

Detection of Symptom Underreporting on the MMPI-2

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The Minnesota Multiphasic Personality Inventory (MMPI-2) was administered to 122 female kindergarten teacher applicants, once with standard instructions, again with scripted experimental instructions (honest or underreporting). Underreporting instructions produced higher scores on *L*, *K*, *S*, and *L+K*, and lower scores on *F* and *F-K* than standard and honest instructions. Some clinical scale scores produced under underreporting conditions were significantly different from those produced under standard and honest conditions. Consistent with the previous report, *L* and *L+K* were effective in identifying underreporting profiles. The new *S* scale, although developed using samples of men, fared quite well. Overall, cutting scores suggested by Baer et al. (1993) showed fairly positive results. Although *S* failed to outperform *L* and *L+K* in discriminating between the underreporting and standard profiles, further research is needed to explore the discriminative power of the *S* scale.

Keywords : Symptom underreporting, MMPI-2, S-scale

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Clinicians working in a variety of situations may encounter "underreporting of symptoms of psychopathology," also known as defensiveness, faking good, or socially desirable responses. In personnel selection, for example, individuals may attempt to present the best possible impression of themselves in order to get a job or to be accepted into a training program (Butcher, 1979). Prisoners who wish to be transferred to a less restrictive unit or a more desirable institution may try to portray themselves in a very favorable light. Divorcing parents undergoing custody evaluation may attempt to deny any existing emotional disturbance. Patients who wish to be released from hospital may try to appear as psychologically healthy. For these reasons, it is important that clinicians have tools available to aid them in the detection of the underreporting of psychological symptoms (Greene, 1991).

On the basis of meta-analysis and well-designed individual studies (Baer, Wetter, & Berry, 1992; Baer, Wetter, Berry, Nichols, & Greene, 1993), there is little question that the Minnesota Multiphasic Personality Inventory 2 (MMPI-2; Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) is effective in discriminating between those responding truthfully and those underreporting psychopathology when a clinician believes that an individual may be motivated to deny pathology. Several studies suggest that the *L* scale and the *L+K* index are useful in identifying defensive profiles (Baer et al., 1992; Baer et al., 1993; Graham, Watts, & Timbrook, 1991). The *K* scale and the *F-K* index have been pointed out to have limited utility for assessing defensiveness because the majority of individuals who are motivated to present themselves in a very positive light, for example, airline pilots, produce consistently high *K* scores which exceed

the threshold for identifying defensiveness and many valid profiles have been misclassified as invalid (Butcher, 1994; Graham et al., 1991). However, suggested cut off scores have varied across studies, and it has been consistently suggested that identifying underreporting profiles is more difficult than identifying overreporting protocols because there is considerable overlap between underreporting and valid profiles. In addition, monetary incentives, such as prizes awarded to the subjects whose responses are most convincingly deceptive, may motivate subjects sincerely attempting to comply with the instructions, but have not been used in previous studies on underreporting.

The new underreporting scale, the *S* scale (superlative self-assessment scale; Butcher & Han, 1995) consists of 50 items found to discriminate a large group of pilots seeking employment with a major airline from the normative sample. In addition to the *S* scale being associated with lower levels of manifest symptoms and negative personality features in an individual's profile, it was also associated with personality ratings made by spouses in a large sample of normal individuals. Analyses showed that the *S* scale items that are not included on the *K* scale appear to operate as a "virtue-claiming" or a problem denial scale, which suggest that the *K* scale is not accounting for much of the overly positive self-appraised test-items content that can be found in the MMPI-2. Baer et al. (1993) examined the sensitivity of the MMPI-2 validity scales to the underreporting of symptoms, using male police applicants. In their study, the *S* scale showed promising results with correct classification rates of 83%. Further research, however, needs to examine whether the scale works similarly with women since the items on the scale were initially derived using samples

of men.

This study was conducted (a) to evaluate the utility of the existing validity indices of the MMPI-2 to detect the underreporting of symptoms, particularly in personnel screening; (b) to evaluate the effectiveness of the new *S* scale in identifying underreporting of psychological problems by women; (c) to cross-validate cutting scores developed by Baer et al. (1993) for the detection of the underreporting of psychological symptoms by male police applicants who were asked to underreport problems to gain admittance to a police officers' training program.

METHODS AND PROCEDURES

Subjects

The subjects for this study were 122 female kindergarten teacher applicants in Indiana. They were presumed to have an incentive to underreport symptoms. The mean age of the participants was 24.1. The mean years of education were 14.8 years. Ninety-three percent of the participants were White, 2% were African American, and 5% were Asian American. Ninety-eight percent of the participants were unmarried.

Procedure

The purpose of the study was explained, and informed consent was obtained. The participants were randomly assigned to one of the experimental conditions: honest or underreporting conditions. Participants completed the MMPI-2 twice, once with standard instructions to respond to the items "as they apply to oneself," and again with one of

the two scripted experimental instructions. Under the honest conditions, participants were given the following instructions:

This is the MMPI-2, a widely used test for looking at psychological and emotional adjustment. We would like for you to answer the items as open and honest about yourself as you possibly can. If the psychologists evaluating your MMPI-2 responses consider your test results to imply that you have been honest and open, you will be entered into a drawing for a bonus of \$5.00. There is a 20% of chance to win \$5.00 bonus. Please try as hard as you can to be open and honest about yourself so that you can have a chance to win \$5.00 bonus. Your test results will be kept confidentially and be used only for research.

Participants under the underreporting conditions were instructed as follows:

This is the MMPI-2, a widely used test for looking at psychological and emotional adjustment. We would like for you to imagine yourself as being considered for a kindergarten teacher job. Please answer the items to demonstrate to the employment psychologists that you do not have psychological problems and are very responsible and moral. If the psychologists evaluating your MMPI-2 responses consider your test results to imply that you have been trying to appear as psychologically well adjusted, very responsible, and moral, you will be entered into a drawing for a bonus of \$5.00. There is a 20% of chance to win \$5.00 bonus. Please try as hard as

you can to appear as psychologically well adjusted, very responsible, and moral so that you can have a chance to win \$5.00 bonus.

When completing the MMPI-2, participants were given a debriefing sheet to assess the extent to which they understood the instructions, the extent to which they felt they followed the instructions, and the extent to which they responded consistently. Subjects' responses were recorded on a 6-point Likert scale ranging from 1 (low) to 6 (high) (Berry et al., 1992).

Following completion of the debriefing form, each participant was paid \$5.00 for participating in the study. Then participants were asked to wait for a moment while the MMPI-2 was scored to see if participants adequately followed the instructions. In fact, every participant was entered into a drawing where there was a 20% chance of winning an additional \$5.00 bonus. This bonus session was to motivate participants to comply with the instructions.

Scoring and Exclusion Criteria

The MMPI-2 raw scores were determined for the three standard validity scales, the ten clinical scales, and for the *VRIN*, *TRIN*, *Fb*, and *S* scales. Raw scores were transformed to *T* scores using data provided in the MMPI-2 manual (Butcher et al., 1989). Because of the nature of the study, no participants were eliminated on the basis of the *L*, *F*, or *K* scores. As recommended in the MMPI-2 manual, protocols with a *VRIN T* score at or greater than 70 or a *CNS* score exceeding 15 were considered inconsistent and were excluded. In addition, participants who failed to complete the MMPI-2 twice were also excluded. Fifteen

participants (13 participants under the honest conditions and 2 participants under the underreporting conditions) were excluded from the study on the basis of these exclusion criteria. The remaining sample then consisted of 107 participants (43 under the honest conditions and 64 under the underreporting conditions).

Analyses

Since validity scales are used to evaluate response attitudes whereas clinical scales are intended to assess psychopathology, analyses were performed into two separate sets, one for validity scales and the other for clinical scales. A Multivariate Analysis of Variance (MANOVA) was conducted on each set of variables to test the overall differences between profiles produced under standard and scripted experimental instructions (honest or underreporting instructions). When MANOVA results reached significance, univariate *t* tests were performed to identify scales which contributed to the overall differences. For the univariate *t* tests, Bonferroni corrections for multiple comparisons were used to protect against alpha inflation which may result from multiple statistical tests. Then, correct classification rates and optimal cutting scores were examined. Finally, hierarchical regression analyses were conducted to explore the incremental validity of the *S* scale in discriminating between standard and underreporting profiles.

RESULTS

Figure 1 shows the mean profiles produced under standard instructions for both honest and underreporting groups. The mean profiles were

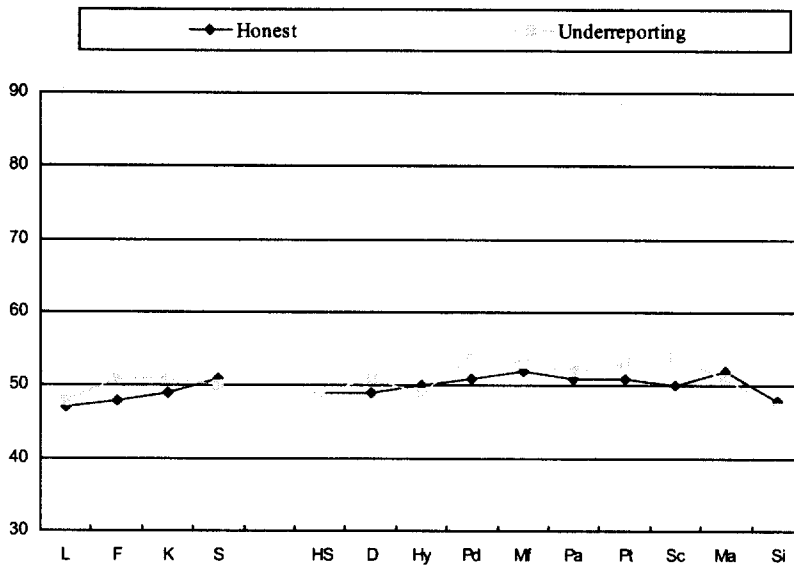


Figure 1. Mean MMPI-2 Profiles under Standard Instructions for the Honest and Underreporting Groups

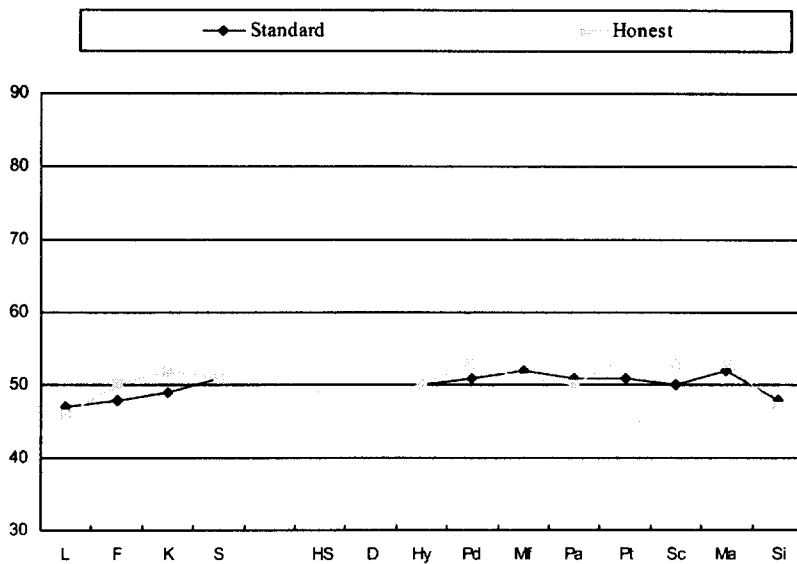


Figure 2. Mean MMPI-2 Profiles under Standard and Honest Instructions

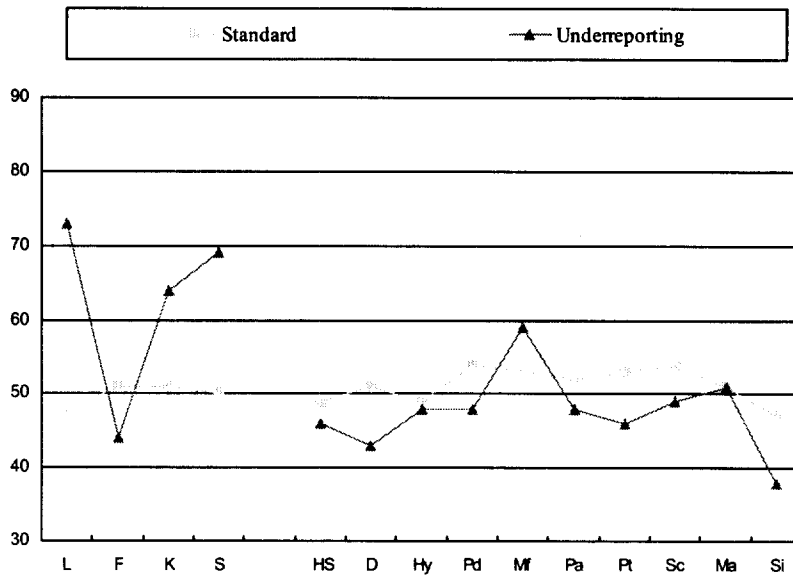


Figure 3. Mean MMPI-2 Profiles under Standard and Underreporting Instructions

Table 1. Means and Standard Deviations of MMPI-2 Validity Scales.

Scale	Instructions			
	Standard 1 ^a	Honest ^a	Standard 2 ^b	Underreporting ^b
<i>L</i>	46.749.37	46.4911.29	48.119.36	73.3515.97 ^{cd}
<i>F</i>	48.376.92	49.849.24	51.199.54	44.277.53 ^{cd}
<i>K</i>	49.339.12	52.3511.09	51.3910.80	63.958.46 ^{cd}
<i>Fb</i>	48.5111.71	47.957.39	49.7710.05	45.588.74
<i>S</i>	50.819.93	51.2311.27	50.4611.96	69.099.69 ^{cd}
<i>VRIN</i>	48.938.93	45.749.60	48.638.42	41.510.91 ^d
<i>TRIN</i>	50.587.41	51.4710.78	51.3411.01	50.347.41
<i>F-K</i>	-11.265.46	-11.936.89	-11.646.86	-19.364.97 ^{cd}
<i>L+K</i>	17.655.15	19.147.34	18.815.86	29.836.04 ^{cd}

Note. All means are presented in linear *T* scores, except for *F-K* and *L+K* which are reported in raw scores.

Standard 1 is for the standard conditions after which subjects were given honest instructions.

Standard 2 is for the standard conditions after which subjects were given underreporting indicates.

^a n=43. ^b n=64.

^c indicates $p < .001$ for paired *t* tests corrected for multiple comparisons between standard and underreporting instructions.

^d indicates $p < .001$ for independent *t* tests corrected for multiple comparisons between honest and underreporting instructions.

very much similar between the two groups, which implied that participants were successfully randomly assigned to one of the scripted experimental conditions, honest or underreporting conditions.

Figure 2 represents the mean profiles produced under standard and honest instructions. The configurations of the validity and clinical scales were very similar, suggesting that the MMPI-2 results produced under standard instructions appeared to accurately reflect current psychological symptoms and distress.

Figure 3 contains the mean profiles obtained under standard and underreporting instructions. The underreporting instructions produced considerably higher scores on the *L*, *K*, and *S* scales and lower scores on the *K* scale than the standard instructions. Relative to the standard administered profiles,

clinical scale scores under the underreporting conditions were lower, except for scale 5, *Mf*. This elevation on scale 5, *Mf*, may result from the fact that women typically attempt to emphasize assertiveness, competitiveness, self-confidence, and being logical when they demonstrate positive characteristics. The mean MMPI-2 profiles displayed in Figure 3 were considered to imply that participants followed the underreporting instructions, denying psychological problems and trying to assure superlative adjustment.

Validity scale results are presented in Table 1. MANOVA between the standard and honest conditions did not achieve significance, $F(9,76)=1.48, p>.05$. Therefore, further univariate analyses were not conducted. MANOVA between the profiles produced under standard and underreporting

Table 2. Means and Standard Deviations of MMPI-2 Clinical Scales.

Scale	Instructions			
	Standard 1 ^a	Honest ^a	Standard 2 ^b	Underreporting ^b
<i>Hs</i>	49.308.99	49.308.99	49.489.45	46.315.57 ^d
<i>D</i>	49.4712.27	49.4712.27	50.739.81	43.306.18 ^{cd}
<i>Hy</i>	50.359.37	50.218.79	48.988.83	48.258.23
<i>Pd</i>	51.078.33	52.658.16	53.539.68	48.415.99 ^{cd}
<i>Pa</i>	50.6510.20	49.818.35	52.2011.65	48.258.23
<i>Pt</i>	50.8110.78	54.218.78	53.429.78	46.445.02 ^{cd}
<i>Sc</i>	50.339.65	52.846.85	54.038.46	49.255.70 ^{cd}
<i>Ma</i>	52.479.64	53.129.20	50.869.57	51.318.01
<i>Si</i>	48.1410.55	46.9510.84	47.1410.53	38.366.94 ^{cd}

Note. All means are presented in uniform *T* scores, except for *Si* which is reported in linear *T* scores.

Standard 1 is for the standard conditions after which subjects were given honest instructions.

Standard 2 is for the standard conditions after which subjects were given underreporting instructions.

^a n=43. ^b n= 64.

^c indicates $p<.006$ for paired *t* tests corrected for multiple comparisons between standard and underreporting instructions (using the Bonferroni correction).

^d indicates $p<.006$ for independent *t* tests corrected for multiple comparisons between honest and underreporting instructions (using the Bonferroni correction).

instructions reached significance, $F(9,118)=19.58$, $p<.001$. Therefore further univariate analyses were performed to explore which scales revealed the differences between the two conditions. Significant differences were noted between the standard and underreporting conditions for all validity scales except for the *Fb*, *VRIN*, and *TRIN* scales. MANOVA between the two scripted experimental conditions (honest and underreporting conditions) also achieved significance, $F(9.97)=58.0$, $p<.001$. Univariate *t* tests showed that all validity scales, with the exception of the *Fb* and *TRIN* scales, were significantly different between the two scripted conditions. It can be seen that the underreporting instructions produced higher scores on the *L*, *K*, and *S* scales and the *L+K* index, and lower scores on the *F* scale and the *F-K* index.

Clinical scale data are presented in Table 2. MANOVA between the standard and honest

conditions did not achieve significance, $F(9,76)=1.44$, $p>.05$. MANOVA between the protocols produced under both the standard and underreporting conditions reached significance, $F(9,118)=5.08$, $p<.001$. Further univariate *t* tests showed significant differences between the standard and underreporting conditions on scales *D*, *Pd*, *Pt*, *Sc*, and *Si*. MANOVA between the honest and underreporting instruction groups also reached significance, $F(9.97)=6.90$, $p<.001$. On the univariate *t* tests, significant differences between the two scripted conditions were found on the scales, *Hs*, *D*, *Pd*, *Pt*, *Sc*, and *Si*. These results were considered to suggest that subjects who were given underreporting instructions tried to deny psychological symptoms, thereby producing lower scores on the clinical scales than those who received standard and honest instructions.

Table 3 compares correct classification rates from this study with those reported by Baer et al.

Table 3. Correct Classification Rates by Group for MMPI-2 Underreporting Scales.

Scale	Cutting Score	Baer et al.			This Study		
		Specificity ^a	Sensitivity ^a	Hit Rate	Specificity ^b	Sensitivity ^b	Hit Rate
<i>L</i>	≥59T	90%	73%	82%	90%	80%	85%
<i>K</i>	≥55T	77%	80%	78%	63%	81%	72%
	≥59T	nr	nr	nr	78%	78%	78%
<i>L+K</i>	≥-24	87%	77%	82%	84%	81%	83%
<i>F-K</i>	≥-14	70%	93%	82%	53%	86%	70%
	≥-18	nr	nr	nr	78%	75%	77%
<i>S</i>	≥57T	83%	83%	83%	75%	88%	81%
	≥60T	nr	nr	nr	83%	88%	85%

Note. nr indicates that correct classification rates were not reported. Specificity indicates the percentage of subjects in the Standard Instruction group with a score on the indicated scale falling at or below the given cutting score. Sensitivity indicates the percentage of subjects in the Underreporting Instruction group with a score on the indicated scale falling above the given cutting score. Hit Rate indicates the percentage of subjects in the combined groups correctly classified by the given cutting score.

^a n=30. ^b n= 64.

(1993) using their cutting scores. The *L* and *L+K* cutting scores developed by Baer et al. (1993) were cross validated with fairly positive results. However, on the *K* and *S* scales and the *F-K* index, cutting scores suggested by Baer et al. (1993) were likely to lead to relatively low classification rates. To achieve higher classification rates in this study, higher cutting scores on the *K* and *S* scales and lower cutting scores on the *F-K* index were needed. The *K* scale and the *F-K* index produced lower classification rates than other underreporting indices as reported in previous studies (Butcher, 1994; Graham et al., 1991). The new *S* scale showed a particular promise in identifying those women who underreport psychological symptoms, although developed using samples of men. Overall, underreporting indices, *L*, *L+K*, and *S* were effective in discriminating between standard and underreporting profiles.

To examine the incremental validity of the new

S scale, *S* was compared with the two most effective existing underreporting indices, *L* and *L+K*, by examining correlations between instructions (standard and underreporting) and scale means. Instructions were dummy coded with the standard instructions coded as 0 and the underreporting instructions coded as 1. Positive correlations between instructions and scale means are considered to indicate that the underreporting instructions produced higher scores on the given scale. *L* was correlated as .70 with instructions and *S* and *L+K* were correlated as .68. These correlations were significantly different ($p < .001$). Therefore *L* appeared to be a somewhat stronger discriminator between profiles produced under the standard and underreporting instructions than *S*, whereas *L+K* seemed to be as strong as *S*. To explore further the incremental validity of *S*, hierarchical regression analyses were performed with instructions, the dependent variable, regressed on independent variables, *L*, *L+K*, and *S* scores.

Table 4. Regression Analyses for discriminating between Standard and Underreporting Instructions.

Variable	R^2	F_{change}	significance of F_{change}	β
<i>L</i> entered first				
<i>L</i>	.49			.44
<i>S</i>	.57	24.10	$p < .001$.39
<i>S</i> entered first				
<i>S</i>	.46			.39
<i>L</i>	.57	30.99	$p < .001$.44
<i>L+K</i> entered first				
<i>L+K</i>	.47			.37
<i>S</i>	.49	5.77	$p < .05$.35
<i>S</i> entered first				
<i>S</i>	.46			.35
<i>L+K</i>	.49	6.60	$p < .05$.37

The results of these regression analyses are presented in Table 4. Examination of the F_{change} and indicates that *L* added significantly to *S* in predicting instructions (standard vs. underreporting) when *S* was entered first into the regression equation, and *S* also added significantly to *L* when the order of entry into the regression equation was reversed. When comparing *S* with *L+K*, *L+K* added significantly to *S* in the prediction of instructions (standard vs. underreporting) when *S* was entered first into the regression equation, and *S* also added significantly to *L* when the order of entry into the regression equation was reversed. However, *S* did not outperform *L* and *L+K* when distinguishing between standard and underreporting profiles.

Debriefing results indicated that subjects' understanding of instructions was rated at 5.8 for both standard and underreporting conditions. Ratings for compliance with the instructions were 5.6 for the standard instructions and 5.5 for the underreporting instructions. Response consistency was rated at 5.8 for the standard conditions and 5.7 for the underreporting conditions. *t* tests showed that none of these differences reached significance.

DISCUSSION

Mean profile configuration and optimal cutting scores found in this study for identifying underreporting protocols were quite similar to the previous report on detection of underreporting profiles. Underreporting instructions produced higher scores on the *L*, *K*, and *S* scales and the *L+K* index, and lower scores on the *F* scale and the *F-K* index than standard and honest instructions. Some clinical scales showed significantly lower

scores under the underreporting conditions. The MMPI-2 results were almost identical between the standard and honest instructions, suggesting that standard administrated MMPI-2 results were quite reliable. Consistent with the previous report, *L* and *L+K* were effective in identifying underreporting profiles, whereas *K* and *F-K* led to relatively low correct classification rates. The new *S* scale developed using samples of men showed promising results in the detection of the underreporting of symptoms by women. *L* and *L+K* cutting scores suggested by Baer et al. (1993) worked fairly well, whereas slightly higher scores on the *K* and *S* scales and lower scores on the *F-K* index were likely to improve correct classification rates for this study. Overall, underreporting indices, *L*, *L+K*, and *S* were effective in discriminating between standard and underreporting profiles, and the cutting scores suggested by Baer et al. (1993) were cross-validated with fairly positive results.

This study examined the incremental validity of the *S* scale for the detection of the underreporting of symptoms using samples of female kindergarten teacher applicants. *S* did not provide incremental contribution over *L* and *L+K* in discriminating between profiles produced under standard and underreporting instructions. Considering some methodological issues, including the modest number of subjects, restrictions to the personnel screening situation, and the use of only female job applicants, further research is needed to explore the discriminative power of the *S* scale across a variety of settings with a larger sample composed of both genders.

The utility of the cutting scores may be influenced by base rates which vary across settings. Base rate data can provide information on about how "different" and how "extreme" an

individual profile is when compared to the population of profiles in a particular setting. Therefore, it is recommended that future research utilize positive predictive power and negative predictive power which incorporate base rate information, instead of using sensitivity and specificity (Widiger, Hurt, Frances, Clarkin, and Gilmore, 1984). In addition, one can examine the effect of different base rates on the relative performance of underreporting indices by randomly deleting underreporting profiles from the data set to achieve different base rates of underreporting.

In summary, the present study provided support for the use of the underreporting indices, *L*, *L+K*, and *S* in identifying symptom underreporting on the MMPI-2. Although *S* failed to outperform *L* and *L+K* in the correct classification of underreporting profiles, further research is needed to examine the predictive power of *S*. Since the sample in this study consisted of women who applied for kindergarten teacher positions, future studies should be conducted with both men and women in a variety of settings including clinical and forensic settings.

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MMPI-2 프로파일상에서의 증상은폐(Symptom Underreporting)의 탐지

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본 연구는 미네소타 다면적 인성검사-2 (MMPI-2) 프로파일에 나타난 증상은폐(Symptom Underreporting)를 탐지해내는 데 목적을 두고, 122명의 어린이 집 교사 여성 지원자들을 대상으로 2회에 걸쳐, 첫 번째는 표준(standard) 지시하에, 두 번째는 실험적인 지시하에 ('정직, honest' 또는 '증상은폐, Underreporting') MMPI-2를 실시하였다. 증상은폐 지시하에서 실시된 MMPI-2 프로파일은 표준 지시나 정직 지시하에서 실시된 MMPI-2 프로파일 에 비해 L , K , S , $L+K$ 점수는 더 높았고, F , $F-K$ 점수는 더 낮았으며, 몇몇 임상척도들에서 통계적으로 유의미한 차이가 관찰되었다. 증상은폐 지시조건 의 프로파일과 표준 지시조건 의 프로파일을 구별해내는 데 있어서 이전 연구들에서 보고된 바와 마찬가지로 L 과 $L+K$ 가 효과적이었으며, 새로운 S 척도 또한 상당히 유용한 것으로 나타났다. Baer 등의 연구(1993)에서 제안된 변별점 (cutting score)은 비교적 긍정적인 결과를 나타내었다. 기존의 증상은폐 지표들 중 가장 효과적이라고 보고되어 온 L , $L+K$ 와 비교했을 때 새로운 S 척도는 L , $L+K$ 이상의 탐지력을 보이지는 못했으나, 앞으로 더 많은 연구가 필요한 것으로 생각된다.

주요어 : 증상은폐, MMPI-2, S척도