The external validity of MMPI-2 research conducted using college samples disproportionately represented by psychology majors

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Abstract

Psychology researchers have relied extensively on undergraduate college participants in their study of human behavior. Concern has been raised about the disproportionate representation of psychology majors among participants included in samples drawn from psychology department subject pools. In particular, MMPI researchers have relied extensively on college samples without reference to participant major. The present study compared the MMPI-2 profiles of 72 psychology majors with 425 college students specializing in other areas (e.g., social work, nursing, occupational therapy, physical therapy, criminal justice, communication disorders, biology, natural science, chemistry, chemical engineering, mechanical engineering, mathematics, and others). Psychology majors did not differ from comparison students on any of the MMPI-2 validity or clinical scales. Significant gender by college major interaction effects were not found. These profile symmetries provided assurance that efforts to control potential college major effects in published MMPI-2 research are unwarranted.

Keywords: Psychology major, selection of college major; Minnesota multiphasic personality inventory (MMPI-2), gender by college major interaction

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1. Introduction

Persistent concerns have been raised by heavy behavioral science reliance on college samples (Dobbins, Lane, & Steiner, 1988; Gordon, Slade, & Schmitt, 1986, 1987; Greenberg, 1987; Jackson, Procidano, & Cohen, 1989). One review of 32 experimental studies found different results often were derived from identical procedures using student and community samples (Gordon et al., 1986). Jung (1969) raised early concern that 90% of psychological research published at 60 major universities was collected through large subject pools that have been found in an estimated 75% (Sieber & Saks, 1989) of psychology departments. A recent analysis of eight APA journals found a mean rate of 35% of their publications relied on college samples (King, Bailly, & Moe, 2003, Chapter 4).

The external validity of behavioral science research derived exclusively from college samples could be compromised by a variety of factors. College samples are often disproportionately represented by volunteers who may differ in dozens of demographic and psychological attributes (Rosenthal & Rosnow, 1975). Student volunteers presumably self-select their involvement in areas of research (e.g., reactions to erotica, pain tolerance, lab-induced aggression, etc.) that reflect personal interests that could influence performance (Jackson et al., 1989; Silverman & Margulis, 1973). College students may even differ in important dimensions as a function of the time in the semester when the student consents to participate (Wang & Jentsch, 1998; Masling, O’Neill, & Jayne, 1981).

A related concern regarding the disproportionate representation of psychology majors within psychology department subject pools has generated minimal attention. Reliable estimates of the percentage of psychology majors included in typical department subject pools are not available leaving questions about the extent to which psychology majors (and other pool participants) accurately represent the college student population itself. Only one study could be found where special efforts were taken to assure that a college sample was drawn campus-wide rather than through the department subject pool (Lenzenweger, Clarkin, Kernberg, & Foelsch, 2001).

1.1. College major as an independent variable

Differences between psychology and other college majors have been the focus of little empirical research to date. Puente, Awkard, Tesh, and Southard (1986) found that 47 psychology majors were less political than 78 undergraduate controls as measured on the Revised Study of Values questionnaire (Allport, Vernon, & Lindzey, 1960). Gallucci (1997) found that a substantial portion (56%) of their 130 person sample of undergraduate psychology majors aspired to be clinical or counseling psychologists and generated relatively favorable (as compared to recent doctoral graduates) ratings regarding the job market, salary range, professional autonomy, and job security should they succeed. Harton and Lyons (2003) compared 192 undergraduate psychology majors to 205 controls (drawn from four universities) with an emphasis on gender differences in career choice motives as reflected in Interpersonal Reactivity Index (Davis, 1983). Psychology majors were found to express interest in helping professions and to be more advanced in their college careers with evidence of higher empathy-levels and perspective taking than their peers from other majors. Lunneborg and Lunneborg (1991) found that psychology majors are similar to students from other majors except that they exhibited significantly stronger academic performance, better
high school grades and higher achievement test scores. Crocker, Karpinski, Quinn, and Chase
(2003) found no significant differences between undergraduate psychology and engineering majors
in self-esteem or emotional reactivity to negative feedback.

King et al. (2003) compared 84 psychology majors and 458 comparison college students on 34
measures of developmental history and psychosocial functioning. Gender ratios for the two com-
parison groups were close to identical, and none of the gender by group interactions were signif-
icant. Psychology majors reported significantly higher rates of parental divorce and suicide
attempts than students enrolled in other areas. Otherwise, psychology majors did not differ signif-
icantly from other college students on any of the remaining variables which included prior histo-
ries of mental health treatment (psychotherapy, chemical dependency, eating disorders,
psychiatric hospitalization), physical or sexual abuse, disruptive behavior (sexual harassment
accusations, violence, arrest record), parental bereavement, or depression (as measured by the
Beck Depression Inventory).

1.2. Minnesota multiphasic personality inventory

The Minnesota Multiphasic Personality Inventory provides a broad self-report appraisal of
psychiatric symptomatology including mood, anxiety, somatoform, personality and thought dis-
turbance indicators (MMPI-2: Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) which
have been more widely administered than other major inventories such as the Millon Clinical
Multiaxial Inventory-III (MCMI-III: Millon, Millon, & Davis, 1994), Coolidge Axis II Inventory
(CATI: Coolidge & Merwin, 1992), and Personality Assessment Inventory (PAI: Morey, 1991). It
has been translated into about 125 languages (Lonner, 1990), and a recent literature review found
well over 9000 MMPI and MMPI-2 citations since the early 1940’s. The MMPI-2 validity and
clinical scales have been found to possess sound psychometric properties. The scoring and inter-
pretation manual (Butcher et al., 1989) established internal consistency coefficients for the 13 clin-
ical and validity scales of about 0.65 in the normative sample with one-week test–retest reliabilities
ranging from 0.77 and 0.81.

Graham (1988) summarized data establishing the validity of the clinical scales in distinguishing
423 psychiatric patients from 1644 normative controls in the nature and severity of their psychi-
atric symptoms. A more recent meta-analysis of 403 clinical and control samples estimated that
10–20% of the variance in the diagnosis of major mood, anxiety, and psychotic psychiatric condi-
tions could be accounted for by the clinical scales (Zalewski & Gottesman, 1991). MMPI-2
scores have been shown also to be useful in predicting treatment utilization and outcome (Cher-
vinsky et al., 1998; Chisholm, Crowther, & Ben-Porath, 1997; Jin, Rourke, Patterson, Taylor, &

MMPI-2 normative data can be found in administration and scoring manual (Butcher et al.,
1989) sorted by gender, ethnic group, geographical region and even setting (e.g., military base,
Native American reservation). Caucasian respondents generated lower scores than their ethnic
(Black, Hispanic, Native American, Asian) counterparts on many of the scales. Scores did vary
some as a function of region (Minnesota, California, North Carolina, Ohio, Pennsylvania, Vir-
ginia, Washington). For example, women in Minnesota and California differed in their respective
clinical scale raw scores by the following effect sizes (M difference divided by the MN SD): 0.43
(Hs), 0.28 (D), 0.19 (Hy), 0.26 (Pd), 0.20 (Mf), 0.003 (Pa), 0.12 (Pt), 0.35 (Sc), 0.34 (Ma), and
0.001 (Si). Effect size differences for the men were: 0.12 (Hs), 0.27 (D), 0.08 (Hy), 0.23 (Pd), 0.02 (Mf), 0.04 (Pa), 0.02 (Pt), 0.23 (Sc), 0.20 (Ma), and 0.09 (Si). In all but three cases (Si scale for men and Mf for both genders) respondents from Minnesota generated lower clinical scale scores (tests of statistical significance not reported) than those in California (this trend found in regard to the other states as well).

Lanyon (1968) provided perhaps the earliest summary of MMPI research regarding profile differences as a function of speciality group (e.g., prisoners, parents of troubled children, career aspiration, ethnicity, health, psychopathology, etc.). Only one published report (cited in this 1968 resource) could be found in the psychology literature regarding MMPI profile differences as a function of college major. Norman and Redlo (1952) examined MMPI profile differences between anthropology (n = 22), mathematics/chemistry/physics (n = 18), engineering (n = 29), business administration (n = 23), art/music (n = 17), geology (n = 8), and psychology/sociology (n = 20) majors. Comparisons were made between each group and the total sample (minus itself). Psychology/sociology majors scored significantly lower on the Pa scale. Mathematics/chemistry/physics majors generated lower Sc scores. Engineering students generated lower F, Mf and Ma scores. Business administration was lower in D, and art/music students were found to be relatively higher than the total sample in L and Mf scores. These researchers also examined the level of satisfaction respondents had with their choice of college major. They found higher Mf and lower Pt scores among students “strongly satisfied” with their college major. Replications or extensions of this work on MMPI profile differences across college major could not be found. One recent analysis (Newsom, Archer, Trumbetta, & Gottesman, 2003) revealed substantial changes in response tendencies to individual items comprising an adolescent version of the MMPI generated from different cohorts separated by a forty year period (samples drawn in 1948–1989). Effect sizes for the 25 items showing the greatest shift in endorsement frequency ranged from 0.36 to 1.24. The impact of personal and sociocultural influences such as career choice on test item interpretation and meaning might also be expected to change over time diminishing the replicability of dated findings.

1.3. Present study

A computer search (PSYCHINFO) of the MMPI-2 literature illustrates the regularity with which investigators rely on college samples for clinical (particularly thesis and dissertation) research. The composition of majors within college samples are seldom, if ever, established in published MMPI-2 research. The present analysis provided comparisons of psychology majors with students from other disciplines. It was hypothesized that profiles would differ substantially across undergraduate curricula posing additional concerns about the external validity of MMPI-2 research that relied exclusively on college samples disproportionately represented by psychology majors.

2. Method

2.1. Participants

College students (n = 497) enrolled in undergraduate abnormal, personality, introductory and clinical psychology classes at the University of North Dakota consented (approximately 50% of
those invited) to complete the MMPI-2 to earn extra credit in their respective classes. Most of the sample were women (73%) and only 5.6% identified themselves with minority ethnicity (Native American, $n = 11$, 2.3%; Hispanic, $n = 2$, 0.4%; Asian, $n = 2$, 0.4%; Mixed, $n = 6$, 1.2%; Black, $n = 5$, 0.9%; or Other, $n = 1$, 0.4%). Native American students contributing to the psychology department subject pool were primarily identified with Ojibwa or Chippewa tribal affiliations. This sample was drawn as a subset of the 542 students examined in an earlier analysis (King et al., 2003).

Class rosters circulated by the university registrar’s office were used to establish that 72 of the participants were psychology majors. The remaining 425 undergraduates were categorized into groups including social work ($n = 42$), nursing ($n = 80$), occupational therapy ($n = 40$), physical therapy ($n = 54$), criminal justice ($n = 30$), communications disorders ($n = 26$), various “sciences” (11 biology, 8 natural science, and 4 chemistry, chemical engineering, mechanical engineering, and mathematics majors), undecided ($n = 27$), and 103 “others” (distributed widely among English, German, Russian, journalism, history, visual arts, communications, music, political science, business, public relations, sociology, advertising, aeronautics, management, accounting, industrial technology, computer science, athletic training, and recreational services majors). These various groups differed in their respective percentages of women and minority participants (psychology, 71% and 8%; nursing, 84% and 6%; occupational therapy, 88% and 0%; social work, 74% and 7%; communications disorders, 92% and 7%; physical therapy, 76% and 2%; sciences, 43% and 4%; criminal justice, 50% and 10%; other, 68% and 10%).

2.2. Group comparisons

An initial set of 2 (gender) by 2 (group) analyses of variance (ANOVA) were conducted contrasting the 72 psychology majors with the 425 remaining students in the participant pool on each of the MMPI-2 validity and clinical scales. A second set of 2 (gender) by 9 (group) ANOVAs were completed to contrast the 72 psychology majors with students from social work, nursing, occupational therapy, physical therapy, criminal justice, communications disorders, “sciences”, and “other” majors (undecided students excluded). These categorizations were determined based on the sufficiency of their sample size with the “science” and “other” (largely liberal arts) categories formed as contrasts to the human service and helping profession interests found among most of the participants in this particular sample.

2.3. Measurement procedure

Participants who signed consent forms were invited to complete the MMPI-2 for extra credit at their own discretion during the first month of course enrolment. MMPI-2 profiles were excluded for participants generating an $F$ scale $T$-score in excess of 99 (Graham, 1990). Testing required about an hour and was completed in privacy. Each participant coded the resulting protocol with a six digit self-generated number to allow for anonymity but eventual matching of results with the proper participant in the final data base. Participants were not given test feedback, and study objectives were described in general terms. A total of 17 participants were eliminated at the outset (not assigned to any group) due to the exclusion criterion specified above. Analyses for the 497
eligible participants were conducted using MMPI-2 T-scores for each of the ten clinical and three validity scales.

3. Results

MMPI-2 raw scores are converted into T-scores ($M = 50$, $SD = 10$) that are used in most published research. Table 1 showed that the distribution of scores generated from the present analysis approximated normative expectancies (Butcher et al., 1989). A comparison of these scores with a normative sub-sample of 562 community (as opposed to college) participants drawn from an adjoining state (Minnesota) indicated an average scale to scale difference of about 0.29 standard deviations (present sample higher for all scales except Si).

Gender differences were found for only two of the MMPI-2 clinical scales (see Table 1). Women scored higher on *Mf* (Scale 5), $F(1, 480) = 15.12$, $p < 0.0001$. Men scored higher on *Ma* (Scale 9), $F(1, 420) = 4.39$, $p < 0.04$. Psychology majors did not differ significantly from the remaining college students on any of the MMPI-2 validity or clinical scales ($d = 0.18$ for Scale 0 represented the largest effect size, $p = 0.15$). Similarly, the psychology majors did not differ from the students segregated into the eight alternative groups (social work, nursing, occupational therapy, physical therapy, criminal justice, communications disorders, sciences, or other majors) on any of the 13 MMPI-2 validity or clinical scales. Gender ratios were similar across comparison groups, and

Table 1

<table>
<thead>
<tr>
<th>MMPI-2 scale</th>
<th>Psychology majors</th>
<th>Other majors</th>
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<tbody>
<tr>
<td></td>
<td>Men&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Women&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>$M$</td>
<td>SE</td>
</tr>
<tr>
<td>$L$</td>
<td>47.0</td>
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<tr>
<td>$F$</td>
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<tr>
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<td>2.42</td>
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<tr>
<td>2 $D$</td>
<td>48.0</td>
<td>2.01</td>
</tr>
<tr>
<td>3 $Hy$</td>
<td>52.2</td>
<td>2.40</td>
</tr>
<tr>
<td>4 $Pd$</td>
<td>55.3</td>
<td>2.01</td>
</tr>
<tr>
<td>5 $Mf$&lt;sup&gt;**&lt;/sup&gt;</td>
<td>49.4</td>
<td>2.38</td>
</tr>
<tr>
<td>6 $Pa$</td>
<td>50.4</td>
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<td>7 $Pt$</td>
<td>53.3</td>
<td>2.23</td>
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<td>8 $Sc$</td>
<td>53.7</td>
<td>2.71</td>
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<tr>
<td>9 $Ma$&lt;sup&gt;***&lt;/sup&gt;</td>
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<td>2.93</td>
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<tr>
<td>0 $IO$</td>
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<td>1.86</td>
</tr>
</tbody>
</table>

Note: gender effect significant at the following levels: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

<sup>a</sup> $n = 21$.
<sup>b</sup> $n = 51$.
<sup>c</sup> $n = 110$.
<sup>d</sup> $n = 315$. 
none of the gender by group interactions (cell sizes exceeded 10 in every analysis) were found to be significant.

4. Discussion

The MMPI-2 profile similarities found in this study provide an added level of assurance that research samples disproportionately represented by psychology majors generalize well to those drawn from the broader college population. These participants all shared enrollment in one or more psychology courses, but the total sample was represented by a diversity of majors involving both basic science and human service interests. While a majority of the non-psychology majors (57%) shared applied human service interests (social work, nursing, occupational therapy, physical therapy and communication disorders), additional comparisons with students completing basic science \((n = 23)\) or liberal arts \((n = 103)\) curricula yielded similar results. Contrasts between other majors proved similarly fruitless and served as a partial failure to replicate previous findings regarding MMPI group differences (Norman & Redlo, 1952). These profile symmetries provided further assurance that efforts to control potential college major effects in published MMPI-2 research remain unwarranted.

Participant volunteers in the present study were drawn from the University of North Dakota, a moderate-sized (>12,000) Midwestern institution of higher learning. Potential geographic influences were given attention when considering the relevance of these results to college majors residing in other parts of the country. Regional MMPI-2 differences described in the test manual (Butcher et al., 1989) indeed suggested a trend in Minnesota, as opposed to other states, toward lower scores on many of the clinical scales. This North Dakota sample ultimately looked more similar to California and other non-Midwestern states which may extend the external validity of these results. Recent concerns raised (King et al., 2003) regarding evidence of a higher frequency of suicide attempts and parental divorce among psychology majors in a subset of this same sample did not translate into signs of higher relative distress (e.g., \(F, D, Pt, Sc\)) within this target group.

Gender differences in MMPI-2 profiles were consistent with those found in other studies. The present analysis extended this area of research by demonstrating the absence of gender by college major effects on MMPI-2 profiles as well. It remains possible that other moderating variables (e.g., availability of family role models in area of specialization, degree of satisfaction with career choice, level of academic achievement, etc.) could interact with college major in effecting MMPI-2 symptomatology. Extant research has instead advanced the more modest objective of assuring a certain stability in MMPI-2 scores among men and women across college major.

References


