Placement 1 to Placement 2.

INSERT TABLE 4 ABOUT HERE

Placement intensity

Independent samples t-tests were used to compare the change scores from the end of Placement 1 to the end of Placement 2 between groups of students completing placements with different intensity. Students with competency measures for both placement 1 and 2, allowing for a change score to be derived, were included in these analyses, resulting in n=50. There were no significant differences in growth for Competency Score, ZOC or any of the Generic or Occupational Competencies between the groups of students who completed a block versus a weekly placement for their second placement. Table 5 contains a summary of the comparisons between weekly and block placements.

INSERT TABLE 5 ABOUT HERE

Setting

A one-way between groups ANOVA was used to compare change scores from the end of Placement 1 to the end of Placement 2 between groups of students based in different settings for their second placement (on campus clinic, school and hospital). Students with competency measures for both placement 1 and 2, allowing for a change score to be derived, were included in these analyses. A small group of 6 students were placed in settings other than on campus clinic, school or hospital. This

group was too small to be included in the analyses as its own group, resulting in n=44. There were no significant differences in change scores between the groups for each of the 11 competencies except for CBOS 2 Analysis and Interpretation. Scanning of the data suggests that the school group placement (N=14) had a greater growth in performance for this competency. However this ANOVA is very close to the .05 cut off for significance (F=3.543, p=.049). Overall, the large standard deviations in the groups may have contributed to a lack of statistical significance. Table 6 summarises the comparisons between on campus, school and hospital settings.

INSERT TABLE 6 ABOUT HERE

There were 55 students with data available for Placement 2 and Placement 3. Most students completed an adult block placement for their third placement, in either a Hospital (N=36) or Disability Service (N=13) setting with 6 students completing a child placement. Therefore change scores from the end of Placement 2 to Placement 3 for 49 students were used for these analyses to investigate group differences in change of competency subsequent to completing an adult placement in a Hospital or Disability Service. An independent samples t-test was used to compare change scores between students placed in the two different settings. There were no significant differences in change scores for overall Competency Score, overall ZOC or any of the Generic and Occupational competencies. Again, the large standard deviations may have contributed to the lack of statistical significance. Table 7 summarises the comparisons between hospital and disability service placements.

INSERT TABLE 7 ABOUT HERE

Discussion

The aims of this research were to investigate whether competency of speech language pathology students changes significantly in sequential placements, and whether growth in competency differs between groups of students simultaneously completing different placements. The students studied were in the third year of a four year Australian undergraduate program.

The students made significant progress in overall competency from placement to placement, even though subsequent placements differed in terms of caseload, intensity and/or setting. The results add evidence to support the notion that competency develops on a continuum and with experience. The results are consistent with the quantitative and qualitative evidence collated during the development of COMPASS® (McAllister *et al.* 2011). Speech language pathologists understand competence as developmental, and increasing levels of performance were strongly correlated with increasing levels of experience (McAllister *et al.* 2011). In the current study, as students gained more clinical experience via clinical placements, they were observed to have significantly greater levels of performance on the 11 competencies compared to the previous placement.

The results also suggest that learning transfer and an accumulated learning effect occurs in successive placements. These results are consistent with data obtained through research conducted in the development of COMPASS®. This study builds on the previous research through larger sample sizes and a greater range of

placement types (McAllister *et al.* 2011). However, these results are inconsistent with other previous research, which has identified 'case-specificity' and a lack of learning transfer (Dory *et al.* 2010, Eva 2003, Norman *et al.* 2006). This disparity can be accounted for in a couple of ways. First, the issues identified with previous research including lack of valid and reliable assessment tools and assessments being conducted outside the actual clinical environment, have been decreased through the use of the COMPASS® tool. This tool measures competency based on observed performance across all relevant speech language pathology clinical contexts and is administered by speech pathologists with experience in the particular context of the placement. It therefore appears that the real world context is facilitative of learning transfer, and decontextualised assessments of competency such as OSCE and written examinations may not be.

It can be argued that the ideal conditions for learning transfer are met by clinical education placements. By nature, deep rather than surface understanding is required in the clinical setting, as well as problem solving. Both these features have been found to facilitate the transfer of learning (Barnett and Ceci 2002, Bransford and Schwartz 1999). Clinical educators prompt students to use their prior knowledge, as well as facilitate meta-cognitive activities such as reflection and self-monitoring (Barnett and Ceci 2002). During a placement, students have the opportunity to apply their academic knowledge to a clinical setting and develop understanding about the work they will be doing after graduation (Sheepway *et al.* 2011). Motivational factors such as interest, achievement goals and self-efficacy are therefore also likely to be present for students on placement (Pugh and Bergin 2006).

The results demonstrating that students' learning increased with each placement even though placement caseload, intensity and setting varied support the notion that conceptualizing transfer as 'carrying over' might not be the most accurate conceptualization (Hager and Hodkinson 2009). Furthermore, development of competency does not appear to be passive application of knowledge learned in one context into another. The results suggest that any knowledge gained is preparing students for future learning, and that prior knowledge is being transformed and expanded in each new placement (Hager and Hodkinson 2009).

In this study, caseload had an impact on this growth of competency, as measured by change scores, with students in child placements achieving greater growth in overall competency than students in adult placements. This was true for three of the four generic competencies and five of the seven CBOS competencies. The generic competency for which there was no significant difference in competency growth between groups was Generic Competency 3 'Lifelong learning'. It could be argued that this is a result of the nature of the competency. Lifelong learning includes behaviours such as reflecting on performance, having an appropriate attitude to learning, responding to feedback and structuring one's own learning (McAllister *et al.* 2006), which tend to relate to the learner rather than the context of practice. The other generic competencies such as clinical reasoning, communication skills and professionalism require some adaptation and change in different environments. The lack of significant difference between the students in the child and adult placements for lifelong learning is therefore likely to be due to lifelong learning being less context-specific than other generic competencies.

The CBOS competencies 1 and 2 were the occupational competencies in which there were no significant differences between groups in terms of growth of competency. These competencies relate to conducting assessments and analysis and interpretation of assessment information. The clinical curriculum of the course used in this research does not require students to perform assessments as part of their third year placement and therefore only about half the participants in this study had this experience. The small numbers of students mean that the results for these competencies may not be truly representative. Further research with larger numbers of students in each group may give a more accurate picture of whether the growth for these competencies is different with different caseloads.

The significantly greater growth in competency for child placements for all other generic and occupational competencies may be partly attributable to the child nature of the students' clinical experiences before these placements. In second year, students gain experience in interacting with normally developing children in a preschool, and are also gradually introduced to direct clinical work with one child client in the on campus clinic. Students have academic subjects related to adult communication disorders and treatment, but no direct exposure to adult clients before their third year placements.

This is consistent with the notion of the development of causal semantic networks and illness scripts (Schmidt *et al.* 1990, Schuwirth and van der Vleuten 2011). Knowledge is embedded into networks and these networks are transformed further only after hands-on clinical experiences (Schmidt *et al.* 1990), meaning that students may have more highly developed cognitive networks related to child practice. Greater mental effort is required when encountering something for the first

time as would be the case in adult placements, and therefore accessing any related knowledge would be effortful and inefficient (Schmidt *et al.* 1990). The small amount of experience related to child practice means that students have started to organise and relate their knowledge to speech language pathology practice with this client group. This would mean it is less effortful as the students would be developing new knowledge and add new experiences to already existing causal models and scripts (Schmidt *et al.* 1990). Growth in competency in child placements may be greater due to the reduced cognitive effort and more efficient development of scripts.

Nevertheless, the significantly greater growth in competency for child placements for all other generic and occupational competencies was unexpected given the limited nature of experience prior to the placements. The level of competency that students are able to demonstrate on placement could also be limited by the degree of autonomy they are granted by clinical educators on adult hospital or disability placements. The nature of work in the different settings may also afford greater or lesser opportunities for students to develop their competencies.

Unlike caseload, the intensity of placements in this study did not have an impact on growth of competency. There was no difference in growth of competency, as measured by change scores between groups of students completing block or weekly placements on any of the overall, generic or CBOS competencies. Regardless of the intensity of placement, students were all expected to gain approximately the same amount of direct clinical experience, and the length of placements differed accordingly. The difference between the two groups relates only to how intensively they gained this experience, not the actual amount of experienced gained. That is,

students on weekly placements attended once a week for approximately 12 weeks, and students on block placements attended 3-4 days per week for 3-4 weeks, resulting in approximately the same number of days on placement. The results therefore indicate that it is the gaining of the experience itself, rather than the intensity of gaining this experience that is important for competency development. These results contrast with reported perceptions about these placements. Speech language pathology university educators rate block placements higher than weekly placements in terms of their effectiveness in development of competency (Sheepway *et al.* 2011). These perceptions about the effectiveness of this aspect of placement types are therefore not consistent with the results of this study. As this is the first study to use quantitative research to investigate the effectiveness of placement types, it is possible that other persisting perceptions about placements may also be inconsistent with empirical data. This certainly justifies further research investigating the accuracy of perceptions about competency development.

These results relating to placement intensity may be important for curriculum developers who are facing increasing pressure to find quality placements in the current clinical education climate. If students' development of competency is affected by amount of experience and not intensity, this may provide some flexibility in placement experiences provided. Current workplaces and work practices are not consistent with the intensity of block placements, with 45% of speech pathologists in Australia working part-time (SPAA 2003). Therefore, modifying the intensity of placements and offering alternatives to block placements may mean that clinical education better reflects the workplace and workforce. The part-time proportion of the workforce who have previously been largely excluded from providing clinical

education can be more directly involved, increasing the number and diversity of placements available.

In this study, setting referred to the clinical environment or context, and included school, hospital, on campus clinic and disability services. The results suggest that setting may impact on the development of competency, however the groups in this study were small and may not be representative. Also, when comparing all settings, the inherent relationship between setting and caseload needs to be acknowledged. For example, all school placements were child placements and all hospital placements were adult placements. However, when comparing settings with the same caseload and intensity, there were no differences in growth of competency. The results suggest that the impact of clinical setting on the development of competency needs to be further investigated with larger groups of students and without the possible impact of other aspects of placement type. Studies in medical education which have shown that students in non-traditional rural settings performed equal to, or better than students in traditional tertiary hospital placements on final clinical exams, support this need for further research. Research measuring clinical competency within the actual clinical environments, rather than in exams, is needed.

Limitations

This research was an exploratory study with a relatively small cohort of students in one speech language pathology program. The number of students in the study meant that they could not be grouped to investigate fine details of placement type

and features (particularly caseload and setting). The interaction between caseload, intensity and setting was unable to be explored because of the sample size, and the inherent relationship between setting and caseload limits the conclusions that may be drawn about settings. The single cohort and speech language pathology program also meant that any idiosyncrasies or unique features related to these factors or the Clinical Educators' ratings on the COMPASS® may have had an impact on the results. Given the small sample sizes in this study the results should be interpreted with caution and considered preliminary. However, the results justify further research with larger samples that investigate the impact of a greater range of placement types (e.g. rural, role-emerging, etc) and finer detail for caseload, intensity, setting and also location (e.g. rural).

Implications

The current climate in clinical education is such that traditional placements cannot continue to be used as the primary way to deliver clinical education. Alternative and innovative placement types which may help to alleviate placement shortages are being developed and used in small numbers (Sheepway *et al.* 2011). Reasons for non-traditional placements not being widely adopted included perceptions about disadvantaging students learning and the risk to students' competency development (Sheepway *et al.* 2011). Results from this study indicate that students may not be disadvantaged by changing some aspects of placement type, such as intensity and setting. This study also showed that some perceptions about the effectiveness of some placement types were not consistent with empirical data. Therefore the 'risk'

to student competency development in alternative and innovative placement types might not be as high as perceived, and further development and investigations of these placement types are justified.

Conclusions

This study is the first in speech language pathology to use empirical data to investigate the impact of placement type on competency development. The results support the theory that competency develops on a continuum, and that students transfer and further refine their knowledge in each subsequent clinical placement. Caseload (child or adult) had an effect on the growth of competency, but placement intensity did not. Setting did not appear to have an impact on the growth of competency but requires further investigation. The data from this study suggest that the perceptions and opinions about the effectiveness of placement type may not be accurate and therefore more quantitative research investigating these perceptions is needed. Further research investigating the impact and interaction of aspects of placement types with larger groups and across multiple university programs is justified.

ANDERSON, J., 1988, *The Supervisory Process in Speech-Language Pathology and Audiology* (Boston: College Hill).

BARNETT, S. M. and CECI, S. J., 2002, When and where do we apply what we learn? A taxonomy for far transfer. *Psychological Bulletin,* **128**, 612-637.

BENNER, P., 1982, From novice to expert... the Dreyfus Model of Skill Acquisition. *American Journal of Nursing,* **82**, 402-407.

BENNER, P., 2004, Using the dreyfus model of skill acquisition to describe and interpret skill acquisition and clinical judgment in nursing practice and education. *Bulletin of Science, Technology and Society,* **24**, 188-199.

BIGGS, J. B. and COLLIS, K. F., 1982, *Evaluating the quality of learning: The SOLO taxonomy (Structure of the Observed Learning Outcome)* (New York: Academic Press).

BRANSFORD, J. D. and SCHWARTZ, D. L., 1999, Rethinking transfer: A simple proposal with multiple implications. *Review of Research in Education, 24 1999,* **24**, 61-100.

BRUMFITT, S. and FREEMAN, M., 2007, Speech and language therapy students' perceptions of learning in a university clinical setting. *Learning in Health & Social Care,* **6**, 231-244.

COLLINS, A., GREENO, J. and RESNICK, L., 1992, Cognition and learning. *B. Berliner & R. Calfee, Handbook of Educational Psychology, New York: Simon & Shuster MacMillan*.

DALL'ALBA, G. and SANDBERG, J., 2006, Unveiling Professional Development: A Critical Review of Stage Models. *Review of Educational Research,* **76**, 383-412.

DORY, V., GAGNON, R. and CHARLIN, B., 2010, Is case-specificity content-specificity? An analysis of data from extended-matching questions. *Advances in Health Sciences Education,* **15**, 55-63.

DUBOULOZ, C. J., SAVARD, J., BURNETT, D. and GUITARD, P., 2010, An interprofessional rehabilitation university clinic in primary health care: A collaborative learning model for physical therapist students in a clinical placement. *Journal of Physical Therapy Education,* **24**, 19.

ENGLE, R. A., 2012, The Resurgence of Research Into Transfer: An Introduction to the Final Articles of the Transfer Strand INTRODUCTION. *Journal of the Learning Sciences,* **21**, 347-352.

EPSTEIN, R. M., 2007, Assessment in medical education. *The New England journal of medicine,* **356**, 387-396.

EPSTEIN, R. M. and HUNDERT, E. M., 2002, Defining and assessing professional competence. *JAMA : the journal of the American Medical Association,* **287**, 226-235.

ERAUT, M., 1994, *Developing Professional Knowledge and Competence* (London: Falmer Press).

EVA, K. W., 2003, On the generality of specificity. *Medical education,* **37**, 587-588.

FERGUSON, A., MCALLISTER, S., LINCOLN, M., MCALLISTER, L. and OWEN, S., 2010, Becoming familiar with competency-based student assessment: an evaluation of workshop outcomes. *International journal of speech-language pathology,* **12**, 545-554.

FERNANDEZ, N., DORY, V., STE-MARIE, L. G., CHAPUT, M., CHARLIN, B. and BOUCHER, A., 2012, Varying conceptions of competence: an analysis of how health sciences educators define competence. *Medical education,* **46**, 357-365.

GOBET, F. and CHASSY, P., 2008, Towards an alternative to Benner's theory of expert intuition in nursing: A discussion paper. *International Journal of Nursing Studies,* **45**, 129-139.

GONCZI, A., 1994, Competency Based Assessment in the Professions in Australia. *Assessment in Education: Principles, Policy & Practice,* **1**, 27-44.

HAGER, P. and GONCZI, A., 1996, What is competence? *Medical teacher,* **18**, 15-18.

HAGER, P. and HODKINSON, P., 2009, Moving beyond the metaphor of transfer of learning. *British Educational Research Journal,* **35**, 619-638.

HARGREAVES, J. and LANE, D., 2001, Delya's story: from expert to novice, a critique of Benner's concept of context in the development of expert nursing practice. *International journal of nursing studies,* **38**, 389-394.

KINCHIN, I. M., BAYSAN, A. and CABOT, L. B., 2008, Towards a pedagogy for clinical education: Beyond individual learning differences. *Journal of Further and Higher Education,* **32**, 373-387.

KREITER, C., 2008, A comment on the continuing impact of case specificity. *Medical education,* **42**, 548-549.

KREITER, C. D. and BERGUS, G. R., 2007, Case specificity: Empirical phenomenon or measurement artifact? *Teaching and Learning in Medicine,* **19**, 378-381.

KRUGER, S., KOKEGEI, B., HENDERSON, N., MCALLISTER, S., LINCOLN, M., FERGUSON, A., DAVIDSON, B., HILL, A., DAVENPORT, R., BROWN, L. and TEDESCO, H., 2011, *The Manual for Benchmarking and Research using the COMPASS® Online Assessment Tool*).

LOBATO, J., 2006, Alternative Perspectives on the Transfer of Learning: History, Issues, and Challenges for Future Research. *Journal of the Learning Sciences,* **15**, 431-449.

MATTICK, K., DENNIS, I., BRADLEY, P. and BLIGH, J., 2008, Content specificity: is it the full story? Statistical modelling of a clinical skills examination. *Medical education,* **42**, 589-599.

MCALLISTER, L., BITHELL, C. and HIGGS, J., 2010. Innovations in Fieldwork Education: Current trends and future directions. In*: L. McAllister, et al.* (eds.), *Innovations in Allied Health Fieldwork Education: A critical appraisal* (Rotterdam, The Netherlands: Sense Publishers), pp. 1-13.

MCALLISTER, S., 2006. *Competency based assessment of speech pathology students' performance in the workplace. Unpublished PhD thesis.* University of Sydney.

MCALLISTER, S., LINCOLN, M., FERGUSON, A. and MCALLISTER, L., 2006, *COMPASS®: Competency assessment in speech pathology* (Melbourne: Speech Pathology Australia).

MCALLISTER, S., LINCOLN, M., FERGUSON, A. and MCALLISTER, L., 2010, Issues in developing valid assessments of speech pathology students' performance in the workplace. *International Journal of Language and Communication Disorders,* **45**, 1-14.

MCALLISTER, S., LINCOLN, M., FERGUSON, A. and MCALLISTER, L., 2011, A systematic program of research regarding the assessment of speech-language pathology

competencies. *International journal of speech-language pathology,* **13**, 469-479.

MCALISTER, S., LINCOLN, M., FERGUSON, A. and MCALLISTER, L., in press, Validation of Competency Based Assessment of Speech-Language Pathology Students in the Workplace*, Journal of Applied Measurement.*

NOKES, T. J., 2009, Mechanisms of knowledge transfer. *Thinking & Reasoning,* **15**, 1-36.

NORMAN, G., BORDAGE, G., PAGE, G. and KEANE, D., 2006, How specific is case specificity? *Medical education,* **40**, 618-623.

NORRIS, N., 1991, The Trouble with Competence. *Cambridge Journal of Education,* **21**, 331-341.

OLDMEADOW, L., 1996, Developing clinical competence: a mastery pathway. *Australian Journal of Physiotherapy,* **42**, 37-44.

PRIGG, A. and MACKENZIE, L., 2002, Project placements for undergraduate occupational therapy students: design, implementation and evaluation. *Occupational Therapy International,* **9**, 210-236.

PUGH, K. J. and BERGIN, D. A., 2006, Motivational influences on transfer. *Educational Psychologist,* **41**, 147-160.

SAWYER, K. L. and LOPOPOLO, R., 2004, Perceived impact on physical therapist students of an international pro bono clinical education experience in a developing country. *Journal of Physical Therapy Education,* **18**, 40-47.

SCHMIDT, H. G., NORMAN, G. R. and BOSHUIZEN, H. P. A., 1990, A COGNITIVE PERSPECTIVE ON MEDICAL EXPERTISE - THEORY AND IMPLICATIONS. *Academic Medicine,* **65**, 611-621.

SCHUWIRTH, L. W. T. and VAN DER VLEUTEN, C. P. M., 2011, General overview of the theories used in assessment: AMEE Guide No. 57. *Medical Teacher,* **33**, 783-797.

SCHWARTZ, D. L., CHASE, C. C. and BRANSFORD, J. D., 2012, Resisting Overzealous Transfer: Coordinating Previously Successful Routines With Needs for New Learning. *Educational Psychologist,* **47**, 204-214.

SHEEPWAY, L., LINCOLN, M. and TOGHER, L., 2011, An international study of clinical education practices in speech-language pathology. *International journal of speech-language pathology,* **13**, 174-185.

SIBBALD, M., PANISKO, D. and CAVALCANTI, R. B., 2011, Role of clinical context in residents' physical examination diagnostic accuracy. *Medical education,* **45**, 415-421.

SPAA, 2001, *Competency-Based Occupational Standards for Speech Pathologists (Entry Level)* (Melbourne: Speech Pathology Association of Australia Ltd).

SPAA, 2003, *General Membership Survey* (Melbourne: Speech Pathology Association of Australia Ltd).

SPALDING, N., 2000, The skill acquisition of two newly qualified occupational therapists. *British Journal of Occupational Therapy,* **63**, 389-395.

STEIN, R., JOHNSTON, I. and BANNISTER, S., 2009, Students completing a pediatric clinical clerkship in a regional center perform as well as their peers training at a university teaching hospital... And they liked it better! *Teaching and Learning in Medicine,* **21**, 225-228.

THEW, M., HARGREAVES, A. and CRONIN-DAVIS, J., 2008, An evaluation of a role-emerging practice placement model for a full cohort of occupational therapy students. *British Journal of Occupational Therapy,* **71**, 348-353.

VAN DER VLEUTEN, C. P. M., 1996, The assessment of professional competence: Developments, research and practical implications. *Advances in Health Sciences Education,* **1**, 41-67.

VAN DER VLEUTEN, C. P. M., SCHUWIRTH, L. W. T., SCHEELE, F., DRIESSEN, E. W. and HODGES, B., 2010, The assessment of professional competence: building blocks for theory development. *Best Practice & Research Clinical Obstetrics & Gynaecology,* **24**, 703-719.

WIMMERS, P. F. and FUNG, C. C., 2008, The impact of case specificity and generalisable skills on clinical performance: a correlated traits-correlated methods approach. *Medical education,* **42**, 580-588.

WIMMERS, P. F., SCHMIDT, H. G. and SPLINTER, T. A. W., 2006, Influence of clerkship experiences on clinical competence. *Medical education,* **40**, 450-458.

WIMMERS, P. F., SPLINTER, T. A. W., HANCOCK, G. R. and SCHMIDT, H. G., 2007, Clinical competence: General ability or case-specific? *Advances in Health Sciences Education,* **12**, 299-314.

WORLEY, P., ESTERMAN, A. and PRIDEAUX, D., 2004, Cohort study of examination performance of undergraduate medical students learning in community settings. *British Medical Journal,* **328**, 207-209.

Table 1. Competency measures collected for each student for each placement

What?	What for?	How?
Rating Categories	All 11 competencies	Converted from Visual Analogue Scale
Competency Score	Overall	Scaled score determined from the sum of rating categories
Zone of Competence	Overall	Overall developmental zone that the student's competency score falls into, derived from sum of rating categories
Change Scores	11 Competencies Competence Score Zone of Competence	Difference between scores at end of each placement e.g. P1 to P2, P2 to P3

Table 2. Statistical analyses conducted

	Measure	Analyses used
Competency development	Competency score	One-way repeated measures ANOVA
	Zone of competency	One-way repeated measures ANOVA
Placement types and models	Caseload change scores	Independent samples t-test
	Placement intensity change scores	Independent samples t-test
	Setting change scores	One-way between group ANOVA Independent samples t-test

Table 3. Whole group means and standard deviations of competency scores with corresponding ZOCs

Placement 1 (n=49)		Placement 2 (n=49)		Placement 3 (n=49)	
M	SD	M	SD	M	SD
400.96	57.404	451.55	81.116	510.53	92.874
ZOC=3	343.556 to 458.364 ZOC=2 to lower boundary of 3	ZOC=3	370.434 to 532.666 ZOC = upper boundary of 2 to lower boundary of 5	ZOC=4	417.656 to 603.404 ZOC=4 to lower boundary of 6

Table 4. Comparison of Change Scores from Placement 1 to Placement 2 for Adult and Child Placements

	Adult Placement n=28		Child Placement n=22				
	M	SD	M	SD	t	p	Cohen's d
COMP SCORE	11.21	98.415	96.41	77.458	-3.328	.002	.962
ZOC	.43	1.345	1.32	.995	-2.593	.013	.752
GC1	.25	1.005	.95	1.046	-2.418	.019	.682
GC2	.18	1.416	1.32	1.393	-2.845	.007	.812
GC3	.54	1.290	1.14	1.246	-1.659	.104	
GC4	.21	1.228	1.18	1.402	-2.598	.012	.736
CBOS1	.23 (n=13)	1.013	.80 (n=10)	.789	-1.466	.158	
CBOS2	.43 (n=14)	.852	.92 (n=12)	1.084	-1.286	.211	
CBOS3	.04	1.290	.91	.868	-2.724	.009	.791
CBOS4	.32	1.389	1.36	.953	-3.004	.004	.873
CBOS5	.29	1.301	1.23	1.020	-2.785	.008	.804
CBOS6	.15 (n=26)	1.317	1.18	1.181	-2.824	.007	.823
CBOS7	-.04	1.261	.91	1.109	-2.770	.008	.800

Table 5. Comparison of Change Scores from Placement 1 to Placement 2 for Block and Weekly Placements

	Weekly Placement n = 31		Block Placement n = 19			
	M	SD	M	SD	t	p
COMP SCORE	41.77	112.539	60.00	71.900	-.699	.488
ZOC	.68	1.351	1.05	1.129	-1.057	.296
GC1	.52	1.208	.63	.831	-.400	.691
GC2	.61	1.687	.79	1.182	-.399	.691
GC3	.74	1.316	.89	1.286	-.402	.690
GC4	.61	1.606	.68	.946	-.175	.862
CBOS1	.33 (n = 15)	1.047	.75 (n = 8)	.707	-1.005	.326
CBOS2	.53 (n = 17)	1.125	.89 (n = 9)	.601	-1.062	.299
CBOS3	.35	1.226	.53	1.172	-.488	.628
CBOS4	.71	1.442	.89	1.100	-.480	.634
CBOS5	.61	1.334	.84	1.167	-.618	.540
CBOS6	.61	1.383	.65	1.320	-.083	.934
CBOS7	.29	1.371	.53	1.124	-.631	.531

Table 6. Comparisons of change scores from Placement 1 to Placement 2 for on campus, school and hospital placements

	On campus n = 17		School n = 14		Hospital n = 13			
	M	SD	M	SD	M	SD	F	p
COMP SCORE	23.41	81.807	87.14	73.277	5.08	119.302	3.038	.059
ZOC	.53	1.179	1.36	1.008	.38	1.557	2.454	.099
GC1	.29	1.047	.86	1.027	.31	1.032	1.381	.263
GC2	.29	1.404	1.14	1.027	.15	1.625	2.143	.130
GC3	.41	1.228	.71	.914	.85	1.345	.548	.582
GC4	.35	1.169	.86	1.231	.15	1.345	1.173	.320
CBOS1	.57(n=7)	.787	1.00(n=5)	.707	.13(n=8)	1.246	1.235	.316
CBOS2	.50(n=8)	.535	1.50(n=6)	.837	.38(n=8)	1.061	3.543	.049
CBOS3	.00	1.225	.93	.917	.08	1.382	2.726	.077
CBOS4	.41	1.064	1.21	.699	.38	1.758	2.110	.134
CBOS5	.35	1.057	1.07	.997	.31	1.548	1.794	.179
CBOS6	.27(n=15)	1.100	1.00	1.177	.15	1.573	1.765	.185
CBOS7	.06	1.029	.79	.975	-.15	1.519	2.423	.101

Table 7. Comparison of Change Scores from Placement 2 to Placement 3 for Hospital and Disability Service Placements

	Hospital placement n = 36		Disability Setting n = 13		t	p
	M	SD	M	SD		
COMP SCORE	53.83	104.925	106.38	163.227	-1.326	.191
ZOC	.50	1.320	1.00	1.826	-1.054	.297
GC1	.25	1.180	.92	1.656	-1.578	.121
GC2	.50	1.254	.92	1.891	-.749	.465
GC3	.83	1.384	1.31	1.437	-1.049	.299
GC4	.83	1.483	1.46	1.854	-1.224	.227
CBOS1	1.05(n=21)	1.564	1.20(n=10)	1.989	-.232	.818
CBOS2	.70(n=23)	1.396	1.00(n=10)	2.160	-.486	.631
CBOS3	.44	1.252	1.00	1.871	-1.196	.238
CBOS4	.44	1.403	.85	1.908	-.802	.427
CBOS5	.61	1.358	1.23	2.006	-1.236	.223
CBOS6	.52(n=33)	1.349	1.15	2.035	-1.245	.220
CBOS7	.92	1.402	1.38	2.022	-.913	.366

Figure 1. Mean competency score for each placement