

What skills are required for effective offender profiling? An examination of the relationship between critical thinking ability and profile accuracy

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Abstract

Claims have been made that critical thinking is a necessary skill for constructing accurate offender profiles. However, in studies purporting to demonstrate this, critical thinking ability amongst participants has never been adequately assessed, making it impossible to draw any valid conclusions about the importance of this skill for profiling. In order to empirically examine the relationship between critical thinking ability and profile accuracy, participants ($n=36$) in the current study completed a mock profiling exercise and the Watson–Glaser Critical Thinking Appraisal – Form S (WGCTA-S). Profile accuracy scores were calculated for each participant and correlated with his or her scores on the WGCTA-S. Although the majority of participants were found to be adequate critical thinkers, no significant relationship was found between critical thinking ability and profile accuracy. Potential explanations for this finding are discussed.

Keywords: *offender profiling, critical thinking, serial homicide*

Introduction

Although different definitions of profiling have been proposed (e.g. Geberth, 1981; Rossi, 1982; Vorpapel, 1982), profiling is generally regarded as “a technique for identifying the major personality and behavioral characteristics of an individual based upon an analysis of the crimes he or she has committed” (Douglas, Ressler, Burgess, & Hartman, 1986, p. 405). Since its occasional use in several well known, early cases (e.g. the Jack the Ripper murders in Victorian England), profiling has become a common tool for prioritizing suspects and developing new lines of enquiry in serial crime investigations (Woodworth & Porter, 1999). However, despite the growing popularity of profiling as an investigative technique, the vast majority of literature reviews have documented that this is more a result of its exposure in the media as opposed to any empirical evidence documenting its effectiveness (McCann, 1992; Muller, 2000; Smith, 1993).

Having said this, one issue within the profiling field is beginning to receive a significant amount of attention. Recently, several attempts have been made to determine what attributes (i.e. knowledge, skills, abilities, etc.) are possessed by successful profilers.

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Arguably, the first individuals to explore this issue were Hazelwood, Ressler, Depue, and Douglas (1995), special agents from the Behavioral Science Unit (BSU) of the Federal Bureau of Investigation (FBI). Hazelwood and his colleagues argued that successful profilers possess certain key attributes, including an appreciation for the criminal mind, investigative experience, isolation of affect (referred to as objectivity), logical reasoning ability, and a high level of intuition. While intuitively this claim may make sense, at the time when it was proposed by Hazelwood and his colleagues, it merely represented professional opinion. There was no empirical evidence to support their assertions.

In response to this lack of evidence, Kocsis and his colleagues began to examine the specific contribution of each of Hazelwood et al.'s (1995) proposed attributes to success in profiling tasks (e.g. Kocsis, 2003a,b, 2004; Kocsis, Hayes, & Irwin, 2002; Kocsis, Irwin, Hayes, & Nunn, 2000). The studies emerging from this research program have been interpreted as providing support for some of the profiling skills put forward by Hazelwood et al., particularly logical reasoning ability and an appreciation for the criminal mind (see Kocsis, 2003a for a review of this evidence).

The research paradigm

Across their studies, Kocsis and his colleagues examine the necessary skills for success in profiling by adopting a paradigm similar to that used by Pinizzotto and Finkel (1990). The procedure involves collecting profiling data from various groups of participants who are believed to possess one of the skills proposed by Hazelwood et al. (1995). The participant groups often include professional profilers, psychologists, police officers, university students, and psychics. According to Kocsis et al. (2000), the psychologists are tested because of their appreciation for the criminal mind, the police officers are tested because of their investigative experience, the university students are tested because of their capacity for objectivity and logical reasoning, and the psychics are tested because of the intuition that they claim to possess.

Profile accuracy data are obtained by having each participant review the case material of a genuine solved crime or crime series. Following the presentation of the case material, participants are then presented with a multiple-choice questionnaire that surveys various offender characteristics, including physical features, cognitive processes, offense behaviors, and social history and habits. Each participant is required to complete the questionnaire by selecting the options they believe match the characteristics of the offender known to have committed the crime(s). In their initial study, Kocsis et al. (2000) also requested that participants construct a written profile.

Profile accuracy is measured by comparing the multiple-choice profile constructed by each participant to a correct profile constructed by the police officer who was originally responsible for investigating the crime(s) in question, with a higher degree of correspondence between the two profiles indicating greater accuracy. The performance of each group is then compared across each of the profile sub-sections (and the overall profile) to determine whether a specific group of participants (e.g. students), and therefore a particular type of skill (e.g. logical reasoning ability), produces a more accurate profile.

The current status of the research

In their initial investigation, Kocsis and his colleagues (2000) sampled five professional profilers and 20 individuals in each of the other participant groups (psychologists, police officers, students, and psychics) in order to assess which skills discussed by Hazelwood et al.

(1995) were necessary for effective profiling. The results from the profiling exercise indicated no significant differences between any of the groups in terms of their accuracy, with the exception of the psychologists who outperformed police officers with respect to physical features and offense behaviors. It was not until the non-profiler groups were collapsed and compared to the profilers that significant differences emerged. Under these circumstances, the profilers significantly outperformed the non-profiler group in terms of the total accuracy of their profiles. In conclusion, Kocsis et al. (2000) noted that, while profilers tend to outperform non-profilers, students and psychologists often perform at a level equivalent to profilers. As a result, an appreciation for the criminal mind as well as logical reasoning ability was considered to be important for effective profiling.

Further support for the importance of logical reasoning in offender profiling emerged in another study by Kocsis and colleagues (2002) when they investigated the profiling performance of various groups of police officers (senior detectives, homicide detectives, trainee detectives, and police recruits), along with a group of university students. Using a profiling task that was similar to the one used in the initial study, the university students were found to generally outperform all other groups on all but two sections of the profile (cognitive processes and offense behaviors). In addition, there appeared to be a trend towards groups with post-secondary education outperforming groups without post-secondary education. For example, new police recruits, who were all graduates from post-secondary institutions, outperformed officers without such education. Consequently, Kocsis and his colleagues (2002) proposed that the essential element of profiling may not be investigative experience, but a willingness to attain higher education and the logical reasoning abilities that are learned through this process (or the logical reasoning abilities that are inherent within individuals who attend higher education institutions).

Having focused on homicide cases in his first two studies, Kocsis (2004) utilized serial arson offenses. Due to the change in crime, the participant groups in this study included detectives who specialized in arson offences and a group of arson investigators. All of these individuals had specialized training in arson and a post-secondary education. The other participant groups included professional profilers, undergraduate students, and a control group of community college students. The results revealed only one significant difference between the groups, with profilers obtaining higher accuracy scores than detectives. However, at a descriptive level, profilers were the most accurate overall, followed by undergraduate students, arson investigators, the control group, and police detectives. Once again, logical reasoning ability was considered the most important skill for effective profiling.

Recently, Kocsis (2003a) summarized data from all of his previous studies (including the 2004 study mentioned above). Included were nine groups of participants including profilers, psychologists, undergraduate students, specialist detectives, general police officers, police recruits, non-police specialists, psychics, and controls. Consistent with Kocsis' previous conclusions, the results of this analysis indicated that profilers had the highest number of total correct responses across all of the various groups, followed by undergraduate students and psychologists. Based on these findings, Kocsis reiterated the conclusions made in previous studies and argued that logical reasoning ability and an appreciation for the criminal mind are the key attributes that successful profilers possess.

Limitations of the research

The work of Kocsis and his colleagues has attempted to scientifically test the statements made by Hazelwood et al. (1995) regarding the importance of various skills for profiling.

However, while the research represents an important step forward, it is not without methodological flaws (Bennell, Jones, Taylor, & Snook, 2006). Perhaps the primary criticism that can be leveled against this work regards the lack of any formal assessment of skills amongst participants taking part in Kocsis's studies (with the exception of one group in Kocsis, 2004). As argued by Bennell et al. (2006), the assessment of skills is central to answering the question: What skills are important for profiling? Assessing logical reasoning ability in student participants may be of particular importance, given that this group consistently performs on par with, or slightly below, professional profilers.

Before one can assess logical reasoning ability, the construct must be operationally defined. Historically, logical reasoning and critical thinking have been viewed as synonymous (Facione, Sanchez, Facione, & Gainen, 1995). This is seen in modern definitions of critical thinking as well. Watson and Glaser (2006), for example, define critical thinking as a multi-faceted construct that is based on logical reasoning. More specifically, they state that critical thinking consists of the following:

- (1) attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true;
- (2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined; and
- (3) skills in employing and applying the above attitudes and knowledge (Watson & Glaser, 2006, p. 3).

Although alternative definitions of critical thinking exist (e.g. Chance, 1986; Mayer & Goodchild, 1990; Tama, 1989), Watson and Glaser's definition is a commonly accepted one and it will be adopted for the purposes of the present study.

With the adoption of this particular definition of critical thinking comes the added benefit that reliable and valid assessment tools already exist to measure this construct. In particular, the Watson–Glaser Critical Thinking Appraisal (WGCTA) Forms are widely used to assess this form of critical thinking within individuals (Watson & Glaser, 2006). In fact, the WGCTA assessment protocol is currently considered the gold standard for measuring critical thinking ability and relating that ability to performance across a range of domains (Allen, Berkowitz, Hunt, & Loudon, 1999). For example, McMillan's (1987) survey indicated that the WGCTA was the most commonly used inventory for the purpose of assessing critical thinking skills in post-secondary educational institutions. Given the general acceptance of the WGCTA assessment tools by diagnosticians, and the psychometric properties associated with these tools, which will be discussed in more detail below, a version of the original WGCTA will be the measurement method utilized in the current study to quantify the critical thinking abilities of our participants.

The aims of the current study

The current study is a first step towards empirically examining the relationship between logical reasoning ability, or critical thinking, and profile accuracy. We are focusing on this particular skill because it is the skill that received the most amount of support in previous research by Kocsis. In order to accomplish this task, a group of university students will participate in a Kocsis-like profiling task before being assessed for their capacity to think critically (using a version of the WGCTA). This will allow us to determine whether there is

a significant relationship between critical thinking ability and profiling performance. Given the fact that this study is novel in its attempt to evaluate the relationship between critical thinking ability and profiling performance, no directional hypotheses will be tested. Instead, the following research questions will be explored:

- (1) Can students construct accurate profiles in a mock profiling exercise?
- (2) Do students possess critical thinking abilities and, if so, to what extent?
- (3) Is critical thinking amongst students related to profile accuracy?

Method

Sample

Participants included 36 undergraduate students recruited voluntarily from Carleton University. The sample consisted of 30 females and six males ranging in age from 19 to 54 years ($M = 23.89$, $SD = 6.81$). The sample consisted of both third ($n = 26$) and fourth ($n = 10$) year students. Nineteen of the participants were psychology majors, 14 were criminology majors, and two had majors labeled as “other”. To ensure students did not have extensive prior knowledge of profiling, they were asked to rate their knowledge in the area on a five-point scale ranging from 1 (not knowledgeable) to 5 (extremely knowledgeable). None of the students felt that they were extremely knowledgeable about profiling (mode = 3). To examine whether students had extensive interest in the area of profiling, they were asked to rate their interest of profiling on a five-point scale ranging from 1 (no interest) to 5 (extremely interested). Six of the students felt that they were extremely interested in profiling (mode = 4).

Materials

The current study was conducted in two stages. In the first stage, participants were provided with a package that contained, in order, on separate pages: (a) an informed consent form, (b) instructions for completion of the package, (c) a demographic questionnaire, (d) case material, (e) a multiple-choice profile questionnaire, and (f) a questionnaire asking if the participant had any knowledge of who the actual offender was. The case material contained a description of a series of three genuine homicides committed on separate occasions by a single offender (while it would be preferable, time restrictions prevented the use of more than one case). This case was selected because we had access to adequate offender and offense information, which was necessary to construct the experimental package and evaluate profile accuracy, and because it was viewed as a relatively typical case of serial homicide. The material supplied to the participants contained a case-by-case description that included a victimology report for each victim, information pertaining to the investigation of the crime scene (e.g. location of bodies, autopsy information, interviews with witnesses, etc.), and crime scene photos. The multiple-choice profile questionnaire consisted of 29 items comprising four sections including physical characteristics, cognitive processes, offense behaviors, and social history and habits. Many of the questions contained in the questionnaire were obtained and adapted from Kocsis et al. (2000) (see the Appendix).

In the second stage of the study, participants completed in order: (a) an informed consent form, (b) the online version of the Watson–Glaser Critical Thinking Appraisal – Form S (WGCTA-S), and (c) a debriefing form. The WGCTA-S is a shortened version of the WGCTA – Form A (WGCTA-A). It is made up of 16 scenarios and 40 items that have been

selected from the 80 items encompassed in Form A. The WGCTA-S assesses critical thinking through five sub-tests: Inference (discriminating among degrees of truth of inferences drawn from given data), recognition of assumptions (recognizing unstated assumptions in given statements), deduction (determining whether certain conclusions follow from information in given statements), interpretation (assessing evidence and determining if generalizations based on the given data are justified), and evaluation of arguments (distinguishing between strong and weak arguments to a particular question).

The WGCTA-S can be administered individually, or in groups, and is suitable for individuals with at least a ninth-grade reading ability (Watson & Glaser, 2006). There is no time limit set for the test, but it typically takes 30–40min to complete (Loo & Thorpe, 1999). The WGCTA-S does appear to provide results that are equivalent to the longer, original versions of the WGCTA, as indicated by a correlation of 0.96 between the WGCTA-S and the WGCTA-A (Watson & Glaser, 2006). In addition, the online version of the WGCTA-S appears to give results that are equivalent to the paper and pencil version, as indicated by correlations between the two versions in the range of 0.86–0.88 (Watson & Glaser, 2006). Watson and Glaser (2006) also report a relatively high level of internal consistency for the WGCTA-S, with a Cronbach's alpha of 0.81. Loo and Thorpe (1999) report comparable alpha values ranging from 0.65 to 0.74 for management and nursing students, as do Gadzella, Stacks, Stephens, and Masten (2005), with an alpha value of 0.76 for education students. The test-retest reliability of the WGCTA-S is also high, reported as 0.81 by Watson and Glaser (1994) and as 0.89 by Watson and Glaser (2006). In terms of criterion-related validity, numerous studies in medical, educational, and organizational settings have indicated that scores on the WGCTA-S are predictive of important performance measures, including university grade point averages (GPAs) ($r=0.50$; Holmgren & Covin, 1984), licensing exam scores ($r=0.50$; Bauwens & Gerhard, 1987), and assessment center exercise scores ($r=0.26$; Spector, Schneider, Vance, & Hezlett, 2000). Finally, with respect to convergent validity, Watson and Glaser (1994) provide sufficient evidence of significant positive correlations between the WGCTA-S and other assessment tools, such as the Weschler Adult Intelligence Scale ($r=0.55$) and the Scholastic Aptitude Test ($r=0.60$).

Procedure

The first stage of the study was conducted in a classroom setting. Participants were presented with a package including all of the materials described above. After completing the informed consent form, participants read through the instruction sheet. In addition to providing general instructions, this sheet informed participants that they could consult the case material when constructing their profile, that they had to provide an answer to each question on the multiple-choice questionnaire, that they had to complete the questionnaire independently, and that they could take as long as was required to complete the profiling task. Following this, the participants completed the demographic questionnaire, read through the case material, and completed the multiple-choice profile questionnaire. After completing the profile, participants were asked if they had knowledge of who the actual offender was (none of the participants indicated that they did). Two research assistants were present during this session to ensure that the experiment was completed individually and to answer any questions that arose. The average time to complete the first stage of the experiment was approximately 60min.

To establish a quantitative measure of profile accuracy, each participant's answers to the multiple-choice questions were compared to the correct answers. Each participant was

given a raw score and percentage correct for the multiple-choice profile questionnaire (i.e. an overall score), along with a raw score and percentage correct for each sub-section of the questionnaire (i.e. physical characteristics, cognitive processes, offense behaviors, and social history and habits).

The second stage of the study was conducted individually in a research lab at a time scheduled by the participant. Upon arrival, participants signed another informed consent form and then completed the online version of the WGCTA-S. The providers of this assessment tool calculate the results of the test and provide it as a computerized, printable file to the experimenter. An overall raw score out of 40 is provided (with a higher score indicating a greater degree of critical thinking ability) as well as raw scores for each sub-test (inference is out of seven, recognition of assumptions is out of eight, deduction is out of nine, interpretation is out of seven, and evaluation of arguments is out of nine). The average time to complete the second stage of the experiment was approximately 30min.

Upon completing their second session, participants received a debriefing form explaining the purpose of the entire study and were asked if they would like to have their data removed from the study (no participants opted to have their data removed).

Results

Degree of profile accuracy exhibited by the participants

The mean number of correct answers on the multiple-choice profile questionnaire and the corresponding profile accuracy scores (% correct) are reported in Table I for the overall profile and each of the sub-sections. As can be seen from this table, as a group, the participants did not perform extremely well on the profiling task (their overall accuracy score was 37.74%), but this can be attributed primarily to their extremely poor performance when making predictions about social history and habits (12.28%).

In terms of demographics, no significant correlations between participant age and profile accuracy were found for the overall profile, $r_s = 0.02$, NS, or for any of the sub-sections: Physical characteristics, $r_s = -0.16$, NS, cognitive processes, $r_s = 0.12$, NS, offense behaviors, $r_s = -0.17$, NS, and social history and habits, $r_s = 0.25$, NS. An independent samples t -test showed that the 30 females ($M = 11.03$, $SD = 2.50$) did not differ significantly from the six males ($M = 10.50$, $SD = 1.05$) in terms of their overall profile accuracy, $t(34) = -0.51$, NS, or for any of the sub-sections: Physical characteristics, $t(34) = -1.49$, NS, cognitive processes, $t(34) = -0.53$, NS, offense behaviors, $t(34) = -0.30$, NS, and social history and habits, $t(34) = 0.83$, NS. An independent samples t -test showed that the 26 third-year students ($M = 10.85$, $SD = 2.68$) did not differ significantly from the 10 fourth-year students ($M = 11.20$, $SD = 0.92$) in terms of their overall profile accuracy, $t(34) = -0.41$, NS, or for any of the sub-sections: Physical

Table I. Mean number of correct answers and profile accuracy (% correct) for the overall profile and the profile sub-sections.

Profile component	Mean no. of correct answers (SD)	Profile accuracy (%) (SD)
Overall (/29)	10.94 (2.35)	37.72 (7.99)
Physical characteristics (/6)	3.61 (0.90)	60.17 (14.50)
Cognitive processes (/7)	3.19 (0.95)	45.57 (13.39)
Offense behaviors (/7)	2.94 (0.92)	42.00 (13.09)
Social history/Habits (/9)	1.17 (1.23)	13.00 (13.56)

characteristics, $t(34) = 0.58$, NS, cognitive processes, $t(34) = -1.20$, NS, offense behaviors, $t(34) = -0.63$, NS, and social history and habits, $t(34) = -0.05$, NS. A one-way ANOVA showed no significant differences between a participant's major subject of study (Psychology: $M = 37.39$, $SD = 9.07$; Criminology: $M = 38.42$, $SD = 7.51$; Other: $M = 36.78$, $SD = 1.99$) in terms their overall profile accuracy, $F(2,33) = 0.09$, NS, or for any of the sub-sections: Physical characteristics, $F(2,33) = 0.20$, NS, cognitive processes, $F(2,33) = 0.17$, NS, offense behaviors, $F(2,33) = 0.68$, NS, and social history and habits, $F(2,33) = 0.32$, NS.

A one-way ANOVA showed no significant differences in overall profile accuracy between participant's who indicated that they had extensive knowledge of profiling ($M = 38.42$, $SD = 7.27$), a moderate knowledge of profiling ($M = 36.59$, $SD = 9.10$), or little knowledge of profiling ($M = 40.52$, $SD = 5.17$), $F(2,33) = 0.47$, NS, nor were any significant differences found for any of the sub-sections: Physical characteristics, $F(2,33) = 0.98$, NS, cognitive processes, $F(2,33) = 0.09$, NS, offense behaviors, $F(2,33) = 0.37$, NS, and social history and habits, $F(2,33) = 0.23$, NS. Finally, a one-way ANOVA showed no significant differences in overall profile accuracy between those participant's who indicated that they were extremely interested in profiling ($M = 37.93$, $SD = 2.18$), very interested in profiling ($M = 40.57$, $SD = 8.92$), moderately interested in profiling ($M = 34.80$, $SD = 6.44$), or not interested in profiling ($M = 29.31$, $SD = 12.19$), $F(2,32) = 2.14$, NS, nor were any significant differences found for any of the sub-sections: Physical characteristics, $F(2,32) = 1.45$, NS, cognitive processes, $F(2,32) = 1.45$, NS, offense behaviors, $F(2,32) = 2.03$, NS, and social history and habits, $F(2,32) = 0.97$, NS.

Scores on the WGCTA-S

The mean raw scores and percentages on the overall WGCTA-S and its sub-tests are reported in Table II for the entire sample of participants. As can be seen from this table, the participants exhibited the highest percentage accuracy for the deduction sub-test, followed closely by the recognition of assumptions and the evaluation of arguments sub-tests. This indicates that students may be particularly good at determining valid conclusions, recognizing unstated assumptions based on given data, and distinguishing between strong and weak arguments on a particular point.

To shed some light on what these scores actually mean, the average mean raw scores on the WGCTA-S from the current sample were compared to several group norms reported in the WGCTA-S manual (Watson & Glaser, 1994). Unfortunately, there are, as of yet, no norms for university students. As an alternative, the participant data was compared to the "Miscellaneous Occupations" (MO) group, given that this group appears to be most similar to the students taking part in the current study. The mean raw score on the WGCTA-S for the MO group is 76.70% while the mean for participants in the present sample is 78.95%.

Table II. Mean raw scores and percentages on the overall WGCTA-S and its sub-tests.

WGCTA-S component	Mean raw score (SD)	Percentage (SD)
Overall (/40)	31.58 (4.91)	78.95 (12.27)
Inference (/7)	5.31 (1.39)	75.86 (19.87)
Recognition of assumptions (/8)	6.53 (1.99)	81.62 (24.82)
Deduction (/9)	7.39 (1.76)	82.11 (19.52)
Interpretation (/7)	5.14 (1.36)	73.43 (19.40)
Evaluation of arguments (/9)	7.22 (1.36)	80.22 (14.97)

This indicates that, on average, participants in the current study possessed a higher degree of critical thinking ability than the MO group. Specifically, 63.89% of the participants in the current sample scored at or above 76.70%. Furthermore, students in the present study also performed on par with one of the highest ranked norm groups in the WGCTA-S manual. Executive management (EM) applicants exhibit a mean score of 83.55% on the WGCTA-S (Watson & Glaser, 1994). This mean is higher than the present student sample; however 44.44% of the participants in the current study scored at or above the average EM score.

The relationship between WGCTA-S scores and profile accuracy

The correlations between the WGCTA-S scores (% correct) and profile accuracy (% correct) are reported in Table III. The only significant correlations found included a negative correlation between the overall percentage correct on the WGCTA-S and profile accuracy on the physical characteristics sub-section, $r_s = -0.35$, $p < 0.05$, and a negative correlation between the percentage correct on the recognition of assumptions sub-component of the WGCTA-S and profile accuracy on the physical characteristics sub-section, $r_s = -0.37$, $p < 0.05$.

Discussion

A number of studies have explored the profiling ability of different groups of individuals thought to possess certain skills (e.g. an appreciation for the criminal mind, investigative experience, logical reasoning ability, and intuition) to determine the extent to which these skills relate to profiling performance. However, these previous studies have not adequately determined whether these individuals possess the skills they are thought to possess. The focus of the current study was on extending this existing research by examining one of the most important participant groups included in previous studies (university students). The emphasis was on determining whether these participants possess critical thinking skills and establishing whether the degree of critical thinking that these students possess positively correlates with their performance on a simulated profiling task.

Are students effective profilers?

On average, the overall profiling accuracy exhibited by the present sample of students was approximately 38% and no demographic differences in profile accuracy were found. This low level of accuracy can primarily be attributed to the extremely inaccurate

Table III. Correlations between components of the WGCTA-S and profile accuracy.

WGCTA-S component	Profile section				
	Overall profile	Physical characteristics	Cognitive processes	Offense behaviors	Social history/Habits
Overall	-0.12	-0.35*	0.03	0.03	-0.12
Inference	-0.06	-0.26	0.05	0.06	-0.12
Recognition of assumptions	-0.17	-0.37*	0.08	0.03	-0.14
Deduction	-0.15	-0.21	-0.04	-0.08	-0.18
Interpretation	0.13	-0.12	-0.10	0.05	0.23
Evaluation of arguments	-0.04	-0.08	0.24	-0.06	0.01

* $p < 0.05$.

predictions made with regard to variables concerning social history and habits (12.28%). Indeed, excluding that sub-section of the profile, the overall profile accuracy score increases to 49%. Previous research involving students has reported profile accuracy levels of 40% (Kocsis et al., 2000), 41% (Kocsis et al., 2002), and 59% (Kocsis, 2004).¹ Thus, while the current group of students exhibited slightly lower levels of overall profile accuracy compared to the previous groups, they are comparable to the students that were examined in two of Kocsis' studies. This suggests that the group of students examined in the current study are not markedly different in terms of their profiling performance from the students examined previously.

While these profile accuracy scores may reflect how accurate participants were on the current profiling task, it is important to note that the interpretation of what these accuracy scores actually mean is severely limited.² All these scores indicate is how easy it was for students to profile the particular case that was provided to them in this single, simulation study. The accuracy scores may or may not indicate how the same students would perform in other profiling studies (as is made obvious in Kocsis' previous profiling experiments). In addition, it would be wholly inappropriate at this stage to generalize these findings to naturalistic settings given the many potentially important differences that exist between our testing conditions and the conditions under which genuine profiles are constructed. Some of the most obvious differences relate to the quality of investigative information that was accessible for review, the amount of time that was available to process the case material, the format in which the profile was constructed, and the restricted access to outside sources, including relevant literature, subject matter experts, and an investigative team.

Are university students critical thinkers?

In an attempt to determine whether students actually possess any critical thinking ability they were assessed using the WGCTA-S, currently the gold standard for assessing this construct in a quick and efficient manner (Watson & Glaser, 2006). Clearly, the results from this assessment indicate that, as a group, the students participating in this study do possess a reasonably high degree of critical thinking. Indeed, scores across the various sub-sections of the WGCTA-S ranged from 73.39 to 82.22%, which puts these students on par with some of the best critical thinkers for which normative data is available (Watson & Glaser, 2006).

In terms of supporting the previous research conducted by Kocsis and his colleagues, the performance of the sampled students on the WGCTA-S appears to validate an important element of the Kocsis paradigm. That is, the WGCTA-S scores obtained in this study indicate that Kocsis and his colleagues may have been warranted in their decision to select university students as the group to represent the skill of critical thinking. Despite this finding, it would be inappropriate to generalize the results from the current sample to Kocsis's samples of students. Several factors could influence the degree to which students possess and display critical thinking ability on tests such as the WGCTA-S (e.g. the general intelligence of the students, the particular university in which they are enrolled, the degree to which the students are working towards, etc.) and therefore it is important that each independent sample of students be adequately assessed.

Is critical thinking amongst students related to profile accuracy?

While the results described above support the decision to rely on students to capture the skill of critical thinking, this in no way supports the conclusion that critical thinking is a skill

needed for the production of accurate profiles, even in mock profiling studies. In order for this conclusion to be sound, it must be possible to demonstrate that there is a significant positive correlation between critical thinking ability and profiling performance. Upon examining the data collected in this study, there appears to be no evidence to support this claim. In fact, the only significant results were negative correlations, indicating that as critical thinking ability increased overall or in relation to one's ability to recognize assumptions, profile accuracy decreased with respect to the prediction of physical characteristics (e.g. how tall the unknown offender is likely to be).

Why is critical thinking unrelated to performance in the current simulated profiling task? While no definitive answers can be given at this time, a number of possible explanations exist. For example, one possibility, which contrasts with current thinking in the area (e.g. Kocsis, 2003a), is simply that no relationship exists between critical thinking (as measured using the WGCTA-S) and laboratory-based profiling performance. It is certainly the case that, while scores on this assessment tool have been found to relate to performance in a number of other non-profiling studies (e.g. Profetto-McGrath, Hesketh, Lang, & Estrabrooks, 2003; Scott, Markert, & Dunn, 1998), there are also studies reporting the opposite (Williams & Stockdale, 2003; Wilson & Wagner, 1981).

Alternatively, it may be that there is a relationship between critical thinking and profiling performance, but that the form of critical thinking originally proposed by Hazelwood and colleagues (1995) differs from that which was assessed in the current study. Hazelwood et al. (1995) state that an effective profiler should have the "ability to analyze a situation and arrive at logical conclusions" (p. 141), which clearly overlaps with the skills that are measured by the WGCTA-S (Watson & Glaser, 2006). However, it may be that the critical thinking skills possessed by effective profilers are more context specific than the general skills measured by the WGCTA-S (i.e. specific to problems that arise, or to evidence encountered, in a violent crime investigation). Indeed, it may be that a measure of critical thinking developed specifically for use in policing contexts would be more likely to reveal a significant relationship.³

Furthermore, the WGCTA-S may be a suitable measure of critical thinking in the profiling context, and the capacity to think critically may in fact be important to profiling, but not as an isolated skill. For example, the ability to think critically may interact with other important skill sets in effective profilers, such as an appreciation for the criminal mind, investigative experience, and/or intuition and this may be what enables these individuals to construct accurate profiles. Indeed, it is important to remember that Hazelwood et al. (1995) view effective profilers as individuals who possess a *collection* of these specific skills, not any particular skill to a high degree. If this is the case, then perhaps it should come as no surprise that critical thinking, in isolation, does not correlate significantly with profiling performance.

Finally, it is possible that a relationship between critical thinking and profiling performance does exist, but was not found in the current study because of various validity issues. For example, it might be that the lack of a significant relationship relates to the specific serial homicide case we selected for the study. Presumably, for critical thinking to result in accurate profiling performance the details provided in the case material must logically relate to offender characteristics. Despite our attempt to select a typical serial homicide case, it may be that some of the offender characteristics in this case deviate from what might be logically expected (e.g. low base rate characteristics). If this is true, then the critically thinking student will still make inaccurate predictions. Alternatively, although no time limit was imposed on the participants in this study, it is likely that they felt pressure to

complete the experiment in a timely fashion. If this is true, what we might be picking up from participants in this study is their initial opinions (based on intuition or guesswork) rather than the results from a systematic, critical evaluation of the case material. Furthermore, the very fact that we focused on students in this study, rather than forensic professionals, might explain the lack of any significant findings. If profiling can be characterized as a process of drawing inferences from a critical analysis of case material, most likely those inferences are based on scientific research and/or practical knowledge. Students without this requisite knowledge may be unable to draw on their critical thinking skills to construct an accurate profile despite the fact that they may possess such skills. This certainly does not imply that critically thinking profilers couldn't make accurate predictions under similar conditions.⁴

Conclusion

The current study represents the first attempt to empirically determine whether critical thinking ability relates to profile accuracy within a student sample taking part in a mock profiling exercise. Although students in the current study were found to possess a reasonably high level of critical thinking ability, no support was found for the relationship between critical thinking and profiling performance. Having said this, it should be acknowledged that many of the limitations with laboratory-based profiling studies that were discussed by Bennell et al. (2006) are present in the current study. To draw any firm conclusions about the relationship between critical thinking and profiling performance, future studies will need to reflect more closely on how profiling occurs in naturalistic settings. With improved research, a clearer picture may develop as to how various skill sets relate to profiling performance and these findings may have important implications for the profiling field.

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Notes

- 1 In Kocsis' (2004) study, it is important to note that all of the groups that were examined performed significantly better than in previous studies. This fact may be attributable to the particular case presented to participants or the fact that a different type of crime was profiled (serial arson vs single homicide). Hence, one should take this into consideration when interpreting these results.
- 2 As discussed by Bennell et al. (2006), given the potential problems with the multiple-choice profile questionnaire used in this and previous studies we cannot say with certainty what these accuracy scores actually reflect. For example, many of the questions included on the multiple choice questionnaire are subjective (e.g. the offender's height as short, average, tall, or very tall) or are unverifiable (e.g. the offender's primary motive for the offense). Thus, profile accuracy scores may be reflecting actual accuracies or inaccuracies, but they could also simply be reflecting differences in how questions are interpreted.
- 3 There is some indirect evidence to support this idea. For example, Williams, Oliver, and Stockdale (2004) examined the relationship between critical thinking ability in psychology students and performance in a human development course using both a subject-specific measure of critical thinking (The Psychological Critical Thinking Instrument) and a generic measure (WGCTA-S). They found that the subject-specific measure of critical thinking was a better predictor of exam performance than the generic measure.
- 4 We would like to thank two anonymous reviewers for raising many of the issues discussed in this paragraph.

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Appendix – Multiple-choice questionnaire

Physical characteristics

1. The offender is: (1) male or (2) female.
2. The offender is aged: (1) 1–12 years, (2) 13–17, (3) 18–25, (4) 26–35, (5) 36–45, (6) 46–55, (7) older than 56.
3. The offender's ethnic background is: (1) Anglo-Saxon, (2) Mediterranean, (3) Eastern European, (4) Middle-Eastern, (5) Asian, (6) Aboriginal, (7) Afro-American or (8) other.
4. Offender's general build is: (1) thin, (2) average, (3) solid, or (4) fat.
5. Offender's height is: (1) very short, (2) short, (3) average, (4) tall, or (5) very tall.
6. Offender's hair color is: (1) brown, (2) red, (3) blonde, (4) black, (5) gray, or (6) none/bald.

Cognitive processes

7. Prior to the offense, was the offender familiar with the location where the offense took place? (1) yes, highly familiar, (2) yes, vaguely familiar, or (3) no.
8. Did the offender feel comfortable in the area where the offense took place? (1) yes, or (2) no.
9. Previous relationship between the offender and the victim was: (1) blood relatives, (2) mutual acquaintances but not related by blood, (3) offender knew victim but victim did not know offender, or (4) complete strangers.
10. What was the primary motive for the offense? (1) revenge, (2) uncontrollable impulse, (3) show-off power, (4) feelings of inadequacy, (5) frustration, (6) jealousy, or (7) other.
11. The offense was: (1) totally unplanned or spontaneous, (2) thought of previously but never actually planned, (3) some planning, or (4) carefully planned.
12. Prior to the offense, did the offender have fantasies about killing someone? (1) no, (2) yes, sometimes, (3) yes, often, or (4) yes, constantly.
13. Did the offender experience any remorse about the offense? (1) yes, a great deal, (2) yes, some, or (3) no.

Offense behaviors

14. At the time of the offense, did the offender live within a five-kilometer radius of the location where the offense took place? (1) yes, or (2) no.
15. Did the offender take any precautions to protect his or her identity from the victim? (1) yes, or (2) no.
16. How did the offender initially approach the victim? (1) slowly or casually, (2) with a con or ploy to detain the victim, (3) belligerently, or (4) by surprise (e.g. from behind or during sleep).

17. Did the offender use force before committing the actual offense? (1) no, (2) yes, primarily to gain control over the victim, (3) yes, primarily to intimidate the victim, (4) yes, primarily to see the victim suffer, (5) yes, primarily in a drive for revenge, or (6) yes, primarily in anger.
18. After the offense, did the offender alter the victim's body in any way (e.g. rearrange clothing, reposition body)? (1) yes, or (2) no.
19. After the offense, did the offender do anything to alter the crime scene (e.g. remove evidence, cleaning up)? (1) yes, or (2) no.
20. Did the offender take away from the crime scene any possessions of the victim? (1) yes, or (2) no.

Social history/habits

21. The offender's marital status: (1) single, (2) married, (3) living in a de facto relationship, or (4) divorced.
22. The offender's highest level of education: (1) nil, (2) did not complete primary school, (3) completed primary school, (4) dropped out of high school, (5) completed high school, (6) completed technical college course, or (7) completed university degree.
23. The offender's general employment history: (1) student, not yet employed, (2) mostly unemployed, (3) irregular, part-time employment, (4) regular work as a laborer, (5) regular semi-skilled work, (6) regular skilled work, or (7) professional.
24. The offender's current religious belief: (1) Protestant, (2) Catholic, (3) Greek Orthodox, (4) Jewish, (5) Muslim, (6) Buddhist, (7) Taoist, (8) nil (atheist, agnostic), or (9) other.
25. Offender's history of romantic relationships: (1) no prior relationships, (2) very few brief casual relationships, (3) a few relatively long casual relationships, (4) many short casual relationships, (5) many long casual relationships, (6) a few relatively short serious relationships, (7) a few relatively long serious relationships, (8) many short serious relationships, or (9) many long serious relationships.
26. Offender's history of (non-romantic) friendships: (1) no friendships, (2) very few brief casual friendships, (3) a few relatively long casual friendships, (4) many short casual friendships, (5) many long casual friendships, (6) a few relatively short deep friendships, (7) a few relatively long deep friendships, (8) many short deep friendships, or (9) many long deep friendships.
27. Did the offender ever serve in the armed forces? (1) yes, (2) no, but thought of it, or (3) no.
28. The offender's alcohol consumption: (1) nil, (2) low, (3) medium, (4) in binges, or (5) high.
29. Condition and model of offender's car: (1) does not apply, (2) flashy model in excellent condition, (3) conservative model in excellent condition, (4) flashy model in good condition, (5) conservative model in good condition, (6) flashy model in poor condition, and (7) conservative model in poor condition.