Critical Issues in Dental Education

Canadian Dental Students’ Perceptions of Their Learning Environment and Psychological Functioning Over Time


Abstract: A cohort of dental students (N=28) at the University of Manitoba was followed throughout their entire dental education program to explore changes in their perceptions of the learning environment over time. Aspects of the students’ psychological functioning, including common psychological symptoms, self-esteem, and coping strategies, were also evaluated to assess changes in these factors over time. A battery of instruments consisting of the Learning Environment Survey (LES), the Symptom Questionnaire (SQ), the Ways of Coping Checklist (WCCL), and the State Self-Esteem Scale (SSES) was administered at the beginning, midpoint, and end of each academic year throughout the four-year dental education program. Results indicated that there was a minor positive recalibration of student perceptions in the areas of course relevance and opportunities for outside interests during the first months of year one. Apart from this, perceptions of dental school as a seldom-to-occasionally positive learning environment were maintained over the entire dental education program. In terms of psychological functioning over time, students reported decreases in their levels of problem-focused coping and self-esteem, increased use of avoidance and wishful thinking as coping strategies, and more anxiety, depression, and hostility at various points. Some implications of these findings for dental education are discussed.

Dr. Stewart is Associate Professor and Director, Student Counselling and Career Centre, University of Manitoba; Dr. de Vries is Professor and Dean, Faculty of Dentistry, University of Manitoba; Dr. Singer is Professor, Faculty of Dentistry, University of Manitoba; Dr. Degen is Counsellor, Manitoba Teachers Society; and Ms. Wener is Senior Instructor, Department of Occupational Therapy, School of Medical Rehabilitation, Faculty of Medicine, University of Manitoba. Direct correspondence and requests for reprints to Dr. Donald Stewart, Student Counselling and Career Centre, 474 University Centre, University of Manitoba, Winnipeg, MB R3T 2N2 Canada; 204-474-8592 phone; 204-474-7558 fax; Don_Stewart@umanitoba.ca.

Key words: dental students, learning environment, psychological stress, self-efficacy

Submitted for publication 3/1/06; accepted 5/23/06

Successful completion of a dental education program involves intensive academic and personal preparation by the students, beginning with their predentistry studies and continuing throughout their dentistry program. As such, dental education programs must make every effort to balance the demands of academic and clinical training with students’ needs for a reasonable quality of life if programs are to successfully retain their students and adequately prepare them for the continuing stress involved in professional dental practice. This challenge has led to considerable interest in identifying sources of stress for students in dental education programs.

In a recent study of three European dental schools, several sources of stress for students were identified, including limited leisure time, examination anxiety, and adapting to the clinical phase of dental education. Beyond this, there was considerable variability across the different areas of dental education (e.g., endodontics and prosthetics were considered more stressful than pediatrics). In an Australian study, examinations and grades were found to be the most potent stressors, with the highest levels reported by students in their fourth year of training. A study of stress among dental students in Jordan similarly found examinations and grades to be the most stressful elements, along with limited time for relaxation or outside activities. During the clinical phase of training, difficulties related to patient attendance and ability to meet clinical requirements constituted additional sources of stress for the Jordanian students.

In a study of Canadian dental students, a national survey found that students’ top concerns about their academic program were lack of leisure time, procrastination, meeting faculty expectations...
for workload, and feeling powerless in the system. Problems with finances, motivation, and critical faculty attitudes were among the students’ reported secondary concerns. Another Canadian study\(^7\) found that students’ perceptions of their academic growth and development were affected by the amount of active classroom involvement and level of faculty concern for student development and teaching. Students’ perceptions of perceived control over their academic and developmental progress also affected their willingness to become actively involved in the classroom and to seek contact with faculty members outside of class.

It is clear from these studies that dental students reliably report a number of stressful factors in the learning environment, including managing their workload, dealing with examination pressure, maintaining life balance, and developing positive relationships with faculty. Although each student will experience the stresses of professional training somewhat differently, the cumulative effects of these stressors can have a serious impact on the psychological health of dental students.

For example, in a study of seven European dental schools,\(^8\) dental students across all sites were deleteriously affected by stress. In particular, it was noted that these students were emotionally exhausted, experienced a high degree of psychological distress, and seemed to fare more poorly than a comparison group of medical students, whose own training is also known to be stressful. In terms of psychological morbidity, more than a third of the students sampled were found to be at the level of concern, with almost two-thirds of the students at one site exceeding the clinical cut-off point. With respect to psychological burnout, it was found that rates varied across sites, with a high of 46 percent of students reporting emotional exhaustion at one dental school. Interestingly, in contrast to studies showing that clinical practice increased stress levels,\(^3,5\) these researchers\(^6\) found that contact with patients was positive for students and resulted in lower levels of psychological distress. These researchers also found that students who lived with their families had substantially lower levels of psychological distress and emotional exhaustion.

In another multisite European study of stress effects on dental students,\(^1\) between 10 percent and 28 percent of the sample showed significant signs of burnout, including emotional exhaustion, lack of accomplishment, and depersonalization. Limited leisure activities and examination anxiety contributed to emotional exhaustion, whereas depersonalization was most strongly associated with a lack of social integration.

For Australian dental students,\(^2\) it was found that perceptions of stress were due to an underlying tendency toward perfectionism based on an academic history of high achievement and powerful expectations of scholastic excellence. Once in dental school, where academic excellence is the norm, an adjustment in self-concept is required, and a new form of clinical competitiveness emerges. This transition can affect a student’s level of self-efficacy, which in turn can affect achievement and psychological health.

Together, these studies have contributed much to documenting the role played by stress in dental education. However, much of this research is limited by the use of a cross-sectional design in which students from different class years were sampled at a single point in time. One concern with such an approach is that there is no way to know if differences between class years are due to developmental changes or stem from pre-existing differences among the classes. A prospective approach—in which the same group of students is followed for a period of time, acting essentially as their own control condition—reduces this concern because changes in the cohort of students can be more readily attributed to developmental factors rather than extant differences.

For this reason, we employed a longitudinal design in which a cohort of dental students was followed throughout their entire program. We hoped that such an approach would allow us to more clearly evaluate students’ perceptions of their program and their concomitant psychological functioning as they progressed through their four-year dental education program.

---

**Methods**

**Participants**

All students beginning Dentistry I at the University of Manitoba in August 2000 (class of 2004) were eligible to participate (N=28). The class consisted of fifteen male students (54 percent) and thirteen female students (46 percent). The mean age of the class was twenty-six years, with a range from twenty-four to forty. The majority of the students (86 percent) were from Manitoba.

Students were initially informed of the study as part of their orientation to the dental program prior to the beginning of classes in the first year.
Care was taken to ensure that students understood the rationale for the study, the voluntary nature of their participation, and the safeguards to protect their anonymity when completing the measures. No identifying data were requested from the students, who used an untraceable code name throughout the study. All aspects of the project were reviewed and approved by the university Research Ethics Board and the Dean’s Office in Dentistry.

A battery of questionnaires was administered to the students at three points (August, December, April) in each of the four years of their dental program. The first administration of the measures took place during the orientation period for students prior to the commencement of classes each year. With the cooperation of the Dean’s Office, time was scheduled during the orientation for students to complete the questionnaires. This was seen as a desirable time to survey the students since they would be “starting fresh” at this point each year after their summer break. The second and third administrations of the measures took place approximately ten days prior to the students’ end of term exam series each year. This time was selected because it was late in the term, thereby allowing for an evaluation of the cumulative effects of the term to date, yet before the intense stress of their exam period. We were concerned that if the questionnaires were administered immediately prior to or during the exam period, we would simply be measuring students’ current level of exam anxiety rather than the cumulative effects of that term’s academic demands. With the support of the Dean’s Office and the consent of instructors, a small amount of class time was set aside to allow students to complete the measures during the midyear and final questionnaire administrations each year. Additional sessions were offered to allow students who were not in class at those times to complete the measures. The questionnaire package was pilot-tested on a cross-section of dental students in years one to four to determine how long it would take them to complete the measures and identify any problems with any of the measures prior to commencing the study.

Instruments

A major consideration in selecting the instruments to be employed was that they be brief, so as not to impose too much on the students’ time during the multiple administrations over the years of their program. A related consideration was that the package had “face validity” for the dental students insofar as the measures appeared to be tapping areas of relevance to them in order to maximize their continued investment in completing the measures. In addition, we were concerned that the instruments addressed the major areas of interest in a reliable manner, preferably with some demonstrated validity in studies of students in applied health settings. Within these parameters, a package of measures evaluating perceptions of the learning environment, psychological symptoms, ways of coping, and self-esteem was assembled, which students were able to complete in about fifteen minutes per administration.

Learning Environment Survey. Perceptions of the dental education learning environment were assessed using a modified version of the Medical School Learning Environment Survey (LES), a multidimensional instrument used to measure medical students’ perceptions of their learning environment as a way to plan appropriate educational program interventions and assess their impact. As we wanted our measures to be as brief as possible, we used the shortened version of the LES currently available through the University of New Mexico School of Medicine, adjusting the wording of some of the items to reflect the dental education context of this study (e.g., the term “dentist” was substituted for “physician”). Because we used a modified version of the instrument, our scores are not directly comparable to those obtained using the original longer version of the survey.

The LES is a thirty-four-item Likert-style instrument in which participants indicate the extent to which they perceive various statements to apply to their educational program using a 4-point scale (ranging from 1=Seldom to 4=Often). Some of the items are reverse-keyed to reduce response set bias. Sample items read, “Exams and evaluations emphasize understanding of concepts,” and “Faculty in the program are reserved and distant with students.” The LES has good internal consistency, with an overall Cronbach’s Alpha value of .97 for the entire instrument. Values for the subscales, described below, range from .79 to .86.

The LES consists of six subscales. The Meaningful Learning Experience subscale measures the degree to which students see the relationship between what they are studying and the kinds of situations and problems they will encounter in practice (scores can range from 8 to 32). The Emotional Climate subscale measures students’ affective perceptions of the learning environment (scores can range from 9 to 36). The Nurturance subscale measures students’
perceptions of the extent to which the faculty supports its students by demonstrating caring or providing assistance (scores can range from 4 to 16). The Student-Student Interaction subscale measures the extent to which students perceive close relationships among their classmates (scores can range from 5 to 20). The Flexibility subscale measures the extent to which students perceive the program as being a flexible, changing, open system (scores can range from 4 to 16). The Organization and Breadth of Interest subscale measures students’ perceptions of the degree to which the program allows for interests outside of dentistry (scores can range from 4 to 16).

**Symptom Questionnaire.** Aspects of the students’ psychological functioning and symptoms were assessed using the Symptom Questionnaire (SQ), a ninety-two item checklist of various symptoms respondents may have experienced over the past week. Responses are simply “Yes” or “No” for each item. Sample items are “Nervous,” “Feeling desperate, terrible,” and “Nauseated, sick to stomach.” For our purposes, we used the Anxiety, Depression, Somatic Concerns, and Hostility subscales of the SQ. Scores can range from 0 to 17 on each of the SQ subscales.

The SQ was selected because it focuses on current functioning and is sensitive to changes over time, it has been used with students in clinical health training programs, and it has median split-half reliability coefficients in the .80 range for the clinical scales.

**Ways of Coping Checklist.** Students’ preferred coping styles were assessed using the Ways of Coping Checklist (WCCL), a forty-two item Likert-style instrument in which respondents indicate the extent to which they would use a particular coping technique in response to a current or recent stressor. Respondents rate each coping technique on a 3-point scale ranging from 0=Never Used to 3=Regularly Used. A sample item reads, “Concentrated on something good that could come out of the whole thing.” For our purposes, students were instructed to complete this measure while thinking of a current or recent academic stressor.

The WCCL consists of five scales reflecting various styles of coping: Problem-Focused Coping, which emphasizes a planful approach to dealing with the stressor (scores can range from 0 to 45); Seeks Social Support, which emphasizes talking with others for advice and support (scores can range from 0 to 18); Blamed Self, which emphasizes self-criticism in response to stress (scores can range from 0 to 9); Wishful Thinking, which reflects unrealistic hopes or wishes for a different outcome (scores can range from 0 to 24); and Avoidance, which reflects passive or avoidant responses to stress (scores can range from 0 to 30). The Problem-Focused and Seeks Social Support scales are seen as reflecting adaptive responses to stress, whereas the responses measured by the other scales are seen as maladaptive.

The WCCL was selected because of its multidimensional approach to measuring both adaptive and maladaptive coping strategies, its focus on current or recent stressors, its standardization sample that included students in a clinical health training program, and its adequate reliability (Cronbach’s Alpha ranges from .74 to .88 for various scales, with a mean of .82).

**State Self-Esteem Scale.** Students’ evaluations of their current levels of self-esteem were assessed using the State Self-Esteem Scale (SSES), which was developed to measure changes in various aspects of self-esteem over time. The SSES is a twenty-item Likert-style instrument in which subjects report their self-perceptions in the areas of Performance Self-Esteem (feelings of worthy performance, confidence; scores can range from 7 to 35); Social Self-Esteem (feelings of social comfort; scores can range from 7 to 35); and Appearance Self-Esteem (feelings of satisfaction with physical appearance; scores can range from 6 to 30) using a 7-point scale ranging from 1=Not at all to 7=Extremely. Several of the items are reverse-keyed to control for response set bias. Sample items read, “I feel confident about my abilities,” and “I am worried about whether I am perceived as a success or a failure.” Respondents are instructed to answer the questions based on how they feel at the moment they are completing the questionnaire.

The SSES was selected because of its sensitivity to variations over time, its multidimensional approach to measuring self-esteem, its standardization on a university student sample, and its demonstrated reliability (Cronbach’s Alpha for entire scale=.92).

**Results**

Despite our best efforts, it was not possible to obtain completed questionnaires from all twenty-eight students at each questionnaire administration. This occurred because of scheduling limitations, student absences, opting out, and inconsistency or carelessness when completing the measures. As a result, at each test administration there were cases...
with missing data as well as cases we could not match due to inconsistent use of code names by the students. When we eliminated incomplete and unmatched cases from the data set, we discovered that only five participants consistently completed all measures at each of the twelve test administrations. We also discovered that even though there was an average of twenty-three students present at each of the test administrations, these were not always the same twenty-three students, reducing the amount of usable data from each test administration and precluding meaningful comparisons across all twelve administrations of the questionnaire package.

Since we could not use the entire data set in our analyses, we focused our attention on comparisons between students’ perceptions at the entry (i.e., beginning of first year) and exit (i.e., end of fourth year) points in their program, which increased the sample size to the point where we could conduct meaningful analyses (n=16 for most analyses). Although this approach does not address any fluctuations throughout the middle years of the program, it does serve to capture the cumulative effects of the entire dental school experience, which was our primary interest. In addition to comparing students at entry versus exit, we also conducted analyses involving the three test administrations in the first year (August, December, and April), since this was likely to be a time of fairly rapid change for the students.

**Perceptions of the Learning Environment**

Prior to looking at changes over time, an examination of students’ overall perceptions of the learning environment was undertaken by inspecting the mean ratings students gave to the various elements of the learning environment averaged across the four years of their program. Using the LES metric (where 1=Almost Never, 2=Occasionally, 3=Fairly Often, and 4=Often), the results indicated that mean ratings for all variables fell in the lower to middle categories, with an overall mean rating of 2. Ranked from lowest to highest, students expressed relatively low ratings for perceived Organization/Breadth of Interest (2.60), Emotional Climate (2.8), Flexibility (2.04), and Nurturance (2.14) and Student-Student Interaction (2.33). As noted below, with a few exceptions these ratings were stable over the course of the program.

With respect to changes in perceptions of the learning environment over time, a repeated measures MANOVA (n=16) conducted on the six LES subscales yielded a significant effect for time, F (6, 10)=3.99, p=.027. See Table 1 for mean LES scores. Follow-up univariate F tests (n=16) indicated that the multivariate effect was due to increased scores on the Meaningful Learning Experience (MLE) subscale, F (1, 15)=14.8, p=.002, and the Organization/Breadth of Interest; SSI=Student-Student Interaction. Means were calculated based on number of participants at each test administration.

### Table 1. Mean Learning Environment Survey scores (SD) for perceptions of the learning environment over time

<table>
<thead>
<tr>
<th>Measure*</th>
<th>Aug</th>
<th>Dec</th>
<th>Apr</th>
<th>Aug</th>
<th>Dec</th>
<th>Apr</th>
<th>Aug</th>
<th>Dec</th>
<th>Apr</th>
<th>Aug</th>
<th>Dec</th>
<th>Apr</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>23</td>
<td>23</td>
<td>22</td>
<td>23</td>
<td>26</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>21</td>
<td>23</td>
<td>13</td>
<td>22</td>
</tr>
<tr>
<td>MLE</td>
<td>9.3</td>
<td>18.0</td>
<td>18.3</td>
<td>18.8</td>
<td>20.5</td>
<td>19.0</td>
<td>21.4</td>
<td>19.6</td>
<td>20.2</td>
<td>21.6</td>
<td>19.1</td>
<td>19.7</td>
</tr>
<tr>
<td>(9.5)</td>
<td>(10.0)(3.1)</td>
<td>(4.5)(3.5)(4.1)</td>
<td>(3.5)(3.9)(3.3)</td>
<td>(3.3)(4.7)(3.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC</td>
<td>16.5</td>
<td>21.3</td>
<td>20.0</td>
<td>21.4</td>
<td>23.1</td>
<td>20.0</td>
<td>22.7</td>
<td>20.7</td>
<td>19.5</td>
<td>22.5</td>
<td>20.8</td>
<td>20.0</td>
</tr>
<tr>
<td>(9.3)</td>
<td>(4.8)(5.0)</td>
<td>(6.4)(4.6)(5.9)</td>
<td>(4.1)(5.6)(4.6)</td>
<td>(5.6)(7.3)(5.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nur</td>
<td>5.3</td>
<td>11.3</td>
<td>10.0</td>
<td>10.3</td>
<td>10.2</td>
<td>10.1</td>
<td>10.3</td>
<td>9.5</td>
<td>9.3</td>
<td>10.2</td>
<td>9.2</td>
<td>9.0</td>
</tr>
<tr>
<td>(5.2)</td>
<td>(1.5)(2.2)</td>
<td>(2.2)(2.0)(2.3)</td>
<td>(1.6)(2.4)(2.1)</td>
<td>(2.6)(2.1)(2.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flex</td>
<td>5.6</td>
<td>10.0</td>
<td>9.4</td>
<td>9.2</td>
<td>10.1</td>
<td>9.0</td>
<td>8.8</td>
<td>9.4</td>
<td>8.1</td>
<td>9.1</td>
<td>8.5</td>
<td>8.4</td>
</tr>
<tr>
<td>(4.6)</td>
<td>(2.4)(1.8)</td>
<td>(2.3)(2.4)(2.4)</td>
<td>(1.8)(2.1)(2.0)</td>
<td>(2.0)(2.2)(2.3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBI</td>
<td>4.1</td>
<td>7.1</td>
<td>6.9</td>
<td>6.9</td>
<td>8.0</td>
<td>7.4</td>
<td>7.3</td>
<td>7.0</td>
<td>7.3</td>
<td>7.8</td>
<td>8.2</td>
<td>7.6</td>
</tr>
<tr>
<td>(3.5)</td>
<td>(2.9)(2.3)</td>
<td>(2.3)(2.6)(2.5)</td>
<td>(2.2)(2.5)(2.4)</td>
<td>(2.1)(2.6)(2.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSI</td>
<td>11.6</td>
<td>13.4</td>
<td>12.8</td>
<td>13.7</td>
<td>14.3</td>
<td>12.5</td>
<td>13.2</td>
<td>12.7</td>
<td>12.4</td>
<td>13.3</td>
<td>11.8</td>
<td>13.3</td>
</tr>
<tr>
<td>(4.8)</td>
<td>(2.4)(2.2)</td>
<td>(2.0)(2.6)(2.7)</td>
<td>(2.1)(2.5)(2.7)</td>
<td>(3.1)(2.9)(2.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*MLE=Meaningful Learning Experience; EC=Emotional Climate; Nur=Nurturance; Flex=Flexibility; OBI=Organization/Breadth of Interest; SSI=Student-Student Interaction. Means were calculated based on number of participants at each test administration.
of Interest (OBI) subscale, \( F(1, 15)=7.28, p=.017 \). Using paired sample \( t \) tests \((n=16)\), we found that these increases occurred between August and December of year one for both MLE, \( t(14)=3.41, p=.004 \), and OBI, \( t(14)=2.61, p=.021 \). Students’ scores on Flexibility, \( t(14)=2.49, p=.026 \), and Nurturance, \( t(14)=4.13, p=.001 \), also increased over the first three months of year one, but neither of these changes attained univariate significance within the multivariate analysis.

In summary, we observed that beginning dental students reported increased perceptions of the meaningfulness of the material they were learning and reduced perceptions of the extent to which dental school would limit their outside activities. However, apart from this slight increase in positive perceptions during the first three months of their program, students tended to maintain a stable view of dental school as a seldom-to-occasionally positive learning environment.

**Psychological Symptoms**

A repeated measures MANOVA \((n=16)\) conducted on the four subscales of the Symptom Questionnaire yielded a significant effect for time, \( F(4, 12)=3.39, p=.045 \). See Table 2 for mean SQ scores. Univariate \( F \) tests \((n=16)\) showed significant increases over time for symptoms of anxiety, \( F(1, 15)=10.95, p=.005 \), depression, \( F(1, 15)=7.22, p=.017 \), and hostility, \( F(1, 15)=6.75, p=.02 \). There were no changes over time in students’ reports of somatic symptoms. The observed increases in depression, \( F(2, 24)=3.73, p=.039 \), and hostility, \( F(2, 24)=4.32, p=.025 \), occurred during the students’ first three months in the program, after which the levels remained stable. Although anxiety increased between entry and exit, as noted above, there was no significant increase during the first year of the program, \( F(2, 24)=1.77, n.s. \).

We also examined whether our students reported higher levels of symptoms than those reported in the general population or by clinical samples. We found that the levels of depression, \( t(64)=2.73, p<.01 \), and anxiety, \( t(64)=3.32, p<.01 \), were significantly higher in our sample than for nonpatients in the original standardization sample,\(^{11}\) but the levels remained subclinical overall.\(^{11,15}\) The level of hostility for students overall did not differ from that of nonpatients in the original standardization sample, \( t(64)=0.15, n.s. \). Looking at individual scores, only two students met the clinical cut-off level on the anxiety subscale, whereas three met the clinical cut-offs on the depression and hostility subscales.

In summary, we found that students’ reported levels of depression, hostility, and anxiety increased over time. For depression and hostility, the increases occurred during the first three months of the program, after which the levels were essentially stable. Anxiety tended to increase between entry and exit. Although reported levels of depression and anxiety symptoms were higher than in the general population, very few students actually reported symptoms in the range of clinical concern.

**Coping Strategies**

Separate repeated measures MANOVAs \((n=16)\) were conducted on the adaptive (Problem-Focused Coping, Seeks Social Support) and maldadaptive

---

### Table 2. Mean Symptom Questionnaire scores (SD) over time

<table>
<thead>
<tr>
<th>Measure*</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aug</td>
<td>Dec</td>
<td>Apr</td>
<td>Aug</td>
</tr>
<tr>
<td>N</td>
<td>23</td>
<td>23</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Anx</td>
<td>3.2</td>
<td>6.9</td>
<td>6.1</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>(3.1)</td>
<td>(5.0)</td>
<td>(5.1)</td>
<td>(5.2)</td>
</tr>
<tr>
<td>Dep</td>
<td>1.6</td>
<td>3.9</td>
<td>4.5</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>(1.9)</td>
<td>(4.0)</td>
<td>(5.2)</td>
<td>(4.3)</td>
</tr>
<tr>
<td>Som</td>
<td>2.4</td>
<td>3.9</td>
<td>4.4</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>(2.1)</td>
<td>(4.3)</td>
<td>(4.8)</td>
<td>(4.2)</td>
</tr>
<tr>
<td>Hos</td>
<td>0.8</td>
<td>3.3</td>
<td>4.0</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>(1.3)</td>
<td>(4.5)</td>
<td>(4.0)</td>
<td>(2.9)</td>
</tr>
</tbody>
</table>

*Anx=Anxiety; Dep=Depression; Som=Somatic Concerns; Hos=Hostility. Means were calculated based on number of participants at each test administration.
(Blamed Self, Wishful Thinking, Avoidance) Ways of Coping Checklist subscales. See Table 3 for WCCL means.

Results for the adaptive coping subscales showed a significant multivariate effect over time, $F (2, 14) = 4.136, p = .039$. Within this variable set, a significant decrease was observed for the Problem-Focused Coping subscale, $F (1, 15) = 5.35, p = .035$, particularly during the first three months of the program, $F (2, 22) = 3.65, p = .043$. Along with this, a trend toward reduced levels of Seeking Social Support was observed, $F (1, 15) = 3.81, p = .07$, especially during the first year, $F (2, 22) = 3.35, p = .054$.

A significant multivariate effect was also observed for the maladaptive WCCL subscales, $F (3, 13) = 3.458, p = .048$. Significant univariate effects ($n = 16$) were found for both the Wishful Thinking subscale, $F (1, 15) = 8.01, p = .013$, and the Avoidance subscale, $F (1, 15) = 8.15, p = .012$, both of which increased from entry to exit. There were no changes over time in the extent to which students used self-blame as a response to stress, $F (1, 15) = .786, n.s.$.

Compared to medical students in the standardization sample for the Ways of Coping Checklist, our students used more problem-focused coping, $t (439) = 3.48, p < .01$, despite the decrease observed in their first year, along with more avoidance, $t (439) = 2.04, p < .05$.

In summary, we observed that over the course of their first year in the program, students reported significantly less problem-focused coping and somewhat reduced efforts to seek social support. Avoidance and wishful thinking increased between entry and exit.

**Self-Esteem**

A repeated measures MANOVA ($n = 16$) conducted on the three State Self-Esteem Scale subscales yielded a significant effect for time, $F (3, 13) = 4.625, p = .021$. See Table 4 for SSES means. Univariate Fs ($n = 16$) were significant for Performance Self-Esteem, $F (1, 15) = 6.68, p = .021$, and Appearance Self-Esteem, $F (1, 15) = 8.20, p = .012$, both of which decreased over time.

Looking at the pattern of scores within the first year of the program, we observed that the decrease in students’ performance self-esteem occurred between August and December of year one in the program, $t (14) = 2.37, p = .033$, likely as a consequence of adjusting to the increased academic demands of dentistry compared to their predentistry studies. Appearance self-esteem, on the other hand, declined significantly from entry to exit, $F (1, 15) = 8.20, p = .012$, whereas social self-esteem did not change at all, $F (1, 15) = .377, n.s.$.

Although students’ performance and appearance self-esteem did decrease while in dentistry, the levels remained consistent with those of other groups of university students in the SSES standardization sample, falling at the mean for both performance self-esteem, $t (448) = -.116, n.s.$, and appearance self-esteem, $t (448) =-.431, n.s.$.

**Discussion**

Our primary aim was to examine how a cohort of Canadian dental students perceived their learning experience.
environment and psychological functioning over the four-year course of their dental education program. Consistent with previous research examining dental education programs and psychological functioning, we found that students developed and/or maintained less than positive perceptions of their program\textsuperscript{3,5-7} and experienced a range of stress-related effects during their training.\textsuperscript{3,4,8}

**Perceptions of the Learning Environment**

Perceptions of the learning environment as a seldom-to-occasionally positive experience were maintained over the course of the entire dental education program, with a few minor exceptions. During an adjustment phase in the early months of their first year in the program, students reported increasingly favorable perceptions of the relationship between what they are learning and what they believe they require for professional practice. They also reported an increased awareness of the possibility of maintaining some outside interests despite the demands of dental school. Although these are positive developments, it is unclear whether they stem from positive early impressions of dental school or a sense of relief that it was not as difficult and all-consuming as initially expected. Given the overall modest ratings across the various subscales of the LES, the latter possibility seems more likely.

In contrast to previous studies where more senior students reported progressively more negative attitudes toward their program,\textsuperscript{16-18} our students’ perceptions of the learning environment reflected a moderately negative perspective towards dental school that they essentially maintained throughout their entire dental education. This increased consistency may be due to our longitudinal methodology, where the same students were followed throughout their program, in contrast to other studies employing a more cross-sectional design. Another possibility is that our students held more modest (or realistic) initial expectations about what their professional training would involve; hence, they were less likely to become as disillusioned, cynical, or resentful of their program as students described elsewhere in the literature.\textsuperscript{16-18}

**Psychological Functioning**

In contrast to the rather stable perceptions of the learning environment, we found considerable variability in psychological functioning over time. For example, we found that students experienced increased anxiety, decreased appearance self-esteem, and increased use of maladaptive coping strategies (wishful thinking and avoidance) over the course of their dental education, along with some adjustment difficulties in the first year that were manifest as increased depression and hostility, decreased performance self-esteem, and decreased use of problem-focused coping.

In terms of students’ initial adjustment to dental school, it is possible that the psychological effects noted above are due not to the learning environment per se, but rather to changes in students’ self-concept associated with their early experiences in dentistry. For example, the decrease in performance self-esteem observed during the first three months of year one can be viewed as analogous to a decrease in academic self-concept. Given that students entering dentistry are de facto excellent students, it is obvious that they have a tremendous investment in their academic performance and base important aspects

<table>
<thead>
<tr>
<th>Measure*</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aug</td>
<td>Dec</td>
<td>Apr</td>
<td>Aug</td>
</tr>
<tr>
<td>N</td>
<td>23</td>
<td>23</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Perf</td>
<td>28.3</td>
<td>25.7</td>
<td>25.5</td>
<td>24.6</td>
</tr>
<tr>
<td></td>
<td>(4.2)</td>
<td>(6.5)</td>
<td>(5.7)</td>
<td>(5.3)</td>
</tr>
<tr>
<td>App</td>
<td>22.8</td>
<td>21.7</td>
<td>20.7</td>
<td>21.3</td>
</tr>
<tr>
<td></td>
<td>(3.6)</td>
<td>(4.1)</td>
<td>(4.1)</td>
<td>(5.3)</td>
</tr>
<tr>
<td>Soc</td>
<td>27.5</td>
<td>26.5</td>
<td>24.7</td>
<td>25.3</td>
</tr>
<tr>
<td></td>
<td>(4.3)</td>
<td>(5.9)</td>
<td>(5.8)</td>
<td>(6.5)</td>
</tr>
</tbody>
</table>

*Perf=Performance Self-Esteem; App=Appearance Self-Esteem; Soc=Social Self-Esteem. Means were calculated based on number of participants at each test administration.

---

Table 4. Mean State Self-Esteem Scale scores (SD) over time

September 2006 • Journal of Dental Education

979
of their identity on academic success. As the program begins, students may be pleased and relieved by the perceived relevance of the academic material to their professional goals but at the same time feel somewhat threatened by the amount and nature of the course material to which they are being exposed. One outcome of this could be decreased academic self-confidence, as marked by a decrease in performance self-esteem. The observed increases in depression and hostility during the first year could be seen as further corroboration of this possibility, while the increased anxiety noted by the end of the program could be similarly viewed as evidence of continued disparity between student levels of self-confidence and their program’s mounting academic demands.

In addition to these shifts in self-concept and psychological symptoms, changes were also noted in students’ patterns of coping throughout the program. During their first year, students reported a decrease in their use of problem-focused coping, which is one of the most adaptive coping strategies available for dealing with stress. Even more troubling was the observation that levels of wishful thinking and avoidance, two of the less adaptive coping strategies, increased over the length of the dental education program. Increased use of these more passive stress responses suggests a certain level of helplessness may have developed among the students. Although it was noted that our students continued to show more use of problem-focused coping than medical students, they also showed more use of avoidance than their medical counterparts.

Taken together, the observed pattern of changes in self-esteem, psychological symptoms, and coping strategies suggests that the dental education program may have reduced students’ levels of self-efficacy or their belief in their ability to bring about a desired result. This is important because a strong belief in one’s ability to perform the actions needed to produce a desired result is essential to competence across diverse activities. As noted in earlier research, negative self-efficacy beliefs also account for a substantial proportion of the variance in the level of dental student stress, so any decreases in self-efficacy are problematic in that they both increase stress levels and interfere with the development of competencies.

Despite these negative effects, our students generally did not experience clinical levels of symptoms, contrary to earlier studies in which dental students met clinical cut-offs or fared as poorly as some psychiatric populations with respect to symptom levels. Of particular note was the absence of high levels of somatic symptoms or psychosomatic complaints in our study, again in contrast to earlier studies in which physical reactions were noteworthy. The only “physical” effect noted among our sample was a decrease in appearance self-esteem over the course of the program, perhaps reflecting the reality that as students got busier they had less time to devote to maintenance of their physical health and fitness and consequently felt less confident about their appearance.

Why did our students appear to suffer less serious stress effects compared to students in other programs? This is difficult to answer unequivocally, but some salutary effects may be due to the majority of our students attending their local dental school, thereby maintaining their pre-existing social support networks and outside interests to balance the academic demands. In addition, despite the inherent competition in a dental education environment, our students’ perceptions of student-student interactions and associated peer support were moderately well developed relative to some of the other variables examined, which may have served as a stress buffer of sorts. Finally, it may be that our students had more realistic (i.e., somewhat negative) expectations about dental school and as a consequence were better prepared psychologically to deal with the academic and personal demands of their professional training.

**Implications for Dental Education**

One way to improve the learning environment and quality of life for dental students is to carefully consider the information given to students at their initial orientation to the program, as this can play a key role in shaping their expectations of self and school. Enhancing the orientation content to include specific discussion of how students’ academic identity, self-concept, and efficacy expectations may be challenged during their dental education could help to facilitate a more successful adjustment to dentistry by aligning their expectations more closely with the actual program demands. Along with this, targeted programming to help students at all levels to develop and maintain effective problem-focused coping skills would also seem worthwhile, as would efforts to foster a supportive rather than competitive peer environment. Collaboration with university student counseling and psychological service providers would provide additional expertise in developing programs and services to address these considerations. Finally, efforts to
promote a sense of student empowerment, such as increased student voice in faculty decision making, would also go a long way toward reducing feelings of helplessness, stress, or resentment that could manifest as negative perceptions of the learning environment or decreases in student functioning or wellness.  

Conclusion

Our study is the first to report on the experiences of a single cohort of Canadian dental students followed throughout their entire dental education program. We found that students’ perceptions of their learning environment are formed very early in their professional training and tend to remain stable throughout their program. Although the students do not feel very positively about their professional training, it may be that their modest expectations reflect a more or less realistic appraisal of the demands they will face as they progress through their dental education program. It is also possible that these modest expectations actually help students to successfully adjust to the program.

During the first few months of their program, as the students struggle to understand their new environment, we found that students report increased psychological symptoms and decreased use of adaptive coping strategies. Despite these difficulties, the level of psychopathology manifested by the students overall is quite low, suggesting that they successfully establish a new equilibrium in their academic self-concept that allows them to meet the challenges of their dental education. Dental educators can support students in this process by ensuring that the students have realistic expectations about the program and its demands/effects on them, as well as information about student services and encouragement to access them in a proactive manner.

Acknowledgments

The authors wish to acknowledge the research assistance of Ms. Susan Petras, Ms. Althea Coughlan, Ms. Gennie Heroux, Ms. Sally Hammell, and Ms. Roslyn Gaetz in the data collection process.

REFERENCES

10. Ruman C, research coordinator, Office of Program Evaluation, Education and Research, University of New Mexico School of Medicine. Personal communication, April 1998.