Critical Reasoning Scores of Entering Bachelor’s and Master’s Students in an Occupational Therapy Program

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We compared the critical reasoning (CR) of four classes of students entering a bachelor of occupational therapy program ($n = 88$) with the CR of five classes of students entering an entry-level master of occupational therapy program ($n = 126$) using the Watson–Glaser Critical Thinking Appraisal (WGCTA) and controlling for grade point average and reading comprehension as measured by the Nelson–Denny Reading Test. A multivariate analysis of covariance revealed a small but statistically significant difference between the groups’ CR scores. The univariate tests indicated that the groups differed with respect to their scores on one WGCTA subscale, Recognition of Assumptions; contrary to expectations, the bachelor’s students scored higher than the master’s students, although the effect size indicated small differences between the groups. Possible explanations for the findings and implications for occupational therapy education are discussed.


Occupational therapists work collaboratively with clients to facilitate, support, and maintain clients’ health through engagement in everyday activities. These activities, or *occupations*, are meaningful and purposeful daily life pursuits that clients want or need to perform and that support health and participation in life. Occupational therapists facilitate interactions among clients, environments, and desired or required occupations to help clients reach outcomes that are important to them and that positively affect their health, well-being, and life satisfaction (American Occupational Therapy Association [AOTA], 2008).

Critical reasoning (CR) is central to occupational therapy practice, and educators seek to promote its development in students. Occupational therapy education programs aim to teach students to apply theory, evidence, knowledge, and skills to the therapeutic use of occupations as they work with people who have a variety of disabilities and impairments in a wide range of environments. To observe, analyze, describe, interpret, and intervene in occupational performance, students must learn to use CR to inform and guide their actions. Thus, it is imperative for occupational therapy educators to maximize students’ CR skills. Students who enter an occupational therapy program with better CR skills will presumably perform at a higher level while in the program and have the potential to be more effective practitioners when they move into the professional arena (Brailovsky, Charlin, Beausoleil, Coté, & Van der Vleuten, 2001; Ellis, 2006; Williams & Worth, 2001; Zurmehly, 2008).

Historically, the minimum requirement for national board certification as a registered occupational therapist was a baccalaureate degree. In 1999, however, the official bodies that regulate occupational therapy education recommended...
the postbaccalaureate degree as a requirement for entry into the field (AOTA, 1998; AOTA Council on Education, 1998; Harris, Brayman, Clark, DeLany, & Miller, 1998). One rationale for this recommendation was the desire to graduate students with more advanced CR skills who could meet the challenges of the rapidly changing health care environment (Coppar et al., 2009). The AOTA Representative Assembly concurred with the recommendation of the AOTA Council on Education, the AOTA Council on Practice, and the Accreditation Council for Occupational Therapy Education (ACOTE), and at the April 1999 meeting, the assembly passed a resolution to officially support postbaccalaureate education as the required level of professional entry into occupational therapy and to recommend to ACOTE that it implement steps to facilitate the transition to postbaccalaureate entry-level programs (AOTA, 1999b). Subsequently, ACOTE set January 1, 2007, as the date after which it would no longer accredit baccalaureate programs (AOTA, 1999a); all entry-level degrees are now offered at the master’s or doctoral level.

Many occupational therapy programs transitioned from the bachelor’s to the master’s entry level ahead of the mandated 2007 deadline and have offered entry-level master’s degrees for 5 or more yr. Despite this accrual of experience, little research has been published concerning the educational outcomes that have resulted from the shift from the baccalaureate to the postbaccalaureate entry-level degree.

Our study sought to examine one of the intended consequences of this shift: the matriculation and potential graduation of students with more advanced CR skills. Specifically, we examined the following research question: On matriculation, do entry-level master of occupational therapy students have higher levels of CR than entry-level bachelor of occupational therapy students? To address this question, we compared the two groups’ scores on the Watson–Glaser Critical Thinking Appraisal (WGCTA; Watson & Glaser, 1980) while controlling for grade point average (GPA) and reading comprehension as measured by the Nelson–Denny Reading Test (NDRT; Brown, Fishco, & Hanna, 1993).

**Literature Review**

**Critical Reasoning in Occupational Therapy**

A variety of definitions of CR can be found in the literature, but most incorporate the ability to analyze, evaluate, and make inferences on the basis of available evidence (Williams & Worth, 2001). Occupational therapy definitions of CR have tended to include these skills more implicitly and have focused on how analysis, evaluation, and inferences are used to address the complex occupational performance problems encountered in practice. For example, Schell and Schell (2008) defined CR as “the process used by practitioners to plan, direct, perform, and reflect on client care” (p. 5).

Consistent with Schell and Schell’s (2008) definition, a primary aim of occupational therapy education programs is to teach students to use CR skills to apply theoretical constructs while engaging in client-centered, evidence-based practice. CR is essential for thorough data gathering, for effective collaboration with clients during intervention planning, and for consideration of contextual issues and the needs and priorities of the client during intervention. In short, CR is a requisite skill for effective occupational therapy practice. Atkins and Ersser (2000) described CR as the method by which genuine client-centered practice is accomplished.

Because it is recognized as an essential skill for occupational therapists, interest in and attention to CR has heightened over the past 3 decades. Beginning with Rogers and Masagatani’s (1982) study of clinical decision making during assessment, researchers have attempted to describe the process underlying the therapeutic actions of occupational therapists. In their extensive study of CR, Mattingly and Fleming (1994) uncovered evidence of three CR processes involved in occupational therapy intervention: (1) procedural (reasoning related to occupational therapy routines and physical problems of the client), (2) interactive (reasoning used for interpersonal communication), and (3) conditional (reasoning related to the client’s context). Dunn (2000) and Schell (1998) described four types of CR: (1) scientific, (2) narrative, (3) pragmatic, and (4) ethical. Scientific, narrative, and pragmatic reasoning appear to be analogous to procedural, interactive, and conditional reasoning, respectively, and ethical reasoning refers to the type of reasoning used to make decisions in the client’s best interest and consistent with best practice.

Research delineating the types of CR occupational therapists use, along with studies that have described differences in the CR of novices and experts (Mattingly & Fleming, 1994; McCannon, Robertson, Caldwell, Juwah, & Elfessi, 2004; McCarron & D’Amico, 2002; Neistadt, 1996), has assisted occupational therapy educators in devising techniques and methods for facilitating students’ CR. These techniques and methods include experiential learning (Schell & Schell, 2008), questioning (Velde, Wittman, & Vos, 2006), reflection (Mitchell & Batorski, 2009; Schell & Schell, 2008), problem-based learning (McCannon et al., 2004; McCarron & D’Amico, 2002; Schell & Schell, 2008), clinical application of theory with
feedback from peers and professionals (Benson & Hansen, 2007), case presentations in various formats (Lysaght & Bent, 2005; Mitchell & Batorski, 2009; Schell & Schell, 2008), and service learning (Ciaramino, 2006; Raiz, 2007).

Assessment of Critical Reasoning

Various approaches have been used to assess CR, but to date no objective measures have been developed to examine the specific CR skills occupational therapists use in practice. Sladyk and Sheckley (2000) developed the Clinical Reasoning Case Analysis Test for their study of occupational therapy students' CR, but little information was provided about the nature of the test and the types of CR it assessed. Saffa and Smith (2004) used the Self-Assessment of Clinical Reflection and Reasoning and reported changes in occupational therapy students' CR that seemed to relate to scientific, pragmatic, and ethical reasoning, but the assessment did not actually name or measure these specific types of reasoning.

Although no standardized measures of scientific, pragmatic, narrative, and ethical reasoning exist per se, more general objective measures of CR do exist. The WGCTA has been described as “the oldest and most extensively used measure of critical thinking at the college level” (Williams & Worth, 2001, p. 6). The WGCTA assesses skills such as the ability to use inferences, evaluate arguments, and evaluate conclusions on the basis of given assumptions. Presumably, these general CR skills would be involved in scientific, narrative, pragmatic, and ethical reasoning during occupational therapy practice.

Critical Reasoning and Entry-Level Occupational Therapy Education

The current debate in occupational therapy education centers on whether doctoral education should be the sole means of entry into the profession. Despite the fact that little published research has compared educational outcomes for students with master's versus doctoral degrees, some have argued that the entry-level degree requirement should be increased further (Coppard et al., 2009; Griffiths & Padilla, 2006; Royeen & Lavin, 2007). For many education programs transitioning to the master's level, the first step in addressing the need for advanced CR skills was to increase the prerequisite coursework required for matriculation.

In light of research findings that students with more credit hours of college coursework have higher CR scores (Williams & Worth, 2001), occupational therapy program developers assumed that a more comprehensive liberal arts background would provide students with the foundation needed to perform at higher levels in terms of critical thinking, professional judgment, communication, and complex problem solving. Expanded preprofessional liberal arts preparation, they reasoned, would be a basis for the more complex critical analysis and thinking required in the entry-level postbaccalaureate degree program. Independent learning, problem solving, and abstract and creative thinking abilities that students were expected to develop in the prerequisite years could then be further developed and amplified in the professional program.

We sought to test those assumptions by comparing the CR of students who entered an occupational therapy program at the baccalaureate level with the CR of students who entered the program after its transition to a master’s program to determine whether applicants who had an expanded liberal arts background did, indeed, have higher CR scores on matriculation than those who matriculated at the baccalaureate level.

Method

Research Site

This study was conducted in an occupational therapy department at the University of Tennessee Health Science Center. The occupational therapy department transitioned from a bachelor’s to a master’s entry-level program in 2005 and currently offers an entry-level master of occupational therapy degree.

Design

A retrospective cohort design was used, and all data were in existence before the study began. Institutional review
board approval was obtained from the university. The independent variable was the educational level of the program entered (bachelor’s vs. master’s), and the dependent variables were the five subscale scores from the WGCTA. The WGCTA and NDRT were administered to all students during the first week of the program. GPA and NDRT reading comprehension scores served as control variables in the final analysis.

**Participants**

The study used existing data from nine classes of occupational therapy students: four classes that had entered the bachelor’s program (n = 88), and five classes that had entered the master’s program (n = 126). Students who entered the bachelor’s program did so after the completion of 64 credits of prerequisite coursework in liberal arts and sciences, including 19 semester hr of electives. Other criteria considered in admission decisions included work or volunteer experiences in occupational therapy, involvement in extracurricular activities, preprofessional evaluations, and a written essay. The bachelor’s program itself consisted of 16 mo on campus in didactic coursework and Level 1 fieldwork, followed by a total of 9 mo of Level 2 fieldwork in three different settings.

Students entering the master’s program had completed 90 credit hr of prerequisites before enrollment, including 23 credit hr of electives. Courses in computer science, statistics, medical terminology, humanities, anthropology, social science, and speech were added to the bachelor’s program prerequisites. Work or volunteer experiences in occupational therapy, involvement in extracurricular activities, preprofessional evaluations, and a written essay were retained as admission criteria. Beyond the 90 credit hr of prerequisites, the professional master of occupational therapy degree is currently earned by completing 66 credit hr (18 mo) of on-campus didactic coursework and Level 1 fieldwork and 15 credit hr (9 mo) of supervised Level 2 fieldwork in three separate sites.

**Instruments**

The WGCTA (Watson & Glaser, 1980) is an 80-item test that assesses CR as a composite of attitudes, knowledge, and skills. The WGCTA comprises five 16-item subscales: Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments. It provides a total score for CR, but subscale scores can be determined. Rather than report standard scores for a national standardization sample, the WGCTA includes normative data from more than 40 groups of adults and students (e.g., bank employees, business students, nursing students). The raw scores of examinees are converted to percentile scores that are based on the normative information from the group that most closely matches the examinees. Student Academic Support Services (SASS) at the university uses the WGCTA’s “Upper Division Students in Four-Year Colleges” as the normative group for interpreting the scores of the occupational therapy students. This group had a mean total score of 59.2 with a standard deviation of 8.4 (n = 417).

WGCTA reliability and validity evidence is presented in the examiner’s manual (Watson & Glaser, 1980). Internal consistency based on split-half reliability ranges from .69 to .85. The test–retest reliability coefficient is .73, and alternate-form reliability is .75. WGCTA scores below the 40th percentile are considered below average (Pearson Assessment, 2008). Reading difficulty of the WGCTA is deemed to be at the 9th-grade level. Studies have found no consistent gender differences in scores (Watson & Glaser, 1980).

The NDRT is an assessment of student ability in three areas: (1) vocabulary, (2) reading comprehension, and (3) reading rate. The Reading Comprehension subtest has a 20-min time limit and consists of seven reading passages and 38 five-option multiple-choice questions (Brown et al., 1993). The NDRT was first published in 1929 and has been periodically updated, most recently in 1992. The NDRT standardization sample included >5,000 students from 4-yr colleges and universities drawn from randomly sampled cells stratified by region, size, and type of institution. Steps were taken to minimize or eliminate race and gender bias. In terms of content validity, a 74% rate of satisfaction with the content and form of the test has been reported. Predictive validity studies of earlier versions of the NDRT demonstrated evidence of its ability to predict reading aptitude, reading attitude, and general academic achievement. NDRT scores have demonstrated a moderate correlation with self-reported GPA. Internal consistency reliability for the Reading Comprehension subtest is .88, and alternate form reliability is .81 (Brown et al., 1993).

**Procedure**

As part of program orientation, the WGCTA and NDRT have been administered to students in a group setting each year of both the bachelor’s and the master’s programs. The tests are administered and scored by SASS staff at the university.

**Data Analysis**

Scores on the five subtests of the WGCTA were calculated to enable more specific comparisons of various aspects of CR than could be made using total test scores. Bachelor’s
student data from 1997, 1998, 2001, and 2003 (n = 89) were available for comparison with master’s student data from 2005 to 2009 (n = 126).

SPSS Version 17.0 (SPSS, Inc., Chicago) was used to perform a multivariate analysis of covariance (MANCOVA) to test for differences between entry-level bachelor’s and entry-level master’s students with respect to the different subscales of the WGCTA. Two covariates—entering GPA and NDRT scores—were included. Entering GPA was used to control for level of academic achievement; previous research has demonstrated a relationship between WGCTA scores and GPA (Bauwens & Gerhard, 1987; Garett & Wulf, 1978; Holmgren & Covin, 1984; McCutcheon, Apperson, Hanson, & Wynn, 1992). NDRT reading comprehension scores were used as the second covariate because the WGCTA is a written test that requires reading comprehension. All statistical tests were conducted using a conservative level of .01 because of the lack of previous research in this area and the desire to guard against Type I error.

Results

The 215 participants included 27 men and 188 women with an average age of 23.8 yr (range = 19–47). Eighty-six percent were White; 9% were African American; 2% were Asian; <1% were Latino; and less than <1% were Eastern European. Demographic data for the bachelor’s and master’s students were very similar (see Table 1). WGCTA subscale means and standard deviations for the two groups are reported in Table 2.

Significant correlations between the dependent variables can help increase the power of MANCOVA to detect differences between groups (Tabachnick & Fidell, 2007). Although the correlations were low, all but two were statistically significant (<p < .01; see Table 3), suggesting that the subscales are related but measure different constructs. Correlations between Evaluation of Arguments and two of the subscales, Inference and Deduction, were not statistically significant.

Table 1. Demographic Information for Entering Bachelor’s and Master’s Students

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Bachelor’s Students (n = 88)</th>
<th>Master’s Students (n = 126)</th>
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<tbody>
<tr>
<td>Gender (%)</td>
<td></td>
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</tr>
<tr>
<td>Female</td>
<td>87.5</td>
<td>87.0</td>
</tr>
<tr>
<td>Male</td>
<td>12.5</td>
<td>13.0</td>
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<tr>
<td>Age (yr)</td>
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</tr>
<tr>
<td>Mean</td>
<td>24.0</td>
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<td>19–46</td>
<td>20–47</td>
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<tr>
<td>Ethnicity (%)</td>
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</tr>
<tr>
<td>White</td>
<td>90</td>
<td>85</td>
</tr>
<tr>
<td>African American</td>
<td>7</td>
<td>11</td>
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<tr>
<td>Asian</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Latino</td>
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<td>&lt;1</td>
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<tr>
<td>Eastern European</td>
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Table 2. Mean Scores for Bachelor’s and Master’s Students on the WGCTA Subtests

<table>
<thead>
<tr>
<th>WGCTA Subtest</th>
<th>Bachelor’s Students (n = 88)</th>
<th>Master’s Students (n = 126)</th>
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<tbody>
<tr>
<td>Inference</td>
<td>9.36</td>
<td>8.96</td>
</tr>
<tr>
<td>Recognition of Assumptions</td>
<td>11.98</td>
<td>11.04</td>
</tr>
<tr>
<td>Deduction</td>
<td>10.85</td>
<td>11.37</td>
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<tr>
<td>Interpretation</td>
<td>12.03</td>
<td>12.02</td>
</tr>
<tr>
<td>Evaluation of Arguments</td>
<td>10.81</td>
<td>11.27</td>
</tr>
</tbody>
</table>

Note. M = mean; SD = standard deviation; WGCTA = Watson–Glaser Critical Thinking Appraisal (Watson & Glaser, 1980).
Univariate analyses of variance (ANOVAs), with the Bonferroni adjustment for protection of experiment-wise error rate, were used to determine which of the five dependent variables contributed to group differences. With $\alpha_E = .01$, $\alpha = .002$ was used for each univariate test. As shown in Table 4, the univariate tests indicate that the groups differed in their scores on the Recognition of Assumptions subscale of the WGCTA, but not on the other four subscales. Contrary to expectations, the bachelor’s students’ scores on the Recognition of Assumptions subscale were higher than the master’s students’, although the effect size indicated that this difference was small ($Cohen’s d = .254$).

Discussion

In contrast to previous research (Williams & Worth, 2001), the results of this study suggest that for this sample of students, increasing the credit hours of prerequisite coursework did not result in students who were more adept at CR as measured by the WGCTA. In fact, the entry-level bachelor’s students, who had fewer hours of prerequisite coursework, scored higher than the entry-level master’s students on the one subscale, Recognition of Assumptions, for which there were statistically significant differences. The Recognition of Assumptions subscale has been described as assessing abilities such as interpretation and application of information, differentiation among premises and stated and unstated conclusions, assessment of the relevance of claims made to other claims, and discernment of conclusions (Fawkes et al., 2003). Although statistically significant differences were found on this subscale, the effect size was small. Several potential explanations exist for these findings.

One explanation we considered was that at this university, the bachelor’s-level applicant pools in the 1990s and early 2000s were much larger than the applicant pools since the entry-level master’s degree was instituted, allowing for greater selectivity when accepting applicants. However, the mean entering GPA of the master’s students (3.54, standard deviation $[SD] = 0.29$) was significantly higher than that of the bachelor’s students (3.40, $SD = 0.33$), $t(212) = −3.30, p = .001$; apparently, the bachelor’s students’ superior ability to recognize assumptions was not reflected in their entering GPAs. Likewise, the mean NDRT score for the master’s students (56.11, $SD = 11.65$) was significantly higher than the mean score for the bachelor’s students (50.09, $SD = 9.93$), $t(212) = −3.95, p < .001$. It thus appears that other factors besides reading comprehension, overall achievement, and completion of liberal arts coursework contributed to the bachelor’s students’ higher scores on the Recognition of Assumptions subscale. Further research to identify these factors is needed. Identification of activities and experiences likely to promote CR could assist occupational therapy educators in setting admission criteria that will better meet the need identified by the AOTA Council on Education task force for matriculation of students with advanced CR skills (Coppard et al., 2009).

Another explanation for the findings of this study could be that the specific prerequisite courses required by this university’s occupational therapy program are ineffective in promoting students’ CR. Because this program is located on a health science center campus and all students must complete their prerequisites at feeder institutions, it is difficult for the program to ensure that all courses taken before entry into the program are equivalent and consistent in their content or that the content and format might be expected to facilitate CR skills. Research has suggested that specialized CR courses, experiences in debate and argumentation, communications

<table>
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<th>Subtest</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td>1. Inference</td>
<td>—</td>
<td>2</td>
<td>—</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>2. Recognition of Assumptions</td>
<td>.285*</td>
<td>—</td>
<td>4</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>3. Deduction</td>
<td>.356*</td>
<td>.255*</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4. Interpretation</td>
<td>.317*</td>
<td>.370*</td>
<td>.308*</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>5. Evaluation of Arguments</td>
<td>.125</td>
<td>.220*</td>
<td>.106</td>
<td>.325*</td>
<td>—</td>
</tr>
</tbody>
</table>

* $p < .01$ (two tailed).

Note. WGCTA = Watson–Glaser Critical Thinking Appraisal.
education, coursework focusing explicitly on CR, interactive course formats, coursework emphasizing problem solving and inquiry, and outside study and reading can all promote general improvement in CR (Williams & Worth, 2001). Rather than general liberal arts prerequisites, perhaps an emphasis on prerequisite coursework in communications and courses involving debate and argumentation could better facilitate applicants’ CR. Once students have matriculated into the occupational therapy program, an explicit focus on CR and problem solving using interactive techniques and requiring outside study and reading might be effective for further advancing occupational therapy students’ CR.

A third explanation for the unexpected results of this study could be that the WGCTA is insensitive to actual differences in occupational therapy students’ CR. Although it may be difficult to capture CR abilities using a multiple-choice exam (Fawkes et al., 2003), in previous research the WGCTA has proved to be a useful tool for discriminating between occupational therapy students whose patterns of CR are consistent or inconsistent with expectations on case-based assignments (Mitchell & Batorski, 2009). In fact, the WGCTA continues to be an often-used and well-respected measure of CR (Drennan, 2010; Macpherson & Owen, 2010; Williams & Worth, 2001).

Suggestions for Future Research

Just as practitioners are accountable for examining the outcomes of occupational therapy services, educators are responsible for examining the efficacy of educational policies and practices. Indeed, research has shown that the outcomes of educational practices do not always meet expectations (Liotta-Kleinfeld & McPhee, 2001; McCarron & D’Amico, 2002; Miller, 2006; Rogers, Brayley, & Cox, 1988), as was true in this study. If requiring additional prerequisite coursework does not lead to the intended improvement in CR skills, perhaps those prerequisite credit hours could be better used within the professional program itself, where concentrated efforts could be made to promote the CR occupational therapy practitioners need.

Before this decision is made, more research is needed to elucidate the admission criteria that would allow for improved discrimination of students with better-developed CR skills. Beyond the admissions process, research is also needed to examine other outcomes of the profession’s transition to the entry-level master’s degree. If occupational therapy claims to be an evidence-based profession, evidence must be used to inform and guide our educational, as well as our clinical, practices.

Limitations

This study involved only one occupational therapy program, which may not be representative of all occupational therapy programs. Therefore, caution should be used in generalizing these results. However, the program’s required prerequisite coursework is commonly included in the prerequisites for other occupational therapy programs. Moreover, because the prerequisite coursework was completed at institutions across the state and the southeast region of the United States, this study’s findings may reflect a more wide-ranging view of occupational therapy program prerequisite coursework than if students had completed the prerequisites on a common college campus.

The limitations of the WGCTA should also be considered when reviewing these results. The five WGCTA subscales are each very short, consisting of only 16 questions. Watson and Glaser (1980) recognized the reliability issues inherent in such short scales; however, they also suggested that it is feasible to use the subscales with larger groups of students, as was done in this study.

Conclusion

Bondoc (2005) decried the lack of educational research in occupational therapy and advocated for concerted efforts to advance evidence-based education. Gathering evidence to demonstrate the efficacy of approaches for preparing and selecting occupational therapy applicants seems like a logical place to begin these endeavors. As the profession looks to the future and considers the idea of moving toward the entry-level doctorate, it is important to examine and reflect on the effects of the transition to the master of occupational therapy as the entry-level degree. If the expected outcomes have not been achieved, the occupational therapy profession must learn the lessons and rectify any missteps before moving to a more advanced level of entry into the profession. This study is an attempt to contribute to that effort.

Acknowledgments

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American Occupational Therapy Association. (1999a). ACOTE sets timeline for postbaccalaureate degree programs. OT Week, 13(33), i, iii.


