

FACIAL AFFECT RECOGNITION AS A PREDICTOR OF PERFORMANCE ON A READING COMPREHENSION TEST AMONG CRIMINAL SEX OFFENDERS*

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Among common goals for assessments of criminal offenders is to characterize their Reading Comprehension (RC) abilities. However, in addition to RC skills, many RC measures also require visual-affective skills (due to the requirement to match written passages to pictorial representations that often include affective cues). This study examined the relationship between performances on Reading Comprehension (RC) and Facial Affect Recognition (FAR) tests among male criminal sex offenders and matched controls. FAR was a robust predictor of RC in both groups, even after controlling for education and IQ. In contrast, FAR did not predict world knowledge or visual-constructional skills (i.e., tests that do *not* have any affective components) beyond education and IQ. These findings are particularly relevant for clinicians who work with criminal populations, as offenders are at a particular risk for exhibiting FAR deficits, which may in turn lead to an underestimation of their RC skills.

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For obvious reasons, the ability to accurately comprehend written and spoken language is important for any individual involved in a legal matter, whether they be a judge, attorney, prosecutor, juror, or a defendant. For defendants, the capacity to understand is particularly crucial, as they are faced immediately upon being arrested with the need to understand their basic rights. Defendants are informed of their rights in some detail as part of their “Miranda warning,” presented in either written or oral formats (Weisselberg, 2006). These warnings contain important information, such as information about the right against self-incrimination or the right to an attorney. Clearly, a lack of understanding on the part of the defendant can have deleterious effects on the legal outcomes, both from the standpoint of the accused, and from the standpoint of the prosecution.

Although adequate capacity to comprehend should not be assumed for anyone involved in a legal matter (MacCoun, 1995), it should be even less so for criminal offenders. This is because criminal offenders tend to have higher than average rates of mental disorders (Weinstein, Kim, Mack, Malavade, & Saraiya, 2005) and tend to be characterized by lower than average educational achievement and intellectual functioning (Cantor, Blanchard, Robichaud, & Christensen, 2005; Klinge & Dorsey, 1993). This is even more true for certain subgroups of offenders. For example, sex offenders have been found to exhibit greater than normal rates of brain injuries (Blanchard et al., 2002; Blanchard et al., 2003), as well as higher rates of learning disabilities and placements in special education classes (Cantor et al., 2006).

Given these statistics, there has been much interest in recent years in determining the degree to which defendants comprehend various aspects of their own legal proceedings. Such research has found that nearly 50% of criminal defendants do not understand the basic principles of the Miranda warnings, and that comprehension levels are even lower among mentally disordered defendants (Rogers, Harrison, Hazelwood, & Sewell, 2007). For these reasons, normal language comprehension must not be assumed, but rather, must be objectively and accurately established, both for the protection of the defendant, and so that various legal actions (such as

confessions) can be upheld in the court of law (Clare, Gudjonsson, & Harari, 1998; Greenfield, Dougherty, Jackson, Podboy, & Zimmerman, 2001). A common way of accomplishing this is via tests of Reading Comprehension (RC).

RC refers to the ability to read and conceptually comprehend written passages. This ability is known to be related to intellectual capacity (Markwardt, 1997), which in turn is related to educational achievement (PsyCor, 1997). Several common measures (Markwardt, 1997; PsyCor, 2001) of academic achievement assess RC by presenting the examinee with a written statement accompanied by several pictures, and asking the examinee to select the picture that best corresponds to the written statement. The drawings typically depict a variety of situations, including social scenarios and interactions among actors, and they generally differ from each other only slightly, such as in subtleties of emotional or postural reactions. Thus, as a consequence of this design, poor performance on RC tests can result not only from a bona-fide RC weakness, but also from a poor ability to apprehend visual-spatial detail, or from deficits in understanding non-verbal social or interpersonal cues such as facial affect.

Facial Affect Recognition (FAR) refers to the ability to detect and interpret facial affective cues. The ability to detect such cues is essential for normal communication, as well as for normal interpersonal and social functioning (Dolan & Fullam, 2006; Kornreich et al., 2001; McClure, Pope, Hoberman, Pine, & Leibenluft, 2003; Monnot, Nixon, Lovallo, & Ross, 2001; Simonian, Beidel, Turner, Berkes, & Long, 2001). Thus, it is not surprising that FAR deficits are often present among criminal populations (Carr & Lutjemeier, 2005; Dolan & Fullam, 2006; Kosson, Suchy, Mayer, & Libby, 2002b; W. McCown, Johnson, & Austin, 1986; W. G. McCown, Johnson, & Austin, 1988). Additionally, it should be noted that deficits in FAR are often associated with a variety of neuropsychiatric disorders, including substance abuse (Foisy et al., 2005; Kornreich et al., 2001; Monnot et al., 2001; Philippot et al., 1999; Uekermann, Daum, Schlebusch, & Trenckmann, 2005), fetal alcohol syndrome (Monnot, Lovallo, Nixon, & Ross, 2002), bipolar

disorder (Summers, Papadopoulou, Bruno, Cipolotti, & Ron, 2006), major depression (Leppanen, 2006; Parker, Prkachin, & Prkachin, 2005; Persad & Polivy, 1993; Summers et al., 2006), schizophrenia (Bozikas et al., 2006; Bozikas, Kosmidis, Anezoulaki, Giannakou, & Karavatos, 2004; Sachs, Steger-Wuchse, Kryspin-Exner, Gur, & Katschnig, 2004; Whittaker, Deakin, & Tomenson, 2001), and brain injury (Borod, Bloom, Brickman, Nakhutina, & Curko, 2002), all of which represent common co-morbidities among criminal offenders (Klinge & Dorsey, 1993; Miller, 1999; Sarapata, Herrmann, Johnson, & Aycock, 1998).

In summary (a) FAR deficits are commonly associated with criminal offending, as well as with a variety of neuropsychiatric disorders that are associated with criminal offending, and (b) many tests or RC rely on interpretation of drawings that often include depictions of facial affect. Consequently, it is possible that assessments of RC among criminal offenders may sometimes be confounded by the criminals' FAR deficits. Given the importance of accurate assessment of RC among criminal offenders, better understanding of the effect of the FAR capacity on RC test performance is crucial. However, we are aware of *no* studies that have examined this question.

The purpose of the present study was to address this gap in our knowledge by examining whether FAR contributes to RC abilities above and beyond the expected contribution from educational achievement and intellectual functioning, as well as whether such a contribution is specific to offenders or whether it holds for normal controls as well.

To this end, we analyzed archival data collected as part of a larger study of sex offenders. Sex offenders represent a population that is characterized both by high rates of learning disabilities (Cantor et al., 2006), placing them at risk for RC problems, and by high rates of brain injury (Blanchard et al., 2002; Blanchard et al., 2003) and psychopathy (Seto, 2008), placing them at risk for difficulties with FAR (Suchy, Whittaker, Strassberg, & Eastvold, in press). We examined the relationships among the following variables available in the data set: (a) RC, (b) FAR, (c) educational achievement, and (d) IQ estimate. Additionally, as indices of discri-

minant validity, we also examined the contributions of FAR, education, and IQ estimate to two tasks that do not contain affectively loaded stimuli, i.e., (e) a task of visual-constructional skills, and (f) a test of knowledge of world facts. The participants for this study consisted of male criminal sex offenders and community dwelling demographically-matched controls.

We hypothesized that (a) FAR would contribute to RC performance above and beyond education and IQ estimate, and (b) FAR would not contribute to performance on tests that do not contain social/affective stimuli, such as a test of visual-constructional skills and a test of world knowledge.

METHOD

Participants

Participants were 63 males (42 criminal sex offenders and 21 matched male non-offenders recruited from the community). From this initial sample, 2 participants were removed due to estimated Full Scale IQ of less than 70, and 1 additional participant was removed due to having fewer than 10 years of formal education. This resulted in a sample of 60 participants (39 offenders and 21 non-offenders). Please see Table 1 [page 78] for additional sample characteristics. There were no differences between offenders and non-offenders on any of the indices outlined in the table (all p values $>.130$), with the exception for a trend toward slightly greater number of ethnic minorities in the control group ($p=.079$). Additionally, no participants suffered from serious psychiatric disorders (e.g., psychosis, bipolar disorder, etc.) or a serious neurologic disorder (e.g., stroke, epilepsy, etc.). For a more detailed description of the sample, see (Suchy, Eastvold, Whittaker, & Strassberg, 2007).

Instruments

All clinical measures used in the present study have been used extensively in criminal populations, and have been recommended for such usage (La Due, 2000). From an existing dataset collected for a larger study, we selected the following variables:

Table 1.
Participant characteristics

	Offenders (n=39)	Controls (n=21)
Age		
Mean	32.41	30.76
S.D.	7.09	8.58
Range	21-44	22-45
Education		
Mean	12.54	13.24
S.D.	1.48	2.00
Range	10-16	11-19
Est. WAIS-R IQ		
Mean	103.28	105.62
S.D.	8.03	8.42
Range	84-120	91-121
Number		
Non-righthanded	6	1
Number Latino or mixed ethnicity	2	4

Note. Est. WAIS-R IQ=Estimate Wechsler Adult Intelligence Scale Full Scale IQ based on Shipley Institute of Living Scale.

Reading Comprehension (RC) Subtest form the Peabody Individual Achievement Test—(Markwardt, 1997). This test consists of written passages of increasing complexity. Participants are asked to select one of four drawings that most closely corresponds to the content of the presented passage. Basal and ceiling levels were determined according to the manual, and thus obtained raw scores were used in the analyses.

Shipley Institute of Living Scale (SILS) (Zachary, 1986). The SILS was used to estimate intelligence. It consists of 40 vocabulary items and 20 analytical reasoning items, and contains normative tables for converting performances into Wechsler Adult Intelligence Scale—Revised (WAIS-R) Full Scale IQ estimates (IQ-est). Given

the well-known cohort changes in IQ test performance (Flynn, 1987), conversion to WAIS-R IQs likely resulted in a slight over-estimation of the samples' intelligence (as compared to IQs that would be obtained with the WAIS-III). However, this does not preclude the obtained IQ estimate from demonstrating group comparability, or IQ contributions to performance on other cognitive measures.

Facial Affect Recognition (FAR) Task. We used this task as a measure of FAR. This task consisted of presentation of male and female faces expressing happy, sad, angry, fearful, disgusted, and surprised facial expressions. Stimuli were the well-known and previously validated *Pictures of Facial Affect* (Ekman, 1976; Ekman, Friesan, & Ellsworth, 1972). Photographs were presented on a computer screen for 1.5 seconds each. There were 14 unique stimuli for each emotion, and each stimulus was presented only once, in random order. Participants were instructed to respond as fast as they could, classifying photographs into the six emotion categories. Participants responded using their dominant hand by pressing keys on the computer keyboard that bore labels corresponding to the six emotions. The percent of correctly classified faces was used as a variable in this study.

Wechsler Adult Intelligence Scale 3rd Edition—Information (INFO) Subtest (PsyCor, 1997). INFO was used as an index of the ability to perform a verbal test that does *not* contain emotionally loaded stimuli. The test consists of a series of questions tapping semantic knowledge, with no emotional content. Standard procedures outlined in the manual were followed. The total number of correct responses was used as a variable in the analyses.

Wechsler Memory Scale 3rd Edition—Visual Reproduction-Copy (VRC) Subtest (PsyCor, 1997). VRC was used as an index of the ability to perform a visual-spatial test that does not contain any emotional stimuli. The test consists of participants copying a series of abstract figures. Standard scoring procedures outlined in the manual were followed. Participants earned points for each correctly drawn and placed component of individual figures. The raw score was used as a variable in this study.

Procedures

Participants were recruited using flyers posted in the community and all Salt Lake City area half-way houses for sex offenders. Offenders were paid \$30 for participation, and controls were paid \$50. Offenders were paid less so as to avoid undue coercion in this population with fewer occupational opportunities. All participants first underwent standard IRB approved informed consent procedures, followed by a comprehensive assessment of personality, cognition, and criminal histories as part of a larger study. The battery was approximately three hours long and was administered by a trained graduate student. Offenders were tested in a quiet testing room in their halfway houses, and controls were tested in a quiet testing room in the department of psychology at the University of Utah.

RESULTS

Preliminary Analyses

Zero-order Pearson product correlations among the studied variables can be found in Table 2 [below]. Descriptive statistics for all studied variables, including standardized scores where available, can be found in Table 3. Groups did not differ on any of the cognitive variables, with the exception of INFO [$t(58)=3.71$, $p=.003$, *Cohen's d* = .78], which demonstrated poorer performance among the offenders. As can be seen in Table 3 [page 81], offenders

Table 2.
Pearson Product correlation coefficients among IQ estimate, cognitive and affective variables, and demographics.

	IQ estimate	FAR	Age	Education
Facial Affect Recognition (FAR)	.500**	-	.086	.057
Reading Comprehension (RC)	.608**	.579**	.037	.210
WAIS-III Information	.568**	.396**	.086	.420**
WMS-III Visual Reproduction Copy	.377**	.271*	.249	.169

Note. N=60, * $p<.05$; ** $p<.001$

FAR = Facial Affect Recognition; WAIS-III = Wechsler Adult Intelligence Test-3rd edition; WMS-III = Wechsler Memory Scale-3rd edition

Table 3.
Descriptive statistics for all studied variables, including raw and standard scores (where available).

	Raw Scores						Age Corrected Standard & Scaled Scores	
	Offenders (n=39)		Controls (n=21)		Entire Sample (n=60)		Entire Sample (n=60)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Facial Affect Recognition (% correct)	78.94	7.49	82.09	7.32	80.04	7.52	N/A	N/A
Reading Comprehension (ceiling achieved)	92.23	6.25	94.19	5.31	92.92	5.97	96.96 (Standard Score)	16.56
WAIS-III Information (number correct)	15.79	4.65	19.48	3.97	17.08	4.74	10.83 (Scaled Score)	2.55
WMS-III Visual Reproduction Copy (number correct)	96.92	5.08	97.19	5.10	97.02	5.04	10.18 (Scaled Score)	3.30

Note. S.D. = Standard Deviation; N/A = Not available; WAIS-III = Wechsler Adult Intelligence Test-3rd edition; WMS-III = Wechsler Memory Scale-3rd edition

also appeared to make more errors on FAR (*Cohen's d* =.42) and on RC (*Cohen's d* =.33), although these differences did not reach statistical significance.

Principal Analyses

Facial Affect Recognition (FAR) and Reading Comprehension (RC). To test whether FAR abilities contribute to performance on the PIAT RC subtest above and beyond the effects of IQ and education, we first conducted a linear regression, using RC as the criterion variable, and IQ-est and education as predictors. The results showed that, as expected, IQ-est ($B=.480, \beta=.657, p<.001$) and education ($B=-.360, \beta=-.102, p>.05$) together were reliable predictors [$F(2,57)=17.30, p<.001$], accounting for 37.8% ($R^2=.378$) of variance. These analyses also allowed us to generate residuals that reflected the amount of variance in the RC that could *not* be explained by IQ-est and education. These residuals were used in subsequent analyses.

Next, we used the residuals from the above analysis as the criterion variable; predictors were FAR, Group membership (offender vs. control), and the FAR x Group interaction term. This analysis allowed us to determine whether FAR accounted for variance in RC performance above and beyond the effects of IQ and education, as well as whether RC performance can be explained by Group membership or some interaction between Group membership and FAR. The results showed that, as expected, FAR was a reliable predictor, accounting for 10.6% ($R^2=.106$) of variance in RC above and beyond IQ-est and education [$F(1,58)=6.86, B=-.242, \beta=-.325, p=.011$]. Additionally, there was *no* main effect of Group membership and *no* interaction between Group membership and FAR. This latter finding suggests that FAR contributes to RC performance equally well for both criminals and controls.

Discriminant validity. To determine whether the above results are specific to RC, we repeated the above analyses using INFO and VRC (i.e., two tests that do not contain any emotional stimuli) as criterion variables. The results showed that (1) IQ-est ($B=.276, \beta=.476, p<.001$) and education ($B=.538, \beta=-.193, p>.05$) together accounted for 35.1% ($R^2=.351$) of variance in INFO [$F(1,58)=15.42, p<.001$]; and (2) IQ-est ($B=.237, \beta=.384, p=.008$) and education

($B=-.042$, $\beta=-.014$, $p>.05$) together accounted for 14.2% ($R^2=.142$) of variance in VRC [$F(1,58)=4.72$, $p=.013$]. Additionally, consistent with our preliminary analyses, there was a reliable effect of Group membership on INFO, accounting for 11.3% ($R^2=.113$) of variance [$F(1,58)=7.36$, $B=-1.331$, $\beta=-.336$, $p<.009$] and suggesting that offenders exhibit poorer general knowledge than controls, and that this difference cannot be fully explained by education or intellectual abilities. However, as predicted, there were no main effects of FAR, and no interactions between FAR and Group with respect to either of the two criterion variables.

DISCUSSION

Given that past research shows that up to 50% of criminal offenders have difficulties fully and accurately comprehending important legal information such as Miranda warnings (Rogers et al., 2007), accurate assessment of RC among criminal offenders is critical. In particular, over-estimation of reading abilities may lead to unfair treatment of the defendant, while under-estimation may lead to inappropriate questioning of the validity of Miranda warnings and, by extension, the validity of evidence collected via interrogations or confessions.

The present study examined the relationship between performances on Reading Comprehension (RC) and Facial Affect Recognition (FAR) tests among male criminal sex offenders and community-dwelling controls. The results demonstrated a robust relationship between performance on RC and FAR, even after controlling for educational background and intellectual abilities. In contrast, FAR did *not* contribute (above IQ and education) to tests that do not contain emotional cues, such as a test of general knowledge or a test of the ability to copy complex abstract figures. These findings suggest that RC assessments may be confounded by examinees' weaknesses in the ability to identify and understand affective cues, such as facial affect. This relationship appears to be a function of the design of the RC tests, which usually assess RC abilities by asking examinees to match written passages to pictorial representations that often

contain affective cues. However, additional careful examination of the causes of the relationship between RC and FAR is warranted.

The findings of the present study are particularly relevant for offenders who present with neuropsychiatric comorbidities, such as substance abuse, mood or other psychiatric disorders, developmental disorders, or brain injury, as these conditions place them at an increased risk for poor FAR abilities (Bozikas et al., 2004; Carr & Lutjemeier, 2005; Parsons, 1980; Sachs et al., 2004). Similarly, offenders with high levels of psychopathic traits (Dolan & Fullam, 2006; Kosson, Suchy, Mayer, & Libby, 2002a) or certain types of crimes, such as sex offenders (Suchy et al., in press), are at an increased risk. Among these offenders, their poor FAR skills may lead to an underestimation of RC abilities. This may lead not only to inappropriate legal decisions, but may also lead clinicians to inappropriately forego certain assessment procedures (such as personality questionnaires) with the very individuals for whom accurate and thorough assessments are most needed.

Additionally, underestimation of reading abilities (due to affect recognition weaknesses) may lead legal representatives and clinicians to focus more on oral, rather than written, communication with the defendant. Ironically, for defendants whose reading comprehension skills are underestimated due to affect recognition weaknesses, this could be a highly deleterious decision, as such individuals are likely experiencing some oral communication problems due to inability to appropriately interpret nonverbal cues that are necessarily present in all verbal interactions. In other words, such a change in strategy may lead to poorer, rather than better, comprehension on part of the defendant.

By the same token, it should be noted that the difference in FAR abilities between offenders and controls was small, and that FAR predicted RC abilities equally well in both groups. Consequently the effects of FAR on RC performance does not appear to be limited to criminal populations. These findings point to the need to assess FAR and other affective abilities in conjunction with cognitive assessments.

Unfortunately, most current measures of FAR and other affective functions are appropriate only for research, as they lack norms, or only have limited norms that are not appropriate for clinical interpretations. Until adequate tests are available, clinicians should be aware of the possibility that the scenarios depicted on RC tests, as well as possibly other clinical measures that contain emotionally loaded stimuli, may not be processed normally by patients who are at risk for FAR deficits. Consequently, clinicians may wish to exercise caution when assessing patients who are at risk for FAR deficits, by selecting tests that are less likely to confound findings due to presence of emotional stimuli. Nevertheless, the present study is only the first (that we are aware of) that examines the possible relationship between FAR and performance on cognitive tests that contain emotional stimuli, and as such should not precipitate considerable changes in clinical practice.

Limitations and future directions. The present study is only the first attempt of teasing apart the relationship between FAR abilities and performance on cognitive measures. As such, it examined only one at-risk population. Different results may be yielded by different groups of patients who are at risk for FAR deficits. Additionally, different results may be yielded by different types of offenders. Similarly, the present hypothesis needs to be examined in the context of acquired versus developmental FAR problems.

Additionally, the present study examined only one cognitive measure. Careful examination of a variety of tests that contain emotionally loaded stimuli is warranted.

And finally, given that the PIAT RC subtest uses different basal and ceiling points for different individuals, it was not possible to tease apart which stimuli in particular were responsible for the relationship between RC and FAR. Thus, the present findings may need to be replicated using an experimental RC test that allows for direct comparison of affectively loaded and affectively neutral items, to confirm that affectively loaded stimuli are in fact responsible for the present findings.

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