Factor Analysis of Beck Depression Inventory-II
With Two American Indian Samples

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Introduction
The Beck Depression Inventory-II (BDI-II) is used on a daily basis to assess depression with people from many cultures and ethnicities, however; very few validated the use of the BDI-II with minority populations (Gray, Peters, & McCullagh, 2016; Gray, Brionez, Petros, & Gonzaga, 2018). We conducted confirmatory factor analyses of the BDI-II with two independent American Indian (AI) samples with the factor analysis provided in the BDI-II Manual (Beck, Steer, & Brown, 1996). This type of analysis will inform practitioners about the construct validity of the BDI with American Indians.

Method
Participants consisted of three groups of people who completed the BDI-II. AI clinical and community, and AI community.


Sample 2: AI Clinical &Community consisted of 500 AI adult participants with and without diagnoses of depression, anxiety and substance abuse (M=233, F=360; Age: 18-80 Years) from seven reservations in the northern plains of the US.

Sample 3: AI Community was a Community Sample of 509 Adults Collected at Powwows and Health Fairs in North Dakota and Minnesota. (Male=191; Female=360; Age: 18-79 Years).

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Results
Two confirmatory factor analyses (CFA) were computed testing Sample 2 against Sample 1 Factor Structure (BDI Norms 150 Psychiatric Patients) and Sample 3 against Sample 1

<table>
<thead>
<tr>
<th>Symptom</th>
<th>BDI-II Norms</th>
<th>Sample 2</th>
<th>Sample 3</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Fact. 1</td>
<td>Fact. 2</td>
<td>Fact. 1</td>
</tr>
<tr>
<td>Sadness</td>
<td>.33</td>
<td>.39</td>
<td>.67</td>
</tr>
<tr>
<td>Pessimism</td>
<td>.22</td>
<td>.53</td>
<td>.66</td>
</tr>
<tr>
<td>Past Failure</td>
<td>-1.14</td>
<td>.81</td>
<td>.68</td>
</tr>
<tr>
<td>Loss of Pleasure</td>
<td>.57</td>
<td>.23</td>
<td>.74</td>
</tr>
<tr>
<td>Guilty Feelings</td>
<td>-.01</td>
<td>.66</td>
<td>.72</td>
</tr>
<tr>
<td>Punishment Feelings</td>
<td>-.03</td>
<td>.55</td>
<td>.67</td>
</tr>
<tr>
<td>Self-Dislike</td>
<td>.09</td>
<td>.63</td>
<td>.79</td>
</tr>
<tr>
<td>Self-Criticalness</td>
<td>.06</td>
<td>.63</td>
<td>.79</td>
</tr>
<tr>
<td>Suicidal Thoughts/wishes</td>
<td>.15</td>
<td>.47</td>
<td>.51</td>
</tr>
<tr>
<td>crying</td>
<td>.36</td>
<td>.27</td>
<td>.57</td>
</tr>
<tr>
<td>Agitation</td>
<td>.39</td>
<td>.12</td>
<td>.70</td>
</tr>
<tr>
<td>Loss of Interest</td>
<td>.60</td>
<td>.18</td>
<td>.76</td>
</tr>
<tr>
<td>Indecisiveness</td>
<td>.44</td>
<td>.34</td>
<td>.74</td>
</tr>
<tr>
<td>worthlessness</td>
<td>.08</td>
<td>.73</td>
<td>.77</td>
</tr>
<tr>
<td>Loss of Energy</td>
<td>.71</td>
<td>.01</td>
<td>.70</td>
</tr>
<tr>
<td>Changes/sleeping</td>
<td>.56</td>
<td>.04</td>
<td>.55</td>
</tr>
<tr>
<td>Irritability</td>
<td>.48</td>
<td>.19</td>
<td>.72</td>
</tr>
<tr>
<td>Changes/Appetite</td>
<td>.57</td>
<td>.01</td>
<td>.63</td>
</tr>
<tr>
<td>Concentration Difficulty</td>
<td>.53</td>
<td>.23</td>
<td>.794</td>
</tr>
<tr>
<td>Tiredness or fatigue</td>
<td>.84</td>
<td>.08</td>
<td>.755</td>
</tr>
<tr>
<td>Loss of Interest in sex</td>
<td>.52</td>
<td>.07</td>
<td>.506</td>
</tr>
</tbody>
</table>

Factor structure. Several guidelines for model fit have been proposed. For CFAs using maximum likelihood estimation, CFI 0.95 or greater have been proposed (Hu & Bentler, 1999). For RMSEA, values < .05 suggest good fit, .08 suggests adequate model fit.

An examination of the standardized residuals in the first CFA indicated no values greater than 2.58. Two co-variances were established between items in the model based upon high modification indices. Co-variances were established in descending order of the magnitude of the modification indices for Q15 and Q20 (loss of energy & tiredness), Q20 and Q21 (tiredness & loss of interest in sex). Once these modifications were completed a final model produced a $\chi^2$ of 401.781 (186), $p<.001$, with fit indices of CMIN/DF=2.198, CFI=.96 and RMSEA=.048. The standardized factor loadings are in the table under Sample 2. In confirmatory factor analysis adequate factor loadings are considered to be at .7 or higher.

In the analysis of Sample 3 against Sample 1 Factor structure, no standardized residuals were greater than 2.58. Four co-variances were established between items in the model based upon high modification indices. Co-variances were established in descending order of the magnitude of the modification indices for Q15 and Q20 (loss of energy & tiredness), Q16 and Q20 (changes in sleeping patterns & change in appetite), Q15 and Q16 (loss of energy & changes in sleeping patterns) and Q16 and Q18 (changes in sleeping patterns & change in appetite). Once these modifications were completed a final model produced a $\chi^2$ of 455.284 (184), $p<.001$, with fit indices of CMIN/DF=2.474, CFI=.923 and RMSEA=.058. The standardized factor loadings are below under Sample 3. In confirmatory factor analysis adequate factor loadings are considered to be at .7 or higher.

The fit indices for the first analysis were marginally acceptable as were the factor loadings with 7 out of 12 loadings on Factor 1 at .7 or above and 5 out of 9 loadings on Factor 2 above .7. The fit indices for Sample 2 were marginally acceptable but the factor loadings were low with 0 out of 12 loadings on Factor 1 at .7 or above and 1 out of 9 loadings on Factor 2 above .7.

Discussion
These results support weak construct validity in AI participants completing the BDI-II.