Personality Preference Distribution of Dental Students Admitted to One Dental School Using Different Selection Methods

HsingChi von Bergmann, Ph.D.; Kirsten R. Dalrymple, Ph.D.; Charles F. Shuler, D.M.D., Ph.D.

Abstract: This study sought to determine whether using the Myers-Briggs Type Indicator (MBTI) would detect differences in personality preferences in first-year dental students admitted to the same dental school through different admission methods. First-year dental students admitted in 2000 and 2001 were given the MBTI instrument during orientation prior to the start of classes. In fall 2000, the Class of 2004 had 140 students, with 116 in the traditional track and twenty-four in the parallel problem-based learning (PBL) track. In fall 2001, the Class of 2005 had 144 students, all enrolled in the PBL curriculum. All students admitted to the PBL track had experienced a process that included evaluation of their participation in a small group. Students in the traditional track had individual interviews with faculty members. Both student groups were required to meet the same baseline grade point average and Dental Admission Test standards. In 2000, the PBL students showed personality preferences that were distinctly different from the personality preferences of traditional track students in the categories of Extroversion (89 percent PBL, 44 percent traditional) and Thinking (72 percent PBL, 39 percent traditional). In 2001, the all-PBL class retained the trend towards Extroversion (69 percent). This study suggests that admission method may effectively change the personality preference distribution exhibited by the students who are admitted to dental school.

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Selecting students to admit to health professions schools has become a complex process, and many methods have been used to identify the “right” students for admission.1 Overall, dental schools have historically placed most emphasis on academic records as reflected in grade point average (GPA) and Dental Admission Test (DAT) scores of their applicants, but while past academic achievement has been shown to be correlated with future academic achievement,2 this screening feature has limitations. It does not distinguish sufficiently among an excess of academically accomplished candidates, and it is limited in its ability to identify other features considered important for dental practitioners. Finally, it does not allow for selection of candidates that might be better suited to the particular curriculum and ethos of the institution. In programs that utilize pedagogies such as problem-based learning (PBL), students must also be able to work productively in a small-group setting. Admissions procedures therefore set out to achieve a range of outcomes. The process should admit students who can succeed academically, who can adapt to a specific institutional culture, and who can ultimately become capable and ethical dental practitioners.

When the primary pedagogy used in a dental curriculum is changed to PBL, student selection may be of even greater importance since most applicants to dental schools have completed very traditional pre-dental programs. The aim of this study was therefore to explore whether differences exist in the personality preferences of two groups of students after being admitted to a PBL dental school through two different selection methods.

Admission Criteria

Research in Dental Education

Admission methods are critical in determining who will be future dentists. Given the importance of admissions, the topic itself forms an important
thread of discussion among dental educators. The majority of studies in the dental education literature have focused on establishing the power of academic variables from predental education in predicting both academic performance and ethical/professional behaviors in dental schools. Very few studies have attempted to explore the relationship between admissions criteria and professional performance as delineated by such professional organizations as the American Dental Association. The challenge of that type of study is to identify possible indicators of professional behaviors. Personality preferences may be an indicator that could predict the non-academic behaviors.

Specifically, the dental admission research conducted thus far has addressed how dental admission criteria relate to students’ performance on the National Board Dental Examination (NBDE). Admission scores and dental school performance, cultural variables, and the diversity (or lack thereof) of admitted students. All of these studies were contextualized within a specific institution in which some, if not all, of the authors were situated. Although significant relationships have been reported regarding admission scores (DAT or average GPA) and academic performance (GPA in dental school or NBDE scores), it is not clear how independent these relationships are from each institution’s programming or curricular elements. In 2005, Ranney et al. in their review of dental admission studies noted that, overall, the conventional academic admission criteria (DAT scores and GPA) can, at most, account for about 40 percent of the variance in dental school performance and mostly in the early years of the program. The conventional academic admission criteria may have significant predicting power for dental students’ first two years of program performance; however, Mentasti and Thibodeau cautioned that these factors have not yet been shown to be linked to a candidate’s “commitment to society and health care, perseverance in personal interests, leadership potential, professionalism, or dedication to the advancement of knowledge” (p. 1043).

Numerous efforts have been made by academic dental institutions to widen and validate the range of criteria used in admitting students into dental schools. This has been attempted in order to emphasize professional qualities not easily measured by traditional academic performance metrics as well as to aid in the identification of students who will adapt more readily to a specific institution’s curricular and cultural features. To add another criterion based on personality, it would be necessary to determine if different admission methods change the personality profiles of admitted students. Although not without controversy, research from commercial and other employment areas has shown that different personality factors are related to performance in a wide variety of occupations.

In dental education research, studies have examined personality trait as an indicator of non-didactic academic success. Evans and Dirks adopted the widely used NEO Personality Inventory-Revised (NEO-PI-R) to measure personality and found a significant relationship between the traits of Extraversion, Agreeableness, and Conscientiousness to dental laboratory performance. Based on Hough and Furnham’s validation of the NEO-PI-R, Smithers et al. compiled a set of non-academic admission criteria including personality measure to explore how these criteria might relate to students’ academic performance. “Openness to experience” was found to be negatively correlated to both academic and clinical performance. In contrast, using the same instrument as a personality instrument, Poole et al. found “Openness to experience” to show a positive correlation with academic performance. McCrae and Costa defined “Openness to experience” as proactively seeking and being appreciative of new experiences. It is unclear as to why there is a difference in its relationship to academic performance. Chamberlain et al. also used the NEO-PI-R in their admission study and extended their research to explore how the admission criteria predicted professional performance using the Behaviorally Anchored Rating Scale (BARS), a performance measure developed based on the graduation competencies. In contrast to Smithers et al.’s findings, Chamberlain et al. found more significant relationships existed between selective personality traits and dental students’ behavioral anchors (as measured by BARS) or between selective personality traits and academic performance. The differences in the personality traits’ relationships to performance may require more contextual information to begin to interpret the differences. In Table 1, we summarize these research groups’ findings of the relationship between personality traits measured with the NEO-PI-R and dental students’ academic performance.

Among other instruments applied to study personality preferences, the Myers-Briggs Type Indicator (MBTI) is a commonly used instrument using self-reporting to determine an individual’s dominant or preferred psychological process in each
of four bipolar personality dimensions: Extroversion vs. Introversion (E/I), Sensing vs. Intuition (S/N), Thinking vs. Feeling (T/F), and Judging vs. Perceiving (J/P). As defined by Myers and McCaulley, the preferred psychological process in these dimensions simply means that every person uses all eight processes, but responds and feels most comfortable with his or her preferred processes. The self-report inventory produces a four-letter personality type for each survey participant. This four-letter score represents merely possible behaviors or observable psychological traits that can be expected from an individual. After the release of the MBTI, Carlyn conducted a comprehensive assessment of the instrument including its scoring process, review of inter-correlation studies, reliability studies, and validity studies. Her results showed that this self-report instrument was “a reasonable valid instrument” (p. 471) that helps to conduct assessment of relatively independent personality types. More recent critique of the MBTI was reviewed by McCrae and Costa. Although those authors claimed that the instrument did not truly measure dichotomous preferences, similar to what Carlyn found, they found that the instrument does measure relatively independent dimensions.

The MBTI has been used in dental education to chart personality preferences of students during parts of the curriculum and to draw connections between personality preferences and clinical performance. Erskine et al. found that the predominant personality traits were Sensing with Thinking and Sensing with Feeling among the first-year dental students at their university. McDaniel et al., Westerman et al., Westerman et al., and Jones et al. used results from the MBTI to predict dental students’ clinical and academic performance. These studies showed that the personality trait of Extroversion-Introversion correlated with clinical performance specifically involving patient interaction. Extroversion was found to be the personality trait associated with dental students having fewer difficulties in clinical activities in all these studies.

### Context of the Study

The five PBL dental admission procedures described in Pereira’s article established the context for our study at the University of Southern California School of Dentistry. One observation made during our PBL pilot program was that some students were readily able to adapt to a completely different pedagogical approach, whereas others could find it challenging to be in a learning environment that is different from their past experiences and/or preferred learning approaches. This observation was supported by research on inquiry/discovery-type learning. Hofstein et al. studied Grade 11 and Grade 12 students’ participation in an inquiry-type laboratory by separating students into “more experienced” and “less experienced” groups. They found differences in students’ experimental designs as a result of their experience.

<table>
<thead>
<tr>
<th>Table 1. Summary of four studies’ findings using NEO-PI-R to investigate personality traits and dental students’ performance in academic, behavioral, clinical, or perceptual areas</th>
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<tbody>
<tr>
<td>Evans and Dirks</td>
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<tr>
<td>Neuroticism</td>
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<tr>
<td>Extroversion</td>
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<tr>
<td>Openness to experience</td>
</tr>
<tr>
<td>Conscientiousness</td>
</tr>
<tr>
<td>Agreeableness</td>
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<td>-r negative significant correlation</td>
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</table>

prior experiences with inquiry-type learning. Additionally, Eysenck\textsuperscript{31} investigated learning activities (discovery vs. reception learning), instruction, and students’ personality to learning attainment. Eysenck found that learning attainment was related to the students’ personality. Specifically, the extroverted children benefitted from being taught along the lines of discovery learning. Although contextual differences between dental education and K-12 education do exist, some of the findings from K-12 studies are still relevant for our purposes.

The PBL admission processes\textsuperscript{29} used during the time of this research, we conjectured, could help us select students who are more likely to be successful in a PBL environment. The PBL-specific admission method was developed and first implemented with the Class of 2001 in the PBL pilot program. The modified admission processes\textsuperscript{32} were then used for four PBL pilot classes. The main objective of this study was to compare students’ characteristics in two curricular tracks in the same dental school that had track-specific admission processes and then to determine if personality preferences were maintained when the entire class was admitted to a PBL-based curriculum.

We hypothesized that, with an emphasis on group-learning process skills in the admissions screening, the individual characteristics of those students admitted to the PBL-based track would differ from the characteristics of those admitted to the traditional dental education track, which focused on a more traditional set of admission criteria (DAT scores, GPAs, and individual interviews). Specifically, we wanted to explore whether changes in admission method can result in differences in the personality profile of admitted students and whether those differences are maintained with larger class sizes.

**Methods**

The University of Southern California School of Dentistry offers a four-year Doctor of Dental Surgery (D.D.S.) program. At the time of this research, there was a parallel PBL track for a cohort of D.D.S. students that ran at the same time the traditional dental curriculum was running. The PBL parallel track first admitted students in 1995, and the last group of parallel track dental students was admitted in 2000. In 2001 (Class of 2005), a PBL-based curriculum was instituted for the entire class based on a number of factors that included statistically significant improvements in NBDE Part I scores.\textsuperscript{32-34}

Matriculating D.D.S. students from the Class of 2004 (PBL and traditional curriculum) and Class of 2005 (PBL only) completed the MBTI Form M during their orientation period. The Class of 2004 consisted of twenty-four students in the PBL parallel track curriculum and 116 students in the traditional curriculum. In the following year, all 144 incoming students (Class of 2005) were in the PBL-based curriculum. All of the students from the Classes of 2004 and 2005 completed the MBTI. The MBTI was typically administered during orientation to students admitted to the traditional program in order for students to learn more about themselves and their learning preferences. All MBTI results were collected anonymously. The MBTI results were never used as an admission criterion but were administered only after admission. This study was part of a larger PBL in Dentistry project at the University of Southern California School of Dentistry. The ethics application of the project was approved by the university.

**PBL vs. Traditional Track**

Our admission review procedures for both the traditional and the PBL tracks included evaluation of applicants’ prior academic GPAs and DAT scores. Applicants who met the academic criteria were invited for a campus visit (Table 2). The campus visit experience differed between the traditional track and PBL track admission methods. The traditional admission processes included a one-on-one interview, which was not included in the PBL admission method. In the traditional track admission, multiple faculty members conducted one-on-one interviews.

<table>
<thead>
<tr>
<th>Traditional Track</th>
<th>PBL Track</th>
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<tr>
<td>Students were considered on basis of GPA and DAT.</td>
<td>Students were considered on basis of GPA and DAT.</td>
</tr>
<tr>
<td>Students above a threshold were invited to campus visit.</td>
<td>Students above threshold were invited to campus visit.</td>
</tr>
<tr>
<td>All had a one-on-one interview.</td>
<td>All students from above were given a PBL overview.</td>
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<tr>
<td></td>
<td>All participated in an assessed PBL exercise (group size &lt;8).</td>
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</table>
Aside from screening for academically capable students among an excess of candidates, medical educators have argued that an essential function of the admission processes is to help students become better informed about their choice of an educational institution and, even more importantly, of their career choice. To this end, the PBL selection process described above shares this aspiration of aiding students in making informed decisions about their educational institution.

Data Analysis

The anonymous survey data collected from all 284 students were evaluated based on the MBTI’s scoring instruction. The final data consisted of 261 surveys that were valid (i.e., no missing value; see Table 3). The dominant preference of each MBTI type (E/I, N/S, T/F, or J/P) was identified and coded as 1/0. For example, if a student’s personality profile was ENTP, the corresponding code for this profile was 1110. Descriptive statistics and tabulations were applied on the recoded data to understand the dominant personality traits (e.g., E or I) and personality profiles (e.g., ENTP).

The recoded data were discrete data, so Person’s chi-square test was used to assess the test of independence with a p-value less than 0.05 considered statistically significant. We were primarily interested in whether admitted students from different admission groups differed in the frequency of the MBTI personality traits.

Results

There was a significant difference in two out of four MBTI personality types between the students admitted to the PBL and traditional programs in the Class of 2004. Figure 1 provides both a visual representation and descriptive information of the personality preferences of the students admitted using two different admission methods as assessed by the MBTI instrument. Compared to the traditional admission method, the PBL admission method resulted predominately in individuals who showed Extroversion (chi-square=12.5, p<0.001). The distribution of Extroversion and Introversion types among students who were admitted using the traditional method was more even, with a slight emphasis towards the Introversion trait.

The Thinking and Feeling pair of the MBTI personality type also showed a significant difference
parallel track students in the Class of 2004 and the full PBL Class of 2005 with a p-value of 0.08 (see Figure 2, Table 4). There was a difference between the personality pair Thinking and Feeling between the PBL parallel track Class of 2004 and the full PBL Class of 2005 (chi-square=4.5, p<0.03). In the PBL parallel track Class of 2004, there was a higher percentage of students who were assessed as having the Thinking trait (72 percent). In contrast, there was a higher percentage of students who were assessed as having the Feeling trait in the full PBL Class of 2005 (54 percent).

When we compared the students’ personality traits between traditional admission method (Class of 2004) and PBL admission method (Class of 2005), a parallel track students in the Class of 2004 and the full PBL Class of 2005 with a p-value of 0.08 (see Figure 2, Table 4). There was a difference between the personality pair Thinking and Feeling between the PBL parallel track Class of 2004 and the full PBL Class of 2005 (chi-square=4.5, p<0.03). In the PBL parallel track Class of 2004, there was a higher percentage of students who were assessed as having the Thinking trait (72 percent). In contrast, there was a higher percentage of students who were assessed as having the Feeling trait in the full PBL Class of 2005 (54 percent).

When we compared the students’ personality traits between traditional admission method (Class of 2004) and PBL admission method (Class of 2005), a

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>24</td>
<td>116</td>
<td>144</td>
</tr>
<tr>
<td>Number of valid surveys</td>
<td>18</td>
<td>103</td>
<td>140</td>
</tr>
</tbody>
</table>

Table 3. Distribution of MBTI data collected from Class of 2004 and Class of 2005

<table>
<thead>
<tr>
<th></th>
<th>E</th>
<th>I</th>
<th>S</th>
<th>N</th>
<th>T</th>
<th>F</th>
<th>J</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trad.</strong></td>
<td>44%</td>
<td>56%</td>
<td>52%</td>
<td>49%</td>
<td>39%</td>
<td>61%</td>
<td>52%</td>
<td>49%</td>
</tr>
<tr>
<td><strong>PBL</strong></td>
<td>89%</td>
<td>11%</td>
<td>56%</td>
<td>44%</td>
<td>72%</td>
<td>28%</td>
<td>61%</td>
<td>39%</td>
</tr>
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</table>


Figure 1. Distribution of MBTI personality traits among admitted students for the Class of 2004 (PBL admission method vs. traditional admission method)
significant difference remained in the Extroversion-Introversion trait of the MBTI. Given that there were only twenty-four students in the Class of 2004 who were admitted by PBL method, we were curious to see whether if given a similar sample size, the PBL-admitted students in the Class of 2005 would show differences in personality type(s) when compared to the traditionally admitted students of the Class of 2004, given the assumption that the overall applicant population was relatively constant over two consecutive years. We found that the ratio between Extroversion and Introversion was statistically different (chi-square=16.0, p<0.001) between Class of 2005 students who were admitted using the PBL method and those who were admitted using the traditional method in the Class of 2004. However, the ratio was consistent with the Class of 2004 pilot PBL (chi-square=3.0, p<0.08).

**Discussion**

The original intention for designing a PBL-specific admissions method was to attract a group of students who were more likely to succeed in the PBL environment. By familiarizing applicants with the rationale for PBL and assessing their behavior in a simulated PBL small-group learning session, we hoped to accomplish that goal. Underlying this hope was the assumption that different admission

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Table 4. Person’s chi-square test results comparing groups of Class of 2004 and Class of 2005

<table>
<thead>
<tr>
<th>Compared Groups</th>
<th>E/I χ2</th>
<th>E/I p-value</th>
<th>N/S χ2</th>
<th>N/S p-value</th>
<th>T/F χ2</th>
<th>T/F p-value</th>
<th>J/P χ2</th>
<th>J/P p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2004 (Trad) to C2004 (PBL)</td>
<td>12.5</td>
<td>&lt;0.001</td>
<td>0.1</td>
<td>0.75</td>
<td>6.9</td>
<td>0.01</td>
<td>0.6</td>
<td>0.45</td>
</tr>
<tr>
<td>C2004 (PBL) to C2005 (PBL)</td>
<td>3.0</td>
<td>0.08</td>
<td>0.0</td>
<td>0.90</td>
<td>4.5</td>
<td>0.03</td>
<td>0.0</td>
<td>0.97</td>
</tr>
<tr>
<td>C2004 (Trad) to C2005 (PBL)</td>
<td>16.0</td>
<td>&lt;0.001</td>
<td>0.8</td>
<td>0.38</td>
<td>1.1</td>
<td>0.28</td>
<td>2.1</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Figure 2. Distribution of MBTI personality traits among admitted students using PBL admission methods (Class of 2004 vs. Class of 2005)

Note: See key on Figure 1 for explanation of letters on the MBTI scale.
methods would result in the selection of different types of students or would at least provide interested candidates with a more informed perspective about what the curriculum entailed. The enrollment process and the different pedagogies used for the Classes of 2004 and 2005 provided a unique opportunity to assess the impact on student personality profiles of the admission methods. Given that all students assessed came from an identical applicant pool with similar GPA and DAT achievements, they were admitted to one of two curricular tracks using two different admission methods. The administration of the MBTI during orientation had previously been used to help students identify their personality preferences, so the results of this instrument were available for comparison. The MBTI is a reliable and valid instrument for distinguishing Jung’s personality types and has a history of use with dental students. The MBTI was administered to our students during their orientation week. The results from consecutive years allowed comparisons of the ability of the PBL admissions process to reflect certain distributions of personality profiles even with greater numbers of admitted students.

The results of the study provide evidence that the admission method designed for the PBL dental program was associated with the selection of dental students with increased percentages of Extroversion over Introversion when compared to students admitted using a traditional admission method. Some studies have shown that students with the Extroversion trait are more successful in dental clinical environments, and we had observed that students admitted with this personality profile adapted much more quickly to the PBL pedagogy and consequently were successful learners in that curricular environment. The modified admission procedure for the PBL pilot had been used for four years before being used with the entire dental class in 2001. The change of the curriculum to a PBL pedagogy was based on students’ superior achievement on the NBDE Part I; thus, it was considered important to continue to accept students who would succeed using PBL.

There is limited evidence that these personality inventories could be effective as one of the criteria for dental admissions. One important finding from the dental admission literature was that Extroversion was the personality trait associated with dental students’ having fewer difficulties in clinical activities. As with our study, this data came from students already admitted but does highlight the value of Extroversion for success in dentistry. The PBL pedagogy requires active student participation in small groups, which would be one characteristic of an extroverted individual; thus, the PBL admission method selected students who could be successful both in the small-group didactic learning and in the clinical phases of their education.

Our literature review of dental education admission criteria and academic performance provides further confirmation that there remains an unfulfilled need to devise admissions assessment measures that can be linked to both success in dental education and success in an oral health care career. A significant contribution of our study is that data could be used to support changes in dental admission methods. It demonstrates that changes in curricular organization may be facilitated by changes in the student selection criteria to enhance a student’s learning experience. Traditional admission practices rely heavily on academic criteria that may not be sufficient to provide a comprehensive analysis of the best candidates for admission into a problem-based dental program.

REFERENCES