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## The Relationship Between Metacognition and Vocational Indecision

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### Abstract

The purpose of this study was to examine the relationship between metacognition and vocational indecision among 100 introductory Psychology students within the parameters of the theory of cognitive information processing advanced by Peterson, Sampson, Reardon and Lenz (1996). The Cornell Critical Thinking Test was employed as a measure of metacognition and the Career Decision Scale served as the measure of vocational indecision. The results of a correlation analysis revealed a significant statistical relationship between metacognition and vocational indecision. In particular, individuals who scored higher on the measure of metacognition, indicating increased metacognitive activity such as monitoring and regulation, evidenced a greater degree of vocational decidedness. Alternatively, those who scored lower were found to be more vocationally undecided. Regression analysis revealed deduction, one of the components of metacognition, as a predominant predictor for decidedness.

### Résumé

Le but de cette étude est d'examiner la relation entre la métacognition et l'indécision par rapport au choix professionnel parmi 100 étudiants d'Introduction à la psychologie en suivant les paramètres de la théorie du traitement de l'information cognitive élaborée par Peterson, Sampson, Reardon et Lenz (1996). On s'est servi du test de l'esprit critique de Cornell [Cornell Critical Thinking Test] pour mesurer la métacognition et de l'échelle de prise de décision professionnelle [Career Decision Scale] pour mesurer l'indécision par rapport au choix professionnel. Les conclusions d'une analyse de corrélation ont révélé une relation statistique significative entre la métacognition et l'indécision concernant le choix professionnel. En particulier, les personnes ayant obtenu un niveau élevé lors de la mesure de la métacognition, qui indiquait une présence accrue d'activités métacognitives telles que l'analyse et le contrôle, ont démontré un niveau plus élevé de prise de décision professionnelle. Par opposition, les étudiants ayant obtenu des niveaux inférieurs se sont révélés plus indécisifs au point de vue du choix professionnel. L'analyse de régression a mis en évidence que la déduction, une des composantes de la métacognition, est une variable importante permettant de prédire l'esprit de décision.

Vocational indecision among high school and university students is a significant concern among professional career counsellors (Mitchell & Krumboltz, 1987). The problem is widespread and is estimated to affect 18% to 50% of university students across the United States and Canada (Sepich, 1987). Initially research in this field focused solely on the differences between decided and undecided students (Larson, Heppner, Ham, & Dugan, 1988). More recently, however, career indecision has been viewed and accepted as comprising several subgroups of individuals who experience difficulty concerning their vocational decisions (Sepich, 1987). Unfortunately, differentiation between the various subgroups has proven problematic due to a lack of uniform results evident in the research literature (Lucas & Epperson, 1990). Discrimination between sub-

groups is further compounded due to the large numbers of unidentified variables that may or may not play a role in the decision-making process (Sepich, 1987; Wanberg & Muchinsky, 1992).

One area which has not received much attention in the vocational indecision literature is that of metacognition (Bodden, 1970; Neimeyer, Neville, Probert, & Fukuyama, 1985; Neville, Neimeyer, Probert, & Fukuyama, 1986). Metacognition can be defined as what an individual knows about his/her cognitions, such as the person's knowledge of cognitive processes and states including attention, memory, knowledge, and conjecture (Flavell, 1979; Wellman, 1985). Metacognition also entails the regulation of various aspects of information processing such as planning, checking, monitoring, induction, deduction, observation, credibility, assumptions, meaning, testing, evaluating, and the revision of one's decision-making and problem-solving strategies.

Recently, Peterson, Sampson, Reardon, and Lenz (1996) advocated a theory that purports to explain the cognitive dynamics between metacognition and self and occupational knowledge and decision-making skills. This theory is conceptualized within the framework of a pyramid of information-processing domains including: (1) self-knowledge (knowledge domain), (2) occupational knowledge (knowledge domain), (3) generic information processing skills (decisions skills domain), and (4) metacognitions (executive processing domain).

According to Peterson et al. (1996) self-knowledge consists of perceptions of one's interests, abilities, and values. Occupational knowledge can be subdivided into two components: (1) knowledge of individual occupations, such as educational requirements, activities and duties performed; and (2) knowledge of the structural relationships among occupations which refers to categorical or hierarchical knowledge arranged in such a manner that permits the examination of similarities and differences between and within classifications. The decision skills domain is comprised of five generic information processing skills commonly employed in decision-making and problem-solving: (1) communication, (2) analysis, (3) synthesis, (4) valuing, and (5) execution (CASVE).

The executive processing domain incorporates three primary metacognitive activities: (1) self-talk, (2) self-awareness, and (3) control. Self-talk can take the form of positive self-statements as well as negative self-statements. These statements play an integral role in the evolution of self-concept and influence problem-solving behaviour (Bandura, 1982). Positive self-statements and the belief in oneself as competent and trustworthy are essential components for independent and responsible problem solving. The second component, self-awareness, involves being aware of oneself while performing tasks and activities. Attention to self-awareness enables the problem-solver to recognize such characteristics as the need for more information and/or the influence of negative self-talk.

The third essential component to effective problem solving and decision making is referred to as control and monitoring. Competent decision-makers and problem-solvers monitor the content and extent of information in the lower-order processes, i.e. the CASVA skills at their disposal. They can quickly detect when there is a deficit in information that will prevent progression to the next stage in the decision-making framework. Alternatively, decision-makers who possess and exercise control and monitoring skills also know when to move forward to the next step in the sequence of decision making. Individuals who use metacognitive strategies are said to be cognitively complex.

Cognitive complexity and its relationship to vocational decision making has received some attention in the vocational literature. Bodden (1970) and Bodden and Klein's (1972) results demonstrated a positive relationship between the ability to process information in a number of ways, i.e. cognitive complexity and the appropriateness of a vocational choice based on personality style. Neville, Neimeyer, Probert, and Fukuyama (1986) conceptualized cognitive complexity as the structural features of vocational schemas which are composed of two dimensions—differentiation and integration. Individuals displaying high integration and low differentiation processed vocational information much more effectively than those who were poorly integrated and highly differentiated.

The results of these and other studies (Cesari, Winer, & Piper, 1984; Cesari, Winer, Zychlinski, & Laird, 1982; Haase, Reed, Winer, & Bodden, 1979) provide preliminary evidence for the establishment of a relationship between cognitive complexity and vocational choice. However, these previous theories and findings do not explore issues related to the monitoring of one's cognitions. Whether or not an individual possesses high or low levels of integration and differentiation has little bearing on how these constructs are actually employed by the individual. Overall, these previous investigations (Bodden, 1970; Bodden, & James, 1976; Bodden, & Klein, 1972; Neville, Neimeyer, Probert, & Fukuyama, 1986) fail to address the process by which individuals monitor their vocational schema (self-knowledge and occupational knowledge) and level of integration.

The use of metacognitive strategies in various problem-solving situations is well documented in the literature (Harmon, 1993). Investigators have examined areas such as mathematical ability (Cardelle, 1995), depression (Slife & Weaver, 1992), learning disabled individuals (Borkowski, Estrada, Milstead, & Hale, 1989), parenting styles (Kontos & Nicholas, 1986), creativity (Betsinger, Cross, & DeFiore, 1994), personal beliefs (Schauble, 1990), and peer interactions (King, 1991; Vansickle & Hoge, 1991) in relation to problem-solving ability and the use of metacognitive strategies.

Research has demonstrated that metacognitive strategies develop with age, (English, 1992); enable individuals to execute problem-solving ac-

tivities quickly and effectively (Berardi-Coletta, Buyer, Dominowski, & Rellinger, 1995; Swanson, 1990); can be taught and enhanced in a systematic manner (Delclos & Harrington, 1991); and appears to be associated with higher levels of measured aptitude (Swanson, 1992). When combined with clearly articulated goals, high levels of metacognition plays a significant role in the decision-making process (Ridley, Schutz, Glanz, & Weinstein, 1992; Slife, Weiss, & Bell, 1985). Results of these studies clearly indicate that metacognitive controlling and monitoring skills play an integral role in the problem-solving process. These results also have strong implications with respect to the focus of the present study since problem-solving skills are a necessary component for effective vocational decision making (Peterson et al., 1996).

The model presented by Peterson et al. (1996) proposes an alternative explanation for the problems incurred by vocationally undecided individuals as well as a remedy for such difficulties. The purpose of this investigation was to test several components of this theoretical model. It was hypothesized that individuals who are decided concerning their vocational aspirations will demonstrate higher levels of processing and cognitive monitoring skills. Alternatively, vocationally undecided individuals are hypothesized to demonstrate lower levels of processing and cognitive monitoring skills. The results of this investigation will contribute to our understanding of the metacognitive skills required to enable individuals to make vocational decisions as well as the ongoing monitoring and coordination of vocational development issues.

#### METHOD

##### *Participants and Procedure*

The sample used in this study consisted of approximately 100 volunteer undergraduate university students enrolled in introductory Psychology at a university in Atlantic Canada. Participants completed a demographic questionnaire, followed by the Career Decision Scale and the Cornell Critical Thinking Test, Level Z. Debriefing information was distributed to each individual describing the nature of the issues addressed in the questionnaires and also provided references for those individuals interested in further exploring this topic of investigation.

##### *Instruments*

*The Cornell Critical Thinking Test, Level Z.* The Cornell Critical Thinking Test (Ennis, Millman, & Tomko, 1985) was selected as a measure of metacognition. This test is designed for academically advanced and "gifted" (p. 3) high school students, university students, and adults. The test has been extensively employed by educational institutions as a means of assessing metacognition (Wellman, 1985) in relation to critical-thinking instruction.

Six factors deemed as essential aspects of critical thinking form the basis of this 52-item multiple choice test. Deduction involves the ability to arrive at a specific conclusion based on generalizations. Thus, the responses (conclusions) proposed in this section of the Cornell either concur or contradict with statements (generalizations) the test takers are required to read. Scores on these items range from 0 to 24. Meaning focuses on the verbal and linguistic aspects of an argument. Possible scores on this component range from 0 to 15. The credibility component requires accurate delineation of the statement that is a truthful representation of information provided for the test takers prior to each question. The scores on this subscale range from 0 to 4. Induction is a form of reason that involves the ability to formulate generalizations based on observation of a small number of specific events. Generalizations, according to Ennis et al. (1985) must accurately explain facts, as well as remain plausible. The scores on this subscale range from 0 to 18. Assumption identification is defined as the ability to fill a deficit in reasoning. Scores on this measure range from 0 to 10. Lastly, the observation subscale, which is interrelated with the credibility component has a range of scores from 0 to 4.

Overall scores on the inventory range from a minimum of 0 to a maximum of 75. Each correct response is valued at one point. High scores indicate the presence of deep levels of metacognitive activity whereas low scores reflect shallow levels of metacognition.

Split-half reliability estimates for the Cornell Critical Thinking Test, Level Z, range from .50 to .77 (Ennis et al., 1985). In addition, item analyses estimates mean difficulty ranges from .55 to .61 which are in the ideal range of .50 (Ennis et al., 1985). Alternatively, discrimination indices are low ranging from .20 to .24; possibly reflecting the heterogeneity of critical thinking skills (Ennis et al., 1985).

Ennis et al. (1985) also extensively explored the construct validity of the test. For example, the correlation coefficient between the Cornell and the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980), in two separate studies, was .48 and .79 respectively while the correlation between the Cornell and the Logical Reasoning Test, Part II, Form A (Hertzka & Guilford, 1955) was .25. It is important to note that each critical thinking test defines and attempts to measure critical thinking ability in a slightly different manner which could provide an explanation for the moderate relationships between the tests (Lawrenz & Orton, 1992). The Cornell Critical Thinking Test has also been correlated with various other instruments such as scholastic aptitude measures (ranged from .36 to .71), and personality inventories (Ennis et al., 1985). The criterion-related validity of the Cornell Critical Thinking Test, Level Z remains unexplored due to the absence of a recognized established criterion for critical thinking ability.

*The Career Decision Scale, Third Revision.* The Career Decision Scale (CDS; Osipow, Carney, Winer, Yanico, & Koschier, 1976) was employed as a measure of vocational indecision. The CDS is a 19-item self-report questionnaire and has been used extensively in the research literature to measure vocational indecision (Slaney, 1991). This standardized instrument was chosen based on its capacity to differentiate between decided and undecided students as well as to measure antecedents of career indecision (Larson, Heppner, Ham, & Dugan, 1988).

The Career Decision Scale utilizes a Likert type scale to measure participants' responses. The alternatives range from 1 to 4 and correspond to "not like me at all," "only slightly like me," "very much like me," and "exactly like me." The initial two items provide a measure of vocational certainty ranging from a minimum score of two to a maximum of eight. Low scores indicate a lack of vocational certainty while high scores demonstrate certainty about a vocational choice. The ensuing 16 items quantify level of vocational indecision by providing a score ranging from a low of 16 to a high of 64. High scores on these items indicate vocational indecision whereas low scores reflect vocational decidedness. The final item on the scale permits respondents to briefly comment upon their vocational status if none of the above items apply (Osipow et al., 1976).

Shimizu, Vondracek, Schulenberg, and Hostetler (1988) conducted a factor analysis of the 16 indecision items revealing four factors: (1) Diffusion (items 7, 8, 11), (2) Relative Decidedness (12, 16, 18), (3) Approach Conflict (4, 15, 17), and (4) Internal/External Barriers (3, 5, 6, 9). A follow-up study conducted by Schulenberg, Shimizu, Vondracek, and Hostetler (1988) replicated this factor structure, thus, providing further evidence for its validity.

Diffusion is operationally defined by Shimizu et al. (1988) as reflective of feelings of indecision coupled with confusion, and discouragement, as well as a lack of experience and information. Scores on the diffusion scale range from 3 to 12. Relative decidedness describes those individuals who have made a vocational decision but are uncertain about how to implement their decision, and thus require additional support. Scores on relative decidedness range from 3 to 12. Approach conflict represents a situation whereby several possible careers are attractive and the individual experiences difficulty deciding exactly which path he or she will choose. Again, scores on this factor range from 3 to 12. The last factor is labeled internal/external barriers. This factor is indicative of a lack of interest in making a vocational choice as well as external barriers, i.e., lack of support or resources, pertinent to the individual's situation. Scores on this factor range from 4 to 16.

Osipow, Carney, and Barak (1976) report test-retest correlations of .90 and .82 for the CDS on two separate samples of university students. A second study conducted by Slaney, Palko-Nonemaker, and Alexander

(1981) revealed a test-retest correlation of .70. Individual item analyses resulted in item correlations ranging from .19 to .70 (Slaney, Palko-Nonemaker, & Alexander, 1981).

Numerous studies provide strong support for the construct and concurrent validity of the Career Decision Scale (Osipow, 1980). For instance, Osipow and Schweikert (1981) compared total scores on the CDS with the Assessment of Career Decision Making (ACDM; Buck & Daniels, 1985) yielding supportive results. Westbrook (1980) obtained a significant negative relationship between the Career Decision Scale and career maturity attitudes, thus suggesting that high indecision scores are associated with low levels of career maturity. There is significant support for the content validity of the Career Decision Scale (Osipow, 1980).

A questionnaire assessing the demographic characteristics of each participant was administered. Participants were asked to indicate their gender, date of birth, faculty, major area of concentration, whether or not they have previously attended another college or university, the gender and number of siblings in their family, their most recent grade point average, location of family dwelling (rural/urban), father's occupation and level of education as well as their mother's occupation and level of education.

## RESULTS

### *Demographic Characteristics*

Overall sample size totaled 100 and consisted of 25 males, 74 females and one whose gender was not identified. This sample was primarily comprised of students from the faculty of arts (41), followed by science (17), kinesiology (19), business (15), arts/science (3), computer science (2), no degree (2), and arts/computer science (1). Ages for the entire sample ranged from 18.25 years to 43.50 years with a mean of 20.32 years ( $N = 99$ ). Males ranged from 18.41 years to 33 years with a mean age of 20.83 years ( $N = 25$ ). Females ranged from 18.25 to 43.50 years with a mean age of 20.15 years ( $N = 74$ ).

A total of 13 (52%) out of 25 males indicated that they had declared a major whereas 41 (55.40%) out of 74 females stated that they had declared a major. Fourteen (56%) males reported that they presently lived in a rural setting while 36 (52.17%) females presently lived in a rural location. Fifteen (60%) males and 56 (75.67%) females identified a vocational choice. These undecided percentages are consistent with those reported in the research literature (Sepich, 1987).

Examination of self-reported grade point averages revealed an average of 2.88 with a range of 1.10 to 4.20 for the entire sample ( $N = 85$ ). Academic standing for males ranged from 1.4 to 4.2 with an average of 3.02 ( $N = 24$ ). The female average was slightly lower at 2.82 with a range

of 1.10 to 4.00 ( $N = 60$ ). As well, each participant in this study received one participation point, equivalent to one percent, toward their final grade in Psychology 1000.

### *Descriptive Statistics*

Analysis of the data presented in Tables 1 and 2 employed the use of *t*-tests and revealed no significant differences between the means for males and females on the subscales and overall scores from both the Cornell Critical Thinking Test (Ennis et al., 1985) and the Career Decision Scale (Osipow et al., 1976).

TABLE 1  
*Summary of Means and Standard Deviations for Subscales  
on the Measure of Cognitive Information Processing for  
Females ( $N = 74$ ), Males ( $N = 25$ ) and the Entire Sample ( $N = 100$ )*

Subscale	Females		Males		Total	
	Mean	SD	Mean	SD	Mean	SD
1. Induction	9.82	2.90	10.80	1.98	10.07	2.70
2. Deduction	12.51	2.76	12.68	3.11	12.57	2.82
3. Observation	1.93	1.06	1.96	1.27	1.95	1.11
4. Credibility	1.93	1.06	1.96	1.27	1.95	1.11
5. Assumptions	4.76	1.76	5.28	1.79	4.9	1.77
6. Meaning	5.58	1.87	6.24	2.11	5.75	1.94
7. Total	25.35	4.90	27.16	5.04	25.85	4.97

TABLE 2  
*Summary of Means, and Standard Deviations for Factors  
on the Measure of Vocational Indecision for  
Females ( $N = 74$ ), Males ( $N = 25$ ) and the Entire Sample ( $N = 100$ )*

Factors	Females		Males		Total	
	Mean	SD	Mean	SD	Mean	SD
1. Diffusion	6.15	2.78	5.32	2.41	5.94	2.69
2. Relative Decidedness	6.05	2.26	6.08	2.14	6.04	2.22
3. Approach Conflict	6.91	2.53	7.12	2.03	7.00	2.43
4. Internal/External Barriers	6.81	2.62	6.32	2.34	6.75	2.62
5. Certainty	5.66	1.74	5.96	1.74	5.7	1.77
6. Indecision	31.39	10.11	30.2	8.83	31.22	9.85

### *Correlation Analysis*

Analysis revealed that the total score from measuring metacognition (see Table 3) was significantly negatively correlated with the total vocational indecision score ( $r = -.37, p < .001$ ), and was significantly positively related to vocational certainty ( $r = .20, p < .05$ ).

Three subscales from the Cornell were significantly related to the total vocational indecision score including induction ( $r = -.21, p < .05$ ), deduction ( $r = -.38, p < .001$ ), and meaning ( $r = -.28, p < .01$ ). Deduction ( $r = .22, p < .05$ ) was the only subscale that resulted in a significant correlation with vocational certainty.

The total score on the Cornell was significantly related to each of the factors on the CDS; diffusion ( $r = -.34, p < .01$ ), relative decidedness ( $r = -.32, p < .01$ ), approach conflict ( $r = -.26, p < .05$ ), and internal/external barriers ( $r = -.29, p < .01$ ). Several significant correlations were evidenced between the subscales on the Cornell and the factors of the CDS (Shimizu et al., 1988). Deduction showed a consistent pattern of correlation with diffusion ( $r = -.31, p < .01$ ), relative decidedness ( $r = -.31, p < .01$ ), approach conflict ( $r = -.32, p < .01$ ), and internal/external barriers ( $r = -.26, p < .01$ ). As well, meaning was significantly related to diffusion ( $r = -.27, p < .01$ ), approach conflict ( $r = -.20, p < .05$ ), and internal/external barriers ( $r = -.27, p < .01$ ).

### *Males*

The data for males evidenced no significant relationship between the total score on the Cornell and the total score on the CDS ( $r = -.39$ ) and the vocational certainty measure ( $r = .28$ ). None of the subscales on the Cornell were significantly related to the vocational indecision score nor the vocational certainty score.

Several significant correlations were apparent between the subscales on the Cornell and the factors on the CDS. Deduction was negatively related to relative decidedness ( $r = -.40, p < .05$ ) as well as approach conflict ( $r = -.60, p < .01$ ). Observation was significantly related to diffusion ( $r = -.44, p < .05$ ) while credibility was also related to diffusion ( $r = -.44, p < .05$ ).

### *Females*

A statistically significant correlation was found between the total score on the Cornell and the total score on the CDS ( $r = -.38, p < .01$ ) but not for the vocational certainty score ( $r = .20$ ). Two subscales of the Cornell, deduction ( $r = -.39, p < .01$ ) and meaning ( $r = -.29, p < .05$ ) were significantly correlated with vocational indecision; however, none of the subscales on the Cornell were significantly correlated with the vocational certainty measure ( $-.02$  to  $.22$ ).

TABLE 3

*Intercorrelations Between Metacognition and Vocational Indecision for the Entire Sample (N=100)*

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Induction	—	.41‡	.10	.10	.06	.25*	.72‡	-.18	-.18	-.15	-.15	.15	-.21*
2. Deduction		—	.12	.12	.65‡	.38‡	.79‡	-.31†	-.31†	-.32†	-.26†	.22*	-.38‡
3. Observation			—	1.00‡	.03	.16	.39‡	-.18	-.18	.00	-.09	.05	-.13
4. Credibility				—	.03	.16	.39‡	-.18	-.18	.00	-.09	.05	-.13
5. Assumptions					—	.32†	.47‡	-.19	-.13	-.09	-.20*	.11	-.18
6. Meaning						—	.62‡	-.27†	-.15	-.20*	-.27†	.13	-.28†
7. Total Score							—	-.34†	-.32†	-.26*	-.29†	.20*	-.37‡
8. Diffusion								—	.48‡	.65‡	.56‡	-.59‡	.87‡
9. Relative Decidedness									—	.45‡	.37‡	-.31†	.70‡
10. Approach Conflict										—	.40‡	-.57‡	.78‡
11. Internal/External Barriers											—	-.35‡	.75‡
12. Certainty												—	-.60‡
13. Indecision													—

\*  $p < .05$  †  $p < .01$  ‡  $p < .001$

Investigation into the relationship between the total score on the Cornell and the factors on the CDS revealed a statistically significant link with diffusion ( $r = -.33, p < .01$ ), relative decidedness ( $r = -.33, p < .01$ ), approach conflict ( $r = -.25, p < .05$ ), and internal/external barriers ( $r = -.33, p < .01$ ). Several significant correlations were apparent between the subscales on the Cornell and the factors on the CDS. Deduction proved to be significantly related to diffusion ( $r = -.34, p < .01$ ), relative decidedness ( $r = -.28, p < .05$ ), approach conflict ( $r = -.27, p < .05$ ), and internal/external barriers ( $r = -.34, p < .01$ ). Assumptions was significantly interconnected with internal/external barriers ( $r = .30, p < .01$ ). Meaning was negatively linked to diffusion ( $r = -.25, p < .05$ ), to internal/external barriers ( $r = -.28, p < .05$ ) and approach conflict ( $r = -.23, p < .05$ ).

### *Regression Analysis*

Results of a stepwise multiple regression, for the entire sample, indicate that deduction proved to be the only significant predictor for indecision [ $F(1, 98) = 16.05, p < .001$ ] and contributed 14% ( $R^2 = .145$ ), albeit a small amount, to the variability in predicting vocational indecision. Deduction was also a significant predictor for approach conflict [ $F(1, 98) = 11.39, p < .01$ ], and vocational certainty [ $F(1, 98) = 4.94, p < .05$ ], and contributed 10% ( $R^2 = .1041$ ) and 4% ( $R^2 = .0479$ ) respectively to the variability of each measure. Total score on the Cornell resulted in the only significant predictor of diffusion [ $F(1, 98) = 12.92, p < .001$ ], relative decidedness [ $F(1, 98) = 11.04, p < .01$ ] and internal/external barriers [ $F(1, 98) = 8.88, p < .01$ ]. The total score contributed 11% ( $R^2 = .1164$ ) to the variability in predicting diffusion, 10% ( $R^2 = .1012$ ) to relative decidedness, and 8% ( $R^2 = .0831$ ) to internal/external barriers.

### *Males*

A stepwise multiple regression analysis revealed that deduction proved to significantly predict relative decidedness [ $F(1, 23) = 4.47, p < .05$ ] and contributed 16% ( $R^2 = .1629$ ) to the variability in predicting relative decidedness. As well, deduction was a significant predictor of approach conflict [ $F(1, 23) = 12.66, p < .01$ ] contributing 35% ( $R^2 = .3551$ ) of the variance. Credibility was the sole predictor for diffusion [ $F(1, 23) = 5.62, p < .05$ ] and contributed 19% ( $R^2 = .1965$ ) of the variance.

### *Females*

Results of a stepwise regression analysis for females were similar to that described for the entire sample. Deduction proved to be a significant predictor of indecision [ $F(1, 72) = 12.87, p < .001$ ], diffusion [ $F(1, 72) = 9.66, p < .01$ ], approach conflict [ $F(1, 72) = 5.46, p < .05$ ], and internal/

external barriers [ $F(1, 72) = 9.12, p < .01$ ]. Deduction contributed 15% ( $R^2 = .1517$ ) to the variability in predicting indecision, 11% ( $R^2 = .1183$ ) to diffusion, 7% to approach conflict, and 11% ( $R^2 = .1124$ ) to internal/external barriers. Total score on the Cornell was a significant predictor of relative decidedness [ $F(1, 72) = 8.95, p < .01$ ] contributing 11% ( $R^2 = .1106$ ) of the variance.

#### DISCUSSION

The results of this investigation reveal a significant statistical relationship between metacognition and vocational indecision. These results fall in line with the previously stated hypotheses as well as the theory proposed by Peterson et al. (1996). Results of correlation analysis for the entire sample as well as for females demonstrate that metacognition is significantly related to vocational indecision. Interestingly, the correlation coefficient for the female-only group is marginally higher than for the entire sample. However, level of significance is more stringent for the total sample than for females. The direction of these correlations is negative which indicates that those who score low on the vocational indecision scale tend to score higher on the measure of metacognition. In other words, those who are more decided, i.e., low scores on the indecision scale, engage in deeper levels of metacognition as indicated by a high score on the Cornell Critical Thinking Test. The correlation coefficient for the male only analysis is stronger than either the total sample or the female analysis; however, it is not statistically significant. An obvious explanation for this lack of significance could be the small sample size ( $N = 25$ ). In sum, these results provide evidence for the relationship between decisional status and cognitive complexity and fall in line with previous research in this area (Bodden, 1970; Bodden & Klein, 1972).

As predicted, the relationship between metacognition and the certainty scale, i.e., level of decidedness, is positive in nature. Thus, those who obtained higher scores on vocational certainty also scored higher on the measure of metacognitive activity. There is only one statistically significant correlation between these two measures which occurs when all participants are included in the analysis.

In particular, deduction, a subscale on the Cornell Critical Thinking Test, was consistently associated with the indecision scale, certainty scale, as well as the individual factors on the CDS. Specifically, with respect to the total sample, deduction was significantly correlated with diffusion, relative decidedness, approach conflict, and internal/external barriers. In other words, those who obtained high scores on deduction also scored low on the Career Decision Scale indicating increased levels of decidedness. For the female only analysis, deduction was significantly related to the indecision scale, diffusion, relative decidedness, approach conflict,

and internal/external barriers, i.e., high deduction scores were associated with low scores on the CDS. Deduction proved to be significantly linked to relative decidedness and approach conflict when only males were considered.

Results of the stepwise multiple regression analysis provided a limited number of predictors for vocational indecision, and certainty as well as the factors on the four career decision scales, i.e., diffusion, relative decidedness, approach conflict, and internal/external barriers. In fact, deduction was found to be the single significant predictor for vocational indecision, vocational certainty, and approach conflict when the entire sample was examined. Alternatively, the total score on the measure of metacognition was found to be a predictor of diffusion, relative decidedness, and internal/external barriers.

Results of the analysis including only females also evidenced deduction as a consistent predictor. In this analysis deduction was the single predictor for indecision, diffusion, approach conflict, and internal/external barriers. The total score on the Cornell was the best predictor of relative decidedness while there was an absence of significant predictors for vocational certainty. As expected, results of the regression analysis for males were limited. Deduction was a significant predictor for diffusion and relative decidedness. Credibility also emerged as a predictor for diffusion.

Overall findings of this preliminary investigation into the relationship between metacognitive attributes and vocational indecision lend support for the previously stated hypothesis as well as for the theory advanced by Peterson, et al. (1996). Specifically, individuals who are decided concerning their vocational aspirations engage in higher levels of metacognition. Alternatively, those individuals who are vocationally undecided engage in lower levels of metacognition. It appears that individuals who engage in deeper levels of metacognitive activity, that is, they monitor and regulate their thought processes, evidence a greater degree of vocational decidedness as compared to those who engage in more shallow levels of metacognitive activity. Further, the metacognitive regulating skills of deduction and semantics (meaning making) may have a central role in vocational decision making.

The results of this study have implications for career counsellors when working with vocationally undecided individuals. Peterson's (1996) model suggests the necessity of certain knowledge domains (self and world of work), decision-making skills (communication, analysis, synthesis, values and execution), as well as the use of metacognition if individuals are to make a vocational decision. More specifically, two metacognitive skills, deduction and meaning making, appear to be key in making vocational decisions. The metacognitive skill of deduction, that is, the ability to draw conclusions from the information about self and work appears to be re-

lated to making a vocational decision. Perhaps, vocationally undecided individuals have enough information but are not able to draw conclusions from this information in a manner which aids vocational decision making. Similarly the skill of meaning making (semantics), that is, the ability to interpret information about self and work appears to be linked to making vocational decisions. Perhaps vocationally undecided individuals are not able to interpret the information they have within their personal and social context. In sum, these components emerged as integral factors in vocational decision-making within the context of this investigation.

By implication then, career counsellors would do well to attend to the self-regulating aspects of their client's thinking and help them clients draw appropriate conclusions from the self and occupational information gained within the counselling process. Further, counsellors might help their clients to interpret these conclusions in a manner appropriate to the client's context. For example, having skills in Mathematics and being able to apply them is relative to the level of scholastic achievement. Additionally, counsellors might teach vocationally undecided clients the skills of semantics and deductions for use in their future vocational decision making.

This study has several limitations. First, the participants employed in this study consist of introductory Psychology 1000 students who received credit toward their final grade. Thus, the results are limited in their generalizability to undergraduate university students, particularly those who may have a tendency to volunteer for research studies in return for course credit.

Secondly, although each participant was enrolled in Psychology 1000, not all participants were enrolled in the faculty of Arts. Due to the uneven distribution of participants in numerous faculties, it is difficult to generalize the findings to the university population. In addition, random sampling would have been the optimal method of acquiring participants. The third limitation of this study is the unequal sampling of male and female subjects. Optimally, a sample consisting of equal male and female participants would have been preferred and, in turn, would have facilitated the analysis and identification of inherent differences between these populations.

The results of this investigation clearly point to the relationship between metacognition and vocational indecision. Previous research has demonstrated the association between metacognition and problem-solving ability as well as the positive effect of instructional training aimed at enhancing metacognitive awareness and processing (Berardi-Coletta, Buyer, Dominowski, & Rellinger, 1995; Delclos & Harrington, 1991; English, 1992; Ridley, Shutz, Glanz, & Weinstein, 1992; Slife, Weiss, & Bell, 1985; Swanson, 1990, 1992). Therefore, the implications and ben-

efits of implementing metacognitive instructional techniques and programs within the parameters of vocational guidance and counselling could prove valuable.

Undoubtedly, further research in this area of investigation is required to validate the results of this study, as well as to extend research in this domain. First, future research in this area should address the relationship between metacognition and vocational indecision with respect to potential differences observed between males and females. In addition, it may also prove beneficial to explore an alternate method of investigating metacognition. This recommendation is based on the fact that various measures of metacognition conceptualize the notion in a slightly different manner. In addition, it is evident from this investigation that deduction is an integral factor in the development of metacognitive processing. Therefore, a measure that maintains an increased emphasis on deduction could prove useful in the detection of metacognitive activity.

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