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Are formal operations necessary for moral reasoning or ego identity achievement?

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ARE FORMAL OPERATIONS NECESSARY FOR
MORAL REASONING OR EGO IDENTITY ACHIEVEMENT?

A Thesis

Presented to

the Faculty of the Department of Psychology

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Kyle R. Wanshaffe

May, 2001

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ABSTRACT

Are Formal Operations Necessary for Moral Reasoning or Ego Identity Achievement?

by Kyle R. Wanshaffe

This thesis evaluated 3 hypothesized relationships among constructs from 3 theories of development: Piaget's theory of cognitive development, Kohlberg's theory of moral reasoning development, and Marcia's theory of ego identity development. The 3 hypothesized relationships are: (1) Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning, (2) Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement, and (3) that a positive relationship exists between moral reasoning development and ego identity development.

237 college students participated in this study. Lawson's Classroom Test of Formal Reasoning was used to assess participants' cognitive stage, Rest's Defining Issues Test was used to assess participants' moral reasoning stage, and Adams's Extended Objective Measure of Ego Identity Status-2nd Revision was used to assess participants' ego identity classification. Chi square analyses supported the first hypothesis, but they did not support the two other hypotheses.

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Running head: FORMAL OPERATIONS, MORAL REASONING, EGO IDENTITY

Are Formal Operations Necessary for
Moral Reasoning or Ego Identity Achievement?

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Abstract

This thesis evaluated 3 hypothesized relationships among constructs from 3 theories of development: Piaget's theory of cognitive development (e.g., 1970), Kohlberg's theory of moral reasoning development (e.g., 1984), and Marcia's theory of ego identity development (e.g., 1994). The 3 hypothesized relationships were: (1) Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning, (2) Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement, and (3) a positive relationship exists between moral reasoning development and ego identity development. 237 college students participated in this study; 97% of which were enrolled in an introductory psychology course. Lawson's Classroom Test of Formal Reasoning (CTFR) was used to assess participants' cognitive stage, Rest's Defining Issues Test (DIT) was used to assess participants' moral reasoning stage, and Adams's Extended Objective Measure of Ego Identity Status-2nd Revision (EOM-EIS-2) was used to assess participants' ego identity classification. Chi square analyses supported the necessary but not sufficient relationship between Formal Operations and Principled Moral Reasoning, but the analyses did not support the two other hypotheses.

Are Formal Operations Necessary for

Moral Reasoning or Ego Identity Achievement?

At least since the Greeks, a vast variety of people have addressed the question of how I came to be as I am. A related question for many parents is how do present circumstances influence their children's futures as adults. Among the specific constructs that have been used to describe the characteristics of humans as they develop are their cognitive skills, their moral reasoning, and their ego identity. Many researchers have investigated hypothesized relationships among these three constructs (e.g., Leiper, 1981; Weiss, 1984). Although there have been numerous studies, the empirical support for the various hypothesized relationships has been mixed. This thesis is designed to evaluate three specific claims of relationships among these three constructs using research designs with refined measures and a sufficient sample size to evaluate these claims.

The goal of this study, which is based on claims by Rowe and Marcia (1980), is to provide a broader and more complete understanding of human development. This study will assess hypothesized relationships between Piaget's stage theory of cognitive development (e.g., Piaget, 1970), Kohlberg's stage theory of moral reasoning development (e.g., Kohlberg, 1984), and Marcia's theory of ego identity development (e.g., Marcia, 1994).

Review of the three Theories of Development

Piaget's cognitive development theory.¹ Piaget assumed that knowledge guides action and that this knowledge develops through experience and action. According to

Piaget, schemata are organized patterns of thought or action that are used to cope with or explain some aspect of experience. This organization may relate actions to one another, relate different stimuli to one another, or relate outside stimuli to specific actions. The goal of this process of organizing is to further the process of adaptation. Adaptation is defined to be the process of adjusting to the demands of the environment. Changes in our organizations or schemata are done through the process of assimilation and accommodation. Assimilation occurs when new experiences can be interpreted in terms of our current schemata and are incorporated into our existing schemata. Accommodation occurs when new experiences cannot be interpreted in terms of our current schemata, and we revise our current schemata to better explain and incorporate our new and past experiences. Eventually, through this process of adaptation, new schemata are formed and knowledge is reorganized to the point that old issues are thought of in entirely new ways. That is, cognitive development passes from one stage onto the next higher stage. These stages of cognitive development form what Piaget called an invariant developmental sequence. That is, all children progress through the cognitive developmental stages in exactly the same order and that there is no skipping of any stage. Each successive stage builds on the previous stage and represents a more complex way of thinking.

Piaget proposed that there are three stages of cognitive development (Piaget, 1970): (1) the Sensorimotor stage that lasts from birth to approximately 1½ years, (2) the Concrete Operational stage, which includes the Preoperational sub-period within it, and lasts from approximately 1½ - 2 to 11 - 13 years, and (3) the Formal Operational stage

that lasts from about 11 - 13 years and beyond. For the purpose of this study, the relevant period of cognitive development starts with the second sub-period of the Concrete Operational stage and progresses on through to the Formal Operational stage.

During the second sub-period of the Concrete Operational stage, children perform operational schemata on material aspects of experience. They also think quite logically about tangible objects and events. Operational schemata are internal mental activities that transform and manipulate information. Examples of these mental activities are operations of reversibility that allow us to mentally reverse a flow of action, operations of addition and subtraction that allow us to understand the logical relationship between whole classes and subclasses, and operations of conservation that allow us to understand certain objects in terms of properties of the objects like number, length, mass, weight, and volume that can remain the same even if a transformation makes an object appear to be different. Other operations include multiplication, division, and serial ordering. Children also develop the ability to use inductive logic during this stage.

During the Formal Operational stage, children perform operational schemata on ideas and propositions. They also think quite logically about hypothetical processes and events that may have no basis in reality, like when given a hypothetical proposition of where to place a third eye if you could place it anywhere on your body. They can apply operations of conservation to abstract concepts like energy and motion. Children also develop the ability to use hypothetical-deductive reasoning during this stage.

Why use Piaget's cognitive development theory? Even though many components

of Piaget's theory have come under criticism by many cognitive researchers, the important aspect for the purpose of this study is that the reasoning ability described as Formal Operations is a necessary but not sufficient condition for other developmental achievements (i.e., Principled Moral Reasoning and Achieved Ego Identity). That is, being able to reason in this manner, regardless of how it is achieved or the processes involved, is hypothesized to be an absolute prerequisite for the processes that are involved in achieving those developments stated above. Therefore, a measure that assesses cognitive reasoning ability in terms of Piaget's theory is appropriate for this study.

The main points of Piaget's cognitive development theory relevant to this study are: (1) that it is useful to describe levels of cognitive development in terms of stages, (2) these stages are hierarchical and build on one another, (3) each stage has its own unique cognitive characteristics, and (4) these cognitive characteristics are the basis for how a person thinks, what they are able to think about, and how they construct their concepts about the world around them.

Kohlberg's moral reasoning development theory.² Lawrence Kohlberg's theory of reasoning development relies heavily on Piaget's theory as a basis for understanding the growth of moral reasoning. Kohlberg stated that moral reasoning development depends on the interplay between two important factors, the first factor being the child's level of cognitive development and the second factor being the kind of social experiences the child encounters. In addressing the concept of social learning, Kohlberg pointed out that the child's existing cognitive structures determine how they interpret social experiences and

hence, what is likely to be learned by interacting with others.

Kohlberg was more interested in the underlying rationale of a response than the response itself to moral dilemmas. Moral dilemmas, such as whether or not Heinz should steal a drug in an attempt to save his wife's life, were presented to participants and they were asked to justify their decision about what "ought" to be done. Kohlberg's work led him to conclude that moral reasoning growth progresses through an invariant sequence of three moral reasoning levels, each of which is composed of two distinct moral reasoning stages. Like Piaget, Kohlberg assumed that each succeeding stage evolves from and replaces its predecessor, and that achieving each stage of moral reasoning development depends on achieving certain cognitive abilities. In other words, before achieving the next higher moral reasoning stage, the cognitive stage that is associated with that stage of moral reasoning will have to be achieved. However, unlike Piaget, Kohlberg assumed that moral reasoning development can stall at a stage, does not follow a chronological sequence, and can continue to progress in adulthood.

Before reviewing Kohlberg's sequence of stages, it is important to emphasize that each stage represents a particular perspective or method of thinking about moral dilemmas, rather than a particular type of moral decision. For the purpose of this study, the relevant period of moral reasoning development starts with the second moral reasoning level. The first moral reasoning level, Preconventional Moral Reasoning, is thought to only apply to young children.

The second moral reasoning level is Conventional Moral Reasoning. At this level

individuals strive to obey rules and social norms in order to win others' approval (stage 3) or to maintain social order (stage 4). For stage 3, moral behavior is that which pleases, helps, or is approved of by others. Actions are evaluated on the basis of the actor's intent. For stage 4, an individual considers the perspective of the generalized other. What is right is what conforms to the rules of legitimate authority.

The third moral reasoning level is Postconventional Moral Reasoning also labeled Principled Moral Reasoning. At this level, a person defines right and wrong in terms of broad principals of justice that may be among the principles generally accepted by the community (stage 5) or may be more individualized (stage 6). For stage 5, an individual is aware that the purpose of just laws are to express the will of the majority and further human values. On the other hand, imposed laws that compromise human rights or dignity are considered unjust and worthy of challenge. For stage 6, an individual defines right and wrong on the basis of the self-chosen ethical principals of their own conscience. The ethical principals are abstract moral guidelines or principals of universal justice and respect for individual rights that transcend any law or social contract that may conflict with them.

The main points of Kohlberg's moral reasoning development theory relevant to this study are: (1) there are different stages of moral reasoning development, (2) these stages are hierarchical, (3) in order to reach a certain stage of moral reasoning development, it is necessary to have reached the corresponding cognitive reasoning stage before that stage of moral reasoning development can be achieved, (4) each stage has its own unique characteristics, and (5) these characteristics are the basis for how a person

thinks about moral dilemmas.

Marcia's ego identity development theory.³ James Marcia refined and extended Erikson's theory of ego identity development. Erikson defined identity as a coherent sense of one's meaning to oneself and to others within a social context. This sense of identity suggests an individual continuity with the past, a personally meaningful present, and a direction for the future. Marcia proposed that the three main domains of ego identity development are occupation, ideology, and interpersonal values, and that the two crucial processes involved in ego identity development are exploration, previously defined as crisis, and commitment.

Exploration refers to the extent to which an individual has genuinely looked at and experimented with alternative directions and beliefs. Commitment refers to a firm decision of one choice among several alternative paths. Although some identity exploration can be cataclysmic and totally preoccupying, identity formation usually proceeds in a more gradual and nonconscious way. It is accomplished by bits and pieces. Decisions are not made once and for all, but have to be made again and again. In addition, the decisions may seem trivial at the time, like whom to date, whether or not to break up, having intercourse, taking drugs, going to college or working, what college, what major, studying or playing, being politically active, and so on.

Based upon the two criteria of exploration and commitment, Marcia formulated four identity statuses: Identity Achievement, Moratorium, Foreclosure, and Identity Diffusion. Persons who are in the Identity Achievement status are those who have

undergone the exploratory process and made occupational and ideological commitments.

The Moratorium status is an in-process position, these persons are in the process of identity exploration, few persons remain there for a long period of time, most, but not all, move on into Identity Achievement. Persons who are Foreclosures have made occupational and ideological commitments but without having undergone the exploratory process (i.e., it was imputed to them from an accepted authority figure). Persons who are in the Identity Diffusion status are those individuals who may have done some cursory exploring, but who remain uncommitted to a specific identity.

The main points of Marcia's ego identity development theory relevant to this study are: (1) there are different classifications of ego identity development, (2) these classifications are to some extent hierarchical in nature and based on the two processes of exploration and commitment, (3) in order to go through the exploration process and reach the Achieved Ego Identity status it is necessary to have attained the Formal Operational stage of cognitive development,⁴ and (4) each identity classification has its own unique characteristics.

Relevant to the current study is the typical figure found in psychology text books (Figure 1) which depicts the four classifications and the two processes of ego identity development. It is this author's contention that the figure does not accurately portray ego identity development and that the figure can be improved to better depict ego identity development. The first point is that the typical figure shows that the level of exploration of the Identity Achieved and Moratorium classifications are the same. This is not

		Degree of Exploration	
		High	Low
Degree of Commitment	High	Identity Achievement Status (exploration completed)	Foreclosure Status
	Low	Moratorium Status (exploration in progress)	Identity Diffusion Status

Figure 1. The four ego identity classifications (Identity Achieved, Moratorium, Foreclosure, and Identity Diffusion) and their relationships with the two ego identity processes of exploration and commitment.

completely accurate. Identity Achieved implies that a process of exploration has been completed and for Moratorium it is implied that the process of exploration is currently in progress. The second point is that the typical figure depicts that the level of exploration of the Identity Diffusion classification is the same as that of Identity Foreclosure and that no identity exploration so far has taken place. Again, this is not completely accurate. Those who have gone through identity exploration, Moratorium, and have failed to achieve an identity would be classified as Identity Diffused. Therefore, this subset of the Identity Diffused do not belong in the area of the figure depicting that no identity exploration has taken place.

Figures 2 and 3 will help to clarify these points by depicting the two ego identity development processes separately with the appropriate placement of the four ego identity development classifications on each of them. Figure 2 depicts a continuum of identity exploration. One end is anchored by Identity Foreclosure and indicates that no identity exploration has taken place. The other end is anchored by Identity Achievement and indicates that a process of identity exploration had been completed. Moratorium is defined as being in the process of identity exploration and as such should be placed in-between Identity Foreclosure and Achievement. As for Identity Diffusion, those who have had no identity exploration should be placed with the Identity Foreclosure anchor indicating such and the others who have gone through identity exploration should be placed with the Identity Achieved anchor. Figure 3 depicts a continuum of identity commitment. One end is anchored by Identity Diffusion and indicating that there is no

Figure 2. The four ego identity classifications (Identity Achieved, Moratorium, Foreclosure, and Identity Diffusion [without and after exploration]) and their relationships with the ego identity process of exploration.

Figure 3. The four ego identity classifications (Identity Achieved, Moratorium, Foreclosure, and Identity Diffusion) and their relationships with the ego identity processes of commitment.

commitment to an ego identity. The other end is anchored by Identity Achievement and Foreclosure and indicates that there is commitment to an ego identity. Moratorium is defined as a process of forming an identity commitment and should be placed some where in-between the two anchors. Figure 4 is a more accurate depiction of the four classifications and the two processes of ego identity development. The borders have been modified and arrows added to depict the possible changes in status. Moratorium is placed in the center depicting its placement in-between the extremes of the two identity processes and Identity Diffusion is separated into its two components of those who have never gone through an identity exploration process from those who have.

Research Hypotheses

The three hypotheses this study addressed are: (1) Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning, (2) Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement, and (3) a positive relationship exists between moral reasoning development and ego identity development.

The first hypothesis stems from the theory that in order to reason in a Principled Moral Reasoning way a person must first have achieved the cognitive skill of Formal Operations, and in particular the skills of abstract hypothetico-deductive reasoning. In other words, Formal Operations is a foundation from which Principled Moral Reasoning is possible and this foundation is absolutely required. Similarly, the second hypothesis stems from the theory that the process of attaining Ego Identity Achievement requires the

Figure 4 The four ego identity classifications (Identity Achieved, Moratorium, Foreclosure, and Identity Diffusion [without and after exploration]) and their relationships with the two ego identity processes of exploration and commitment. The borders and arrows depict the possible changes in status.

cognitive skill of Formal Operations, and in particular the skills of abstract hypothetico-deductive reasoning. That is, Formal Operations is a foundation from which Ego Identity Achievement is possible and this foundation is absolutely required.

There is no standard way or clear-cut approach to analyze a necessary but not sufficient claim. A standard chi-square test of dependence, which has most commonly been used, is a very weak way to evaluate such a claim because if it is significant it only shows that the two classifications are not independent. It does not directly indicate the nature of the dependent relationship (e.g., necessary, sufficient, neither necessary nor sufficient but correlated). At best, if the chi-square test results are significant and the dependence is in the predicted direction, the results can only be considered consistent with the claim. The results cannot be interpreted to show a necessary but not sufficient relationship. A specific example would be that it is possible to have participant(s) with classifications that invalidate a necessary but not sufficient hypothesis (e.g., their correct cognitive classification is Concrete Operational and their correct moral reasoning classification is Principled) but the results of a chi-square test of dependence are still consistent with the hypothesis. Results based on only chi-square test of dependence are only consistent with a necessary but not sufficient claim and support such a claim in a very weak way.

Past Research

For the past 25 to 30 years many published articles and doctoral dissertations have reported on the dyadic relationships between Piaget's cognitive development theory,

Kohlberg's moral reasoning development theory, and/or Marcia's ego development theory. A few have even reported on the full triadic relationship. What follows is a review of some of the articles that report on these relationships, starting with the relationship between Piaget's cognitive development theory and Kohlberg's moral reasoning development theory.

The relationship between cognition and moral reasoning. Of the eight articles reviewed that have reported on the relationship between Piaget's cognitive development and Kohlberg's moral reasoning development, six were consistent with the hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning (Cauble, 1975; Leiper, 1981; Rowe & Marcia, 1980; Tomilson-Keasy & Keasy, 1974; Walker & Richards, 1979; Zeidler, 1985). Of the six articles that report findings consistent with the hypothesis, four went so far as to report that Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning (Leiper, 1981; Rowe & Marcia, 1980; Tomilson-Keasy & Keasy, 1974; Walker & Richards, 1979). Two articles reported finding no significant relationship (Haan, Weis, & Johnson, 1982; Weis 1984).

The studies used a variety of types of measures. For example, Rowe and Marcia (1980) used only interview type measures and Zeidler (1985) used only objective group administered measures. While some others used a combination of interview and objective type measures. Upon inspection, no relationship between the types of measures used and the reported findings was found. The ages of the participants ranged from 15 to 51 but

the majority of the participants were college students between 18 and 36 years of age.

One experimental study (Walker and Richards, 1979) stimulated the experimental group to transition to the next higher stage in their moral reasoning. Only those participants in the experimental group who had already achieved a cognitive stage corresponding to a higher stage of moral reasoning transitioned to a higher stage of moral reasoning. None of the participants in the experimental group who had not already achieved a cognitive stage corresponding to a higher stage of moral reasoning and none of the participants in the control group transitioned to a higher stage of moral reasoning.

These reported findings for the most part are consistent with the hypothesized relationship between cognitive and moral reasoning development. But the findings of the relationship between cognitive and ego identity development are not as clear.

The relationship between cognition and ego identity. Of the twelve articles reviewed that have reported on the relationship between Piaget's cognitive development and Marcia's ego identity development, six were consistent with the hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement (Cauble, 1975; Rowe & Marcia, 1980; Leadbeater & Dionne, 1981; Protinski & Wilkerman, 1986; Wagner, 1976; Weis, 1984). Of the six articles that report findings consistent with the hypothesis, only one went so far as to report that Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement (Rowe & Marcia, 1980). Six articles reported finding no significant relationship (Afrifah, 1980; Berzonsky, Weiner, & Raphael, 1975; Boyes &

Chandler, 1992; Klaczynski, Fouth, & Swager, 1998; Leiper, 1981; Wagner, 1987).

The studies used a variety of types of measures. For example, Rowe and Marcia (1980) used only interview type measures and Klaczynski, Fouth, and Swager (1998) used only objective group administered measures. While some others used a combination of interview and objective type measures. Upon inspection, no relationship between the types of measures used and the reported findings was found. The ages of the participants ranged from 10 to 51 but the majority of the participants were high school and college students.

James Marcia (1980, p. 180) stated that in view of the imperfect reliability of the identity statuses and of the imperfect validity of measures of Formal Operations, research should begin with “pure types.” That is, only participants who clearly do or do not exhibit Formal Operational thought on several measures and who are clearly either Identity Achieved or not should be utilized. This statement was in regard to the hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement. This study will attempt to follow Marcia’s advice.

At best these reported findings are inconclusive regarding the hypothesized relationship between cognitive and ego identity development. But the findings of the relationship between moral reasoning and ego identity development are clearer.

The relationship between moral reasoning and ego identity. Of the nine articles reviewed that have reported on the relationship between Kohlberg’s moral reasoning development and Marcia’s ego identity development, seven were consistent with the

hypothesis that there is a positive and significant relationship between moral reasoning and ego identity status such that greater moral reasoning is related to higher ego identity status and vice versa (Hatton, 1988; Hult, 1979; Leiper, 1981; Podd, 1972; Poppen, 1974; Rowe & Marcia, 1980; Skoe & Diessner, 1994). Of the seven articles that report findings consistent with the hypothesis, one even went so far as to report that the Achieved Identity status is necessary but not sufficient for Principled Moral Reasoning (Leiper, 1981). Two articles reported finding no significant relationship (Cauble, 1975; Weiss 1984).

The studies used a variety of types of measures. For example, Rowe and Marcia (1980) used only interview type measures and Weiss (1984) used only objective group administered measures. While some others used a combination of interview and objective type measures. Upon inspection, no relationship between the types of measures used and the reported findings was found. The ages of the participants ranged from 16 to 30 but the majority of the participants were college students. These reported findings for the most part are consistent with the hypothesized relationship between moral reasoning and ego identity development.

Summary

This study will assess hypothetical relationships between Piaget's cognitive development theory, Kohlberg's moral reasoning development theory, and Marcia's ego identity development theory. Piaget's theory broadly classifies a person's cognitive stage as either Sensorimotor, Concrete Operational, or Formal Operational. Kohlberg's theory

broadly classifies a person's moral reasoning stage as either Preconventional, Conventional, or Principled. And Marcia's theory classifies a person's ego identity status as either Diffused, Foreclosure, Moratorium, or Achieved.

Past research on the dyadic relationship between cognitive and moral reasoning development plus moral reasoning and ego identity development is mostly consistent with the hypotheses of their relationships. As for the past research on the dyadic relationship between cognitive and ego identity development, the findings are inconclusive at best in regard to the hypothesized relationship.

There are three hypotheses that this study will attempt to address. (1) Formal Operations are a necessary but not a sufficient condition for development of Principled Moral Reasoning. (2) Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement. And (3) a positive relationship exists between moral reasoning development and ego identity development.

Method

Participants

A total of 237 San Jose State University college students participated in the study. Eight students reported their age as being less than 18 years old and were removed from the analyses since there was no parental consent. Of the remaining 229 participants, 90 (39%) were male and the other 139 (61%) were female. The reported age range was 18 to 48 years ($M = 20.5$). Ninety-seven percent of the participants (221) indicated that they were currently enrolled in an introductory psychology course and the two-and-a-half hours

of earned participation time, by participating in this study, could be used towards a required four hours of research participation for that course. The information above is reported in Table 1.

Instruments

The participants' stage of Piagetian cognitive reasoning, Kohlberg's stage of moral reasoning, and Marcia's ego identity status was assessed.

Cognitive measure. The Classroom Test of Formal Reasoning (CTFR; Lawson, 1978) was designed to assess Formal Reasoning. The CTFR has 15 items that are presented in a class demonstration format using laboratory apparatus type equipment. The purpose of using this type of format is to (1) allow for group administration in a short amount of time, (2) to retain the positive aspects of individual testing that uses physical materials while requiring little reading and writing, and (3) to assure a high degree of reliability by including a large number and variety of problems.

To improve consistency across administrations, the demonstrations were video taped in an empty classroom. All the participants saw the same video of the demonstrations instead of live demonstrations as the CTFR was originally designed. The test proctor paused the video between each demonstration to allow sufficient time for the participants to answer the questions related to each demonstration.

An example of one of the demonstrations is Item 7. Given a balance beam and hanging weights, the participants were asked to predict where a 5-unit weight should be hung to balance a 10-unit weight that is hung 7 units of length from the fulcrum. Using

Table 1

Reported Description of Research Participants¹

Descriptors	
Age (in years)	
Range:	18 to 48
Mean:	20.5
Gender	
Male:	90 (39%)
Female:	139 (61%)
College Student	
Yes:	229 (100%)
No:	0 (0%)
Currently taking an introductory psychology course	
Yes:	221 (97%)
No:	7 (3%)
Major in College	
Psychology:	13 (6%)
Social Science but not Psychology:	36 (16%)
Non Social Science:	138 (60%)
Undeclared:	40 (17%)
Passed Reliability Check ²	
Yes:	171 (75%)
No:	58 (25%)

Note. Two of the participants did not report all of the above

information. ¹Eight of the 237 participants reported ages of less than

18 and were removed from the study. N=229. ²Based on

responses to the Defining Issues Test measure.

one balance beam, one 10-unit hanging weight, and one 5-unit hanging weight, the demonstrator is instructed to “Show the participants the balance beam and the two hanging weights. Hang the 10-unit weight 7 marks out from the fulcrum on one side of the beam. Point out that the 10-unit weight is hanging at 7 marks from the center.” The demonstrator is then instructed to ask the participants, “Where would you hang the 5-unit weight to make the beam balance?” On the answer sheet provided the five possible responses are (1) Between Mark 3 and 4, (2) Mark 7, (3) Mark 12, (4) Mark 14, and (5) At the end. The participants are then asked to, “Please explain your choice.” For the item in the above example to be correct, Mark 14 would have to be checked and an explanation to the effect of “It’s half the weight, so it should be twice the distance.” would need to be provided.

Each item of the CTFR was scored as either correct or incorrect and then the correct items were totaled together. An item was considered to be correct only if the correct box was checked and an adequate explanation was provided to justify the choice that was made. The score ranged from 0 to 15 with higher scores indicating greater cognitive reasoning performance. Scores of 0 to 5 were interpreted as reflecting Concrete Operational performance, scores of 6 to 11 as reflecting Transitional performance, and scores of 12 to 15 as reflecting Formal Operational performance.

Moral reasoning measure. The Defining Issues Test (DIT; Rest, Cooper, Coder, Masanz, & Anderson, 1974) was designed to assess the use of Principled Moral Reasoning. The DIT presented participants with six moral dilemmas. For each of the

dilemmas, the participants were asked to decide how to resolve the dilemma. They were then asked to rate 12 specific issues as to their importance in making that decision. The rating of importance was done with a 5-point Likert-type response format from “great” to “no” importance. The participants were also asked to indicate which of the issues were the 4 most important and rank them in order of importance.

Rest et al. (1974) reported that each of the issues was designed to fall into one of eight categories: one of Kolberg’s six stages (2, 3, 4, 5A, 5B, or 6), a meaningless category, or exemplify an antiestablishment orientation. The meaningless items are part of an internal check for reliability and an antiestablishment orientation was at one time considered to be a transitional phase between Conventional Moral Reasoning and Principled Moral Reasoning but now has been discarded (Rest, 1990).

For example, in the moral dilemma described in the introduction of whether or not a husband, Heinz, should steal an exorbitantly priced drug for his dying wife, the participants were asked to rate the importance of such issues as, “Is Heinz willing to risk getting shot as a burglar or going to jail for the chance that stealing the drug might help,” a stage 2 item, “Whether or not a community’s laws are going to be upheld,” a stage 4 item, “Whether the druggist’s rights to his invention have to be respected,” a stage 6 item, “Whether the essence of living is more encompassing than the termination of dying, socially and individually,” a meaningless item, and “Whether the druggist is going to be allowed to hide behind a worthless law which only protects the rich anyhow,” an antiestablishment item. After the importance for each of the 12 issues was rated, the

participant ranked which issues were the four most important.

The DIT was scored by assigning a weight of 4, 3, 2, and 1 to the issues respectively ranked as the first, second, third, and fourth most important issues for each of the six moral dilemmas. The weights were then summed to give a total raw score for each of the eight categories. The Principled Moral Reasoning score (P) is the sum of the total raw stage 5A, 5B, and 6 scores. The range of the P score is 0 to 57 with higher scores indicating greater endorsement of Principled Moral Reasoning. The Conventional Moral Reasoning score (C) is the sum of the total raw stage 3 and 4 scores. The range of the C score is 0 to 60 with higher scores indicating greater endorsement of Conventional Moral Reasoning.

In past studies 10% to 15% of the participants have failed the internal check of reliability. For this particular study, all of the analyses were done twice: once with those who failed the internal check of reliability removed from the data and another time with them retained. Those participants who met the following three criteria were classified as being at the Principled Moral Reasoning stage: (1) P scores were greater than or equal to 24, (2) P scores were 12 or more points higher than their C scores, and (3) raw stage 2 scores were less than 8. Those participants who met the following two criteria were classified as being at the Conventional Moral Reasoning stage: (1) C scores were greater than or equal to 24 and (2) C scores were 12 or more points higher than their P scores. Those participants who met the following two criteria were classified as being at a Transitional Moral Reasoning stage: (1) they were not classified at the Principled or

Conventional Moral Reasoning stage and (2) raw stage 2 scores were less than 8.

Identity measure. The Extended Objective Measure of Ego Identity Status-2nd Revision (EOM-EIS-2; Bennion & Adams, 1986) was designed to assess participants' identity status. The EOM-EIS-2 is a 64-item scale divided into two components; ideology identity status (32 items) and interpersonal identity status (32 items). Each of the components are further divided into four components of 8 items each. Those sub-components assess participants' stage of identity status in the four identity statuses proposed by Marcia (1966, 1980, 1994), (1) Diffusion, (2) Foreclosure, (3) Moratorium, and (4) Achievement. The response format is a 6-point Likert-type response format scored 1 = 'Strongly Agree' to 6 = 'Strongly Disagree'. One item attempting to assess participants feelings of personal expressiveness (Waterman, 1992) was added to the end of the questionnaire, for a total of 65 items. This item is intended to be a part of another study and not to have any bearing on this particular study.

Example statements from the ideology component of the EOM-EIS-2 for each of the four identity status scales are: for Diffusion, "I haven't really considered politics, it just doesn't excite me much." for Foreclosure, "My parents' views on life are good enough for me, I don't need anything else." for Moratorium, "I'm not sure what religion means to me, I'd like to make up my mind but I'm not done looking yet." and for Achievement, "It took me a while to figure it out, but now I really know what I want for a career."

The scores of the EOM-EIS-2 were reversed (i.e., 6 = 'Strongly Agree' and 1 = 'Strongly Disagree') and then summed for each of the eight scales (the four identity

status scales for each component of ideology and interpersonal identity status) with a possible range of 8 to 48 for each of the scales. All of the scores were compared to cut-off scores for each of the scales provided by Adams (1999). For further information on the cut-off scores see the manual for the EOM-EIS-2 (Adams, 1999). Those participants who had one of their four ideology ego identity scores equal to or greater than the corresponding cut-off score and the other three ideology ego identity scores were less than the corresponding cut-off scores were classified into one of the four corresponding pure ideology ego identity classifications (i.e., pure Diffusion, pure Foreclosure, pure Moratorium, or pure Achievement). Note that there are many more possible combinations of scale scores compared to their corresponding cut-off scores than the four addressed above. Only those participants who were classified into one of the four pure ideology ego identity statuses (in past studies about 33%) were included in the analyses.

Procedure

As the participants entered a typical large university classroom, they were asked to take a seat with at least one empty seat between each participant. After the group was assembled, the proctor provided a consent form to each of the participants. Once consent was given, the participants were given a test booklet and instructed to fill in their demographic information on the first page of the booklet.

The proctor then told the participants that there would be two parts to the study with a short 10 - 15 minute break between the two parts. One part included questions from the DIT and EOM-EIS-2 lasting approximately 60 minutes. The participants were

informed that they were not being timed and asked to read the directions provided at the beginning of each of the two sections. The other part of the study consisted of watching the video demonstrations and answering questions about the demonstrations, the CTFR. This second part of the study took approximately 60 minutes to complete. For the video demonstration portion of the study, the proctor paused the video after each of the demonstrations were presented and then continued when all of the participants had sufficient time to completely answer the question related to that demonstration. The order of the parts was counterbalanced (i.e., some groups of participants did the video part first and the pencil and paper part second while other groups of participants did them in the opposite order). Once the participants completed the study they were thanked for their participation and a short description of each of the measures was made available to them.

Results

The results section starts with three reliability checks of the measures used: (1) participant reliability, (2) Cronbach's Alpha, and (3) split half percent agreement. This is followed by a series of chi-square tests for dependence that systematically test the three hypotheses. Power calculations and a detailed explanation for why and how misclassification rates where estimated are included where appropriate.

Reliability of Measures

Participant reliability. To check if participants conscientiously and seriously responded to the items in the measures or if they just randomly put down responses, a participant check that is incorporated into the DIT was used and is termed a "reliability

check” by the DIT. The reliability checks included responses to meaningless items, consistency in responses, and checks for inappropriate duplicated responses. Participants’ responses were considered unreliable if one or more of the following four criteria were met: (1) their meaningless score was greater than eight, (2) they had inconsistent responses on more than two stories, (3) they had more than eight inconsistent responses to any one story, (4) they ranked an item twice in the same story. See the moral reasoning measure sub-section in the method section for more details on the scoring procedure of the DIT. The check indicated that 58 out of the 229 participants (25%) failed the reliability check. This is much greater than the 10 – 15% reported in past studies.

Cronbach’s alpha. To check the reliability of the instruments, Cronbach’s alphas were calculated for each of the measures’ different factors (e.g., the eight items of the EOM-EIS-2 that make up the ideological Ego Identity Achievement subscale). Also, the Cronbach’s alpha for each item removed was evaluated. These calculations were done once with all participants and again with only those participants who passed the reliability check on the DIT. Since the differences between the two calculations were minimal, the focus was on the ones that retained all the participants. The findings are presented in Table 2. Cronbach’s alphas of .9 or greater are considered excessive, of .8 to .9 optimal, of .7 to .8 acceptable, and of less than .7 unacceptable.

The results of these calculations showed that for the CTFR measure the overall Cronbach was .84 and is considered optimal. As for the five factors that make up the CTFR, four of them had unacceptably low Cronbach’s and the one other factor,

Table 2

Reliability Check of the Studies Measures

Factors	Number of items	Participants			
		All N = 229		Passed Reliability check N = 171	
		Cronbach's Alpha	One item Removed ¹	Cronbach's Alpha	One item Removed ¹
CTFR					
Conservation	2	.27		.32	
Proportional	4	.75		.75	
Controlling - Variables	4	.60	.61	.60	.61
Combinatorial	2	.53		.52	
Probability	3	.70	.71	.67	.68
All Items	15	.84		.83	
DIT					
Conventional	36	.76		.77	.78
Principled	21	.80		.82	
All Items	57	.85		.86	
EOM-EIS-2 (Ideology)					
Diffused	8	.55		.57	
Foreclosed	8	.80		.78	
Moratorium	8	.67	.70	.67	.71
Achieved	8	.57	.58	.57	.59
All Items	32	.68	.69	.67	.70

Note. ¹Only those cases where there was an increase in Cronbach's Alpha are reported.

Proportional, had an acceptable Cronbach of .75. Since the CTFR was used to measure one construct of cognitive reasoning and the overall Cronbach is optimal, these calculations showed the CTFR to be an internally consistent measure. The overall Cronbach of the DIT was .85 and is considered optimal. As for the two factors that make up the DIT, both of them had acceptable Cronbach's of .76 and .80. Since the DIT was used to measure one construct of moral reasoning and the overall Cronbach is optimal, these calculations showed the DIT to be an internally reliable measure. As for the EOM-EIS-2 measure, the overall Cronbach was .68 and is unacceptably low. As for the four factors that make up the EOM-EIS-2, three of them had unacceptably low Cronbach's and the one other factor, Foreclosure, had an acceptable Cronbach of .80. Since the overall Cronbach of the EOM-EIS-2 is unacceptably low, these calculations showed the internal reliability of the EOM-EIS-2 to be in question.

The evaluation of the Cronbach's Alpha with each item removed showed that for all but one of the factors that if there was an increase in the Cronbach it was very small (less than 1½ points) and the largest was still quite small (3 points).

Split half agreement. As part of estimating misclassification rates, described below, each of the measures was split into two equal halves. To check on the split half reliability of the instruments, percent agreements were calculated for each of the measures. Percent agreement is the percentage of participants who were classified into the same category by both halves of a measure. To provide a comparison for the percent agreements, expected percent agreements assuming the two halves of each of the

measures were independent and expected percent agreement assuming a completely random distribution were also calculated. These calculations were done once with all participants and again with only those participants who passed the reliability check on the DIT. Since the differences between the two calculations were minimal, the focus will be on the ones that retained all the participants. The findings are presented in Table 3.

The results of these calculations showed that for the CTFR measure the split half percent agreement was 70% and indicates good split half reliability; especially when compared to the expected 38% split half percent reliability if the two halves were independent. The split half percent agreement for the DIT was 67% and at first appears adequate, but when compared to the expected 54% split half percent reliability if the two halves were independent indicated a questionable split half reliability. Further correlational analyses of the raw principled morality score and the raw conventional morality score ($r(229) = .52, p < .001$; $r(229) = .34, p < .001$, respectively) indicated poor split half reliability for the DIT. The split half percent agreement for the EOM-EIS-2 was 23% and indicates poor split half reliability, even when compared to the expected 7% split half percent reliability if the two halves were independent.

Chi-Square Tests for Dependence

To partially test the first hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning, a chi-square test for dependence was conducted with the three classifications of the CTFR crossed with the three classifications of the DIT. The results are presented in the Cognitive Reasoning by

Table 3

Reliability of Measures by Split Half Percent Agreements

	Participants	
	All	Passed Reliability Check
Cognitive Measure (CTFR)		
Data ¹	161/229 (70%)	117/171 (68%)
Independent ²	86.3/229 (38%)	63.2/171 (37%)
Random ³	76.3/229 (33%)	57.0/171 (33%)
Moral Measure (DIT)		
Data	132/196 (67%)	93/144 (65%)
Independent	104.9/196 (54%)	71.0/144 (49%)
Random	65.3/196 (33%)	48.0/144 (33%)
Ego Identity Measure (EOM-EIS-2) ⁴		
Data	50/221 (23%)	43/166 (26%)
Independent	16.5/221 (7%)	12.8/166 (8%)
Random	13.8/221 (6%)	10.4/166 (6%)

Note. ¹Split half percent agreement from the data collected. ²Split half percent agreement assuming the two halves are independent. ³Split half percent agreement assuming a completely random distribution. ⁴The EOM-EIS-2 has 16 possible classifications with 256 cells in a 16 by 16 matrix. The other two measures only have 3 possible classifications with 9 cells in a 3 by 3 matrix.

Moral Reasoning subsection of Table 4. The test was done once with all of the participants and again with only those participants who passed the reliability check on the DIT. The results of the analyses showed a significant dependent relationship [$\chi^2(4, N = 211) = 17.69, p = .001$; $\chi^2(4, N = 156) = 14.10, p = .007$, respectively]. These results are consistent with the first hypothesis, but an estimation of misclassification rates was needed in order to fully test the hypothesis.

To partially test the second hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement, a chi-square test for dependence was conducted with the three classifications of the CTFR crossed with the four classifications of the EOM-EIS-2. The results are presented in the Cognitive Reasoning by Ego Identity Classification subsection of Table 4. The test was done once with all of the participants and again with only those participants who passed the reliability check on the DIT and neither was significant [$\chi^2(6, N = 80) = 9.63, p = .141$; $\chi^2(6, N = 62) = 8.02, p = .237$, respectively].

To do a more direct test of the second hypothesis, a second chi-square test for dependence was conducted after collapsing the Concrete Operational and Transitional classifications of the CTFR into one category and collapsing the Moratorium, Foreclosed, and Diffused classifications of the EOM-EIS-2 into one category. Thus the two by two matrix differentiated those participants whose cognitive reasoning ability was classified as Formal Operational as opposed to not Formal Operational by those participants whose ego identity classification was classified as Achieved as opposed to not Achieved. The

Table 4

Chi-Square Tests for Dependence

		Participants					
		All			Passed Reliability Check		
Cognitive Reasoning by Moral Reasoning							
Moral Classification	Cognitive Classification				Cognitive Classification		
	Concrete	Transition	Formal		Concrete	Transition	Formal
Principled	0	4	5		0	4	5
Transitional	10	23	13		6	19	12
Conventional	68	64	24		42	48	20
$\chi^2=17.69$; $p=.001$; $\phi=.29$				$\chi^2=14.10$; $p=.007$; $\phi=.30$			
Cognitive Reasoning by Ego Identity Classification							
Ego Identity Classification	Cognitive Classification				Cognitive Classification		
	Concrete	Transition	Formal		Concrete	Transition	Formal
Achieved	7	11	6		5	10	6
Moratorium	3	7	4		2	3	4
Foreclosed	10	4	1		7	3	1
Diffused	7	12	8		5	9	7
$\chi^2=9.63$; $p=.141$; $\phi=.35$				$\chi^2=8.02$; $p=.237$; $\phi=.36$			
Moral Reasoning by Ego Identity Classification							
Ego Identity Classification	Moral Classification			Moral Classification			
	Conventional	Transitional	Principled	Conventional	Transitional	Principled	
Achieved	12	8	2	10	7	2	
Moratorium	10	3	0	7	2	0	
Foreclosed	11	3	0	8	2	0	
Diffused	17	5	2	12	5	2	
$\chi^2=4.66$; $p=.589$; $\phi=.25$				$\chi^2=3.91$; $p=.688$; $\phi=.13$			

Note. Not all of the 229 participants met the requirements to be represented in all of the matrices.

test was done once with all of the participants and again with only those participants who passed the reliability check on the DIT and neither was significant [$\chi^2 (1, N = 80) = 0.03$, $p = .863$; $\chi^2 (1, N = 62) = 0.003$, $p = .954$, respectively]. These results are inconsistent with the second hypothesis and no further analyses were needed to test the hypothesis.

To test the third hypothesis that a positive relationship exists between moral reasoning development and ego identity development, a chi-square test for dependence was conducted with the three classifications of the DIT crossed with the four classifications of the EOM-EIS-2. The results are presented in the Cognitive Reasoning by Ego Identity Classification subsection of Table 4. The test was done once with all of the participants and again with only those participants who passed the reliability check on the DIT and neither was significant [$\chi^2 (6, N = 73) = 4.66$, $p = .589$; $\chi^2 (6, N = 57) = 3.91$, $p = .688$, respectively]. These results are inconsistent with the third hypothesis.

Power

To test if there was sufficient power to test the three hypotheses, for each of the six chi-square tests above, the effect size was calculated and used along with the results of the chi-square test to estimate power. That is, was there sufficient power to reasonably reduce the possibility of a Type II Error, failing to reject the null when it is false. The results are reported in Table 4. A power value of .80 or greater is generally considered appropriate and one less than .70 is considered too small. The results of this analysis in regards to the first hypothesis showed that there was sufficient power and a medium effect

size (power $\cong .93$, $\phi = .29$; power $\cong .86$, $\phi = .30$, respectively). For the second hypothesis, the results showed that there was insufficient power and a medium effect size (power $\cong .61$, $\phi = .35$; power $\cong .53$, $\phi = .36$, respectively). As for the third hypothesis, the results showed that there was insufficient power and a small to medium effect size (power $\cong .30$, $\phi = .25$; power $\cong .26$, $\phi = .13$, respectively).

Estimating Misclassification Rates

Since the measures being used are not 100% reliable and valid, it is probable that some participants were misclassified into the combined classifications that are hypothesized to be void (e.g., Principled Moral Reasoning and Concrete Operational; the bold data values in Table 4). To test the first hypothesis, an approximate percentage of those who were misclassified as Concrete Operational, Transitional (cognitive measure); and Transitional Moral Reasoning, Principled Moral Reasoning (moral measure) was determined.

Split half analysis of the CTFR and DIT was carried out such that estimates of the misclassification rates for each of the classification categories was computed. The calculations are based on two major assumptions. The first assumption was that if a participant was misclassified they would only be misclassified into a neighboring category. That is, if a participants' true classification is Concrete Operational they might be misclassified as Transitional but would not be misclassified as Formal Operational. The second assumption was that the number of participants was large enough so that the results conformed to simple rules of probability.

Split half analysis of CTFR. The 15 items of the CTFR were split into two equal halves of 7 items each with one item not being used. Therefore, each participant was classified twice, by the two halves of the CTFR, as to their cognitive performance. Since there are three possible classifications, Concrete Operational, Transitional, and Formal Operational, there are a total of nine possible classifications with the two split half classifications (i.e., Concrete Operational and Concrete Operational; Concrete Operational and Transitional; Transitional and Concrete Operational; ...). For the purpose of this study, no distinction was made between the two halves of the CTFR. That is, a participant whose two classifications were Concrete Operational and Transitional was considered no different from a participant whose two classifications were Transitional and Concrete Operational. Therefore, three of the nine possible split half classifications were collapsed into their respective duplicates, leaving six possible classifications. These data, along with the probability analysis below, were used to calculate the misclassification rates.

Probability analysis of CTFR. Theoretically, a certain number of the participants were truly Concrete Operational and a certain percentage of these were misclassified as Transitional. There are similar probability equations for those participants who are truly Transitional or truly Formal Operational. Combining all of these probability equations led to six equations that theoretically account for the split half classification data above. There are seven variables in these six probability equations. Three variables are the number of participants who are truly Concrete Operational, truly Transitional, or truly

Formal Operational, and four variables are the probabilities that a participant was misclassified into one of the neighboring categories (i.e., the probability that a participant who is truly Transitional was misclassified as Formal Operational.) A seventh equation was the sum of the number of the participants who were truly Concrete Operational, truly Transitional, or truly Formal Operational equaled the total number of participants. These seven equations were used to solve for the seven variables. Once the variables were determined it was possible to calculate estimations for the number of participants who were incorrectly classified into each of the three different possible classifications of the CTFR (see Appendix A).

Misclassification analysis of DIT. The analysis was done identically to the way the CTFR was analyzed. The only difference was that the six moral dilemmas of the DIT were split into two equal halves of three moral dilemmas each and the three possible classifications are Conventional Moral Reasoning, Transitional Moral Reasoning, or Principled Moral Reasoning.

Misclassification estimates. With the percent estimations of those misclassified for each of the categories for both the CTFR and the DIT calculated, the number of participants estimated to be misclassified in each of the nine cells of the CTFR by DIT matrix was calculated as follows. The estimated percentage of misclassifications was multiplied by the corresponding total number of participants classified into the same category. This number was then distributed according to the weighted averages of the total number of participants classified into the classifications of the other measure. Each

of the nine cells of the CTFR by DIT matrix then had two estimations of the number of participants misclassified into that combined category (i.e., one from the CTFR and one from the DIT). Those two estimates were then added together and a correction factor subtracted, the possibility that a participant was missclassified both by the CTFR and the DIT and therefore counted twice, to come up with an estimation of the number of participants misclassified in each of the cells.

For example, four participants were classified as being Transitional by the CTFR and Principled Moral Reasoning by the DIT. The calculations to estimate the number of participants misclassified into that cell are reported. The calculated misclassification rate of those classified as Principled Moral Reasoning by the DIT was about 51% or approximately 4.6 of the 9 participants classified as Principled Moral Reasoning. The portion of the 4.6 that was distributed to the Transitional and Principled Moral Reasoning cell was approximately 2.0 ($4.6 * 91/211$; the number of participants classified as Transitional divided by the total number of participants classified into the matrix). Similarly, the calculated misclassification rate of those classified as Transitional by the CTFR was about 44% or approximately 40 of the 91 participants classified as Transitional. The portion of the 40 participants that was distributed to the Transitional and Principled Moral Reasoning cell was approximately 1.7 ($40 * 9/211$; the number of participants classified as Principled Moral Reasoning divided by the total number of participants classified into the matrix). The number of participants estimated to be misclassified into the Transitional and Principled Moral Reasoning cell was 2.9 ($2.0 + 1.7$

– 0.8). The 0.8 is the estimation of the number of participants counted twice ($2.0 * 1.7 / 4$).

Hypotheses Testing

To test the first hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning, two expected frequency one-way chi-square tests were conducted. To avoid having expected frequencies less than 5, a limitation of chi-square tests, the nine cells were collapsed down to two cells (see Table 5). The chi-square analyses evaluated the actual number of participants whose classifications violate the hypothesis and the actual number of participants whose classifications did not violate the hypothesis by two different sets of expected frequencies. The first set of expected frequencies were those predicted by independence of the two measures; that is a traditional chi-square in which the expected frequencies are calculated from row and column totals. The results are presented in the Collapsed Chi-Square Test for Dependence subsection of Table 5. The results of this analysis showed a significant relationship as predicted by the first hypothesis [$\chi^2 (1, N = 211) = 4.86, p = .028$; $\chi^2 (1, N = 156) = 4.27, p = .039$, respectively].

The second set of expected frequencies were the total number of participants estimated to be misclassified into those classifications that violate the hypothesis and the total number of participants minus that estimated number. The results are presented in the Collapsed Chi-Square Test for Expected Misclassifications subsection of Table 5. This analysis determined whether the findings were significantly different than those predicted

Table 5

Hypotheses Testing: Cognitive Reasoning by Moral Reasoning

		Participants							
		All		Passed Reliability Check					
Full Chi-Square Test for Dependence									
Moral Classification		Cognitive Classification		Cognitive Classification					
		Concrete	Transition	Formal	Concrete	Transition	Formal		
Principled		0	4	5	0	4	5		
Transitional		10	23	13	6	19	12		
Conventional		68	64	24	42	48	20		
		$\chi^2=17.69$; $p=.001$; $\phi=.29$				$\chi^2=14.10$; $p=.007$; $\phi=.30$			
Collapsed Chi-Square Test for Dependence									
Data		14		197		10		146	
Expected		24.2		186.8		18.3		137.7	
		$\chi^2=4.86$; $p=.028$; $\phi=.15$				$\chi^2=4.27$; $p=.039$; $\phi=.17$			
Collapsed Chi-Square Test for Expected Misclassifications									
Data		14		197		10		146	
Expected		12.6		198.4		11.2		144.8	
		$\chi^2=0.16$; $p=.691$; $\phi=.03$				$\chi^2=0.13$; $p=.716$; $\phi=.03$			

by the hypothesis while taking into account the possibility of misclassifications. The results of this analysis showed a nonsignificant relationship as predicted by the first hypothesis [$\chi^2 (1, N = 211) = 0.16, p = .691$; $\chi^2 (1, N = 156) = 0.13, p = .716$, respectively]. Since the chi-square tests for dependence above showed that the data contradicted the second hypothesis, no further analysis of this studies hypotheses was necessary.

Discussion

This discussion starts with reviewing the first hypothesis and why the results support the hypothesis. The discussion then continues with a review of the second and third hypotheses and why the results do not support the hypotheses. This is followed by a much more in depth and systematic examination of the results and the implications for the second and third hypotheses.

The first hypothesis proposed that Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning. This hypothesis was supported by the full chi-square test for dependence, the collapsed chi-square test for dependence, and the collapsed chi-square test for expected misclassifications. The concept behind the first hypothesis is that a certain level of cognitive reasoning must be absolutely achieved before that levels corresponding level of moral reasoning can be achieved. Therefore, as shown in Table 5, it should be impossible for anyone to be truly classified into the three cells with the bold numbers in the upper left quadrant of each of the three by three matrixes. In fact, none of the 211 participants were classified into the

left upper most cell of Principled Moral Reasoning and Concrete Operations; and as the bottom chi-square analysis of Table 5 shows, the 14 participants that were classified into the two neighboring cells can be reasonably accounted for within the limits of misclassification errors. In other words, they were misclassified due to classification errors with the measures used. These results directly support the necessary but not sufficient claim of the first hypothesis. Even though the past research reviewed supports the first hypothesis, they fail to provide the strong and direct support for the claim that this study is able to.

The second hypothesis proposed that Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement and the third hypothesis predicted a positive relationship exists between moral reasoning development and ego identity development. Neither hypothesis was supported by the analyses. The concept behind the second hypothesis is that in order to successfully go through the process of ego identity exploration, Moratorium, and achieve the Ego Identity Achievement status absolutely requires a Formal Operational kind of cognitive reasoning ability. Therefore, as shown in the middle of Table 4, it should be impossible for anyone to be truly classified into the two cells with the bold numbers in the upper left quadrant of each of the three by four matrixes. The data collected clearly shows that this is not the case and cannot be accounted for solely through errors due to misclassifications.

The concept behind the third hypothesis is that since moral reasoning ability and ego identity status are both similarly related to cognitive reasoning ability they should be

positively related to each other. Therefore, as shown at the bottom of Table 4, the participants should be concentrated in the area from the bottom left up to the top right in each of the three by four matrixes. The data collected clearly shows that this is not the case. Does this mean that the second and third hypotheses are not valid. Not necessarily.

In determining the validity of relationships between any two constructs there are four issues that need to be addressed: (1) are the measures used reliable, (2) are the measures used valid, (3) the strength of the relationship between the two constructs, and (4) is there sufficient power to detect a relationship.

Reliability

The reliability check of the DIT indicated that 25% of the participants failed this check. This rate is much greater than the typical rate of 10 to 15%. Rest (1990) reported that purging these participants from data analyses produced more meaningful trends in the data but a review of the current results does not show any meaningful difference. Also, the reliability analyses of the measures by internal consistency and split half percent agreement indicated that there could be a problem with some of the measures. These findings bring up some questions about the reliability of this study. If there is a problem with the reliability, is it with the participants or with one or more of the measures or some combination of all of them.

The finding that the internal consistency by Cronbach's Alpha for the CTFR (.84) and for the DIT (.85) are in the optimal range and that Lawson (1978) reported an internal consistency by Kuder-Richardson 20 of 0.78 for the CTFR and that Rest (1990) reported

an internal consistency by Cronbach's Alpha of .77 for the P index, .80 for this study, would indicate that the participants performed reliably. If the participants would have performed unreliably, that is responded more randomly to the measures items, the internal consistency would not be as high and should be less than those reported in other studies. One explanation for the discrepancy between the high failure rate of participants who failed the participant check of the DIT and the optimal reliability for the performance of the CTFR and the DIT measures is that there is always a certain amount of error and that the amount of error introduced by the participants who failed the reliability check of the DIT did not significantly change the amount of this overall error.

Since the internal consistency by Cronbach's Alpha for the CTFR is optimal and the split half reliability by percent agreement is good, this measure performed reliably. These findings are similar to those reported above by other studies and in general indicate that this measure is reliable. The internal consistency by Cronbach's Alpha for the DIT is optimal but the split half reliability by percent agreement and by correlations between the measures scores are poor. These findings are consistent with those reported by Rest (1990), "Although the DIT can be divided into two sets of three stories each, the two sets should not be considered alternative forms of the DIT." (p. 5.3) and in general indicate that the DIT is reliable for internal consistency but not for split half reliability. The internal consistency by Cronbach's Alpha and split half reliability by percent agreement for the EOM-EIS-2 are less than acceptable. Adam's (1999) manual for the EOM-EIS-2 reported the minimum and maximum Cronbach's Alpha for the individual ego identity

factors for four studies (.50 to .73, .62 to .75, .65 to .83, and .61 to .91). The Cranbach's Alpha's for this study (.55 to .80) are within the range of those reported by Adams.

Therefore, the reliability in general for the EOM-EIS-2 is less than acceptable.

One possible explanation for the unacceptable reliability for the EOM-EIS-2 is that conceptually a person's ego identity status is dependent on two mostly independent factors of exploration and commitment and the measure appears to try to access the four quadrants that are bordered by the two factors and not the two factors independently themselves. What this means is that each of the items are trying to access a certain level of the two independent factors simultaneously within a specific domain. A better approach might be to access the two factors independently of each other and with half of the items domains being nonspecific. Due to the unacceptably low reliability of the EOM-EIS-2 the validity of the second and third hypotheses can not be determined from the present study.

Validity

The nature of this study does not lend itself to the evaluation of the measures validity beyond support for or against the three hypotheses themselves. That is, do the constructs relate to each other as conceptualized they would? It might be possible to argue that since the first hypothesis is supported that the measures used to access cognitive reasoning and moral reasoning do actually access those constructs and therefore are valid. As for the ego identity measure, since the reliability is unacceptably low, it cannot have an acceptable validity. Past research on the two measures of cognitive reasoning and moral

reasoning reported factor analyses that showed multiple factors for each of the measures.

Individual factors are supposed to be independent of each other. In other words, there is no relationship between them. These analyses did not make sense because each of the measures are supposed to be made up of one factor or at least multiple related factors.

For example, the moral reasoning factors of Conventional Moral Reasoning and Principled Moral Reasoning should be related, in that a participants score on one of the factors is correlated to the score on the other factor and not independent of each other.

Conceptually, the ego identity measure is made up of two semi-independent factors of exploration and commitment, but because none of the measures items access these factors independently of each other, factor analysis would not be able to separate these two factors out.

Relationship Between Constructs

Because the second and third hypotheses were not able to predict the results, a possible explanation might be that the hypothesized relationship between ego identity status with both cognitive and moral reasoning does not exist. Due to the problem of the unacceptably low reliability of the ego identity measure, it is not possible to make a determination either way. If the reliability of the ego identity measure used in this study is similar to the reliability of the other measures of ego identity used in past research, that might explain why the support for or against the second hypothesis is so mixed. Another reason to suspect the validity of the second and third hypotheses came up during the literature review.

This author had the conception that the ego identity exploration process (e.g., the Moratorium status) that is a prerequisite to the Achieved Ego Identity status, is a process that involves consciously considering alternative paths that can have very divergent long-range outcomes for an individuals' life. This process was thought to involve considerations of religious beliefs, personal values, and occupational goals and what the long-term implications would be. This process by its definition would require Formal Operational cognitive abilities to complete. For some people this probably is a description of the ego identity exploration process that they went through. But if for most of the people who go through this moratorium status, the description given on page nine of the introduction is more accurate, then Formal Operational cognitive ability would not be required, and therefore the reasoning behind the second and third hypotheses would not be valid.

Power

Power calculations indicated that there was insufficient power to evaluate the second and third hypotheses. A review of the results for the second hypothesis indicated that the only noticeable dependency between cognitive reasoning and ego identity was that those participants who were classified as being Foreclosed by the ego identity measure were more likely to be classified as Concrete Operational by the cognitive reasoning measure than either Transitional or Formal Operational than would be predicted by independence. All indications were that even with sufficient power, the second hypothesis would not hold.

A review of the results for the third hypothesis indicated that the only noticeable dependency between moral reasoning and ego identity was that those participants who were classified as being Achieved by the ego identity measure were more likely to be classified as Transitional or Principled Morality by the moral reasoning measure than Conventional Morality than would be predicted by independence. All indications were that even with sufficient power the third hypothesis would not hold.

Conclusion

The bottom line is that this study provides strong support for the first hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Principled Moral Reasoning. This study though is inconclusive regarding the second hypothesis that Formal Operations are a necessary but not a sufficient condition for the development of Ego Identity Achievement and the third hypothesis that a positive relationship exists between moral reasoning development and ego identity development due to the questionably reliability of the ego identity measure (EOM-EIS-2nd). This is an issue that hopefully future research will resolve so that the second and third hypotheses and others dependent on ascertaining a large number of participants' ego identity status can be evaluated. Finally, this studies creative method for analyzing a necessary but not sufficient claim needs to be validated.

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Footnotes

¹ The source of the information on Jean Piaget and his theories came mainly from two texts (Ornstein, 1988; Shaffer, 1994).

² The source of the information on Lawrence Kohlberg and his theories came mainly from two texts (Santrock & Barlett, 1986; Shaffer, 1994).

³ The source of the information on James Marcia and his theories came mainly from two articles (Marcia, 1980; 1994).

⁴ It is unknown if James Marcia ever made this claim himself.

Appendix A

Thesis Proposal Signature Form

APPROVED BY THE MASTERS'S THESIS COMMITTEE

Dr. Robert Cooper, Ph.D.

Dr. Kurt Baker, Ph.D.

Dr. Glen Callaghan, Ph.D.

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Appendix B

Human Subject Approval

San José State
UNIVERSITY

Office of the Academic
Vice President
Associate Vice President
Graduate Studies and Research

1000 San Carlos Avenue
San Jose, CA 95128-1000
Phone: (408) 924-2480
Fax: (408) 924-2481
E-mail: academic@sjstate.edu
Web: www.sjstate.edu/academic

TO: Kyle Wanshaffe
Department of Psychology
San Jose, CA 95192-0120

FROM: Nabil Ibrahim, *N. Ibrahim*
Acting AVP, Graduate Studies & Research

DATE: March 29, 1999

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

"Are Formal Operations Necessary but not
Sufficient for Either Principled Moral Reasoning
or Archived EGO Identity Status?"

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project, and with regard to any and all data that may be collected from the subjects. The Board's approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Nabil Ibrahim, Ph.D., immediately. Injury includes but is not limited to bodily harm, psychological trauma and release of potentially damaging personal information.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at
(408) 924-2480.

The California State University:
Chancellor's Office
Bakersfield, Chico, Dominguez Hills,
Fresno, Fullerton, Hayward, Humboldt,
Long Beach, Los Angeles, Maritime Academy,
Monterey Bay, Northridge, Pomona,
Sacramento, San Bernardino, San Diego,
San Francisco, San Jose, San Luis Obispo,
San Marcos, Sonoma, Stanislaus

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Appendix C

Participant Consent Form

San José State
UNIVERSITY

College of Social Sciences
Department of Psychology

One Washington Square
San Jose, CA 95193-0120
Voice: 408-924-5600
Fax: 408-924-5605
E-mail: psych@email.sjsu.edu

Agreement to Participate in Research

Responsible Investigator: Kyle R. Wanshaffe

Title of Protocol: A Comparison Between Several Theories of Human Development

1. I have been asked to participate in a research study investigating the relationship between three theories of human development.
 2. I will be asked to fill out three sets of questionnaires that should not take longer than 3½ hours.
 3. I understand that I might experience temporary fatigue.
 4. I understand that I might discover some aspect about who I am as a person.
 5. I understand that the results of this study may be published but no information that could identify me will be included.
 6. I understand that if I participate fully in the complete study I will be able to receive credit hours towards a psychology class study participation requirement.
 7. If I have any questions about this study, I may contact Kyle Wanshaffe at (408) 295-2576. If I have any questions or complaints about the procedure, I may contact Dr. Robert Cooper, Psychology Department Chair at (408) 924-5600. If I have any questions or complaints about research participants' rights, or in the event of a research related injury, I may contact Nabil Ibrahim, Ph.D., Associate Academic Vice President for Graduate Studies and Research, at (408) 924-2480.
 8. I understand that no service of any kind, to which I am entitled, will be lost or jeopardized if I choose not to participate in this study.
 9. I give my consent voluntarily and may refuse to participate in the study or any part of the study. If I decide to participate in the study, I am free to withdraw at any time without prejudice from my relationship with San Jose State University.
 10. I have received a signed and dated copy of this consent form.
- My signature on this document indicates my agreement to participate in this study.
 - The signature of the investigator indicates agreement to be included in the research and attestation that I have been fully informed of my rights.

Participant's Signature

Date

Investigator's Signature

Date

The California State University:
Chancellor's Office
Bakersfield, Chico, Dominguez Hills,
Fresno, Fullerton, Hayward, Humboldt,
Long Beach, Los Angeles, Maritime Academy,
Monterey Bay, Northridge, Pomona,
Sacramento, San Bernardino, San Diego,
San Francisco, San Jose, San Luis Obispo,
San Marcos, Sonoma, Stanislaus

Appendix D

Questionnaire

DEMOGRAPHIC INFORMATION

AGE: _____

GENDER: Male Female

Are you a college student: YES NO

Are you currently taking PSYC 001 General Psychology: YES NO

WHICH BEST DESCRIBES YOUR MAJOR STANDING:

- A. My major is psychology.
- B. My major is one of the social sciences or social work but not in psychology.*
- C. My major is not in one of the social sciences or in social work.
- D. My major is undeclared.

* i.e., AAS, AFAM, AMS, ANTH, COMM, CP, ECON, ENVS, GEOG,
HIST, JWSS, MAS, POLS, SOCI, SOCS, URBP, WOMS

WHICH STATEMENT BELOW BEST DESCRIBES YOUR SITUATION:**

- I. I am NOT currently working and have NOT in the past worked in a career field.
- II. I am currently working, or have in the past worked, in a career field and my education is in support of the SAME career field.
- III. I am currently working, or have in the past worked, in a career field and my education is in support of a DIFFERENT career field.

** It is assumed that your educational goals are to support you towards employment in some career field.

PART

A

Directions:

For each of the items below, a situation will be demonstrated. Each demonstration will lead to a question or questions for which there are a number of possible answers. For each item you are to check the box of the best answer and explain your choice in the space provided.

Example Item: “The Balancing Beam”

- ☐ Mark 3
- ☐ Mark 7
- ☐ Mark 8
- ☐ Mark 10

Please explain your choice.

Item 1: “Pieces of Clay”

- ☐ The pancake weighs more.
- ☐ The pieces weigh the same.
- ☐ The ball weighs more.

Please explain your choice.

Item 2: “Container Weights”

- ☐ The water will rise to a higher level.
- ☐ The water will rise to a lower level.
- ☐ The water will rise to the same level.

Please explain your choice.

Item 3: "Cylinders 1"

The water will rise to Mark:

- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ Other
- ☐ There is no way of predicting.

Please explain your choice.

Item 4: "Cylinders 2"

The water will rise to Mark:

☐ $5 \frac{1}{3}$	☐ $8 \frac{1}{3}$
☐ $5 \frac{2}{3}$	☐ $8 \frac{1}{2}$
☐ $7 \frac{1}{3}$	☐ 9
☐ $7 \frac{1}{2}$	☐ Other
☐ 8	☐ There is no way of predicting.

Please explain your choice.

Item 5: “The Pendulum’s Length”

Which pendulum or pendulums would you use for the experiment?

- ☐ 1 and 2
- ☐ 1 and 3
- ☐ 2 and 3
- ☐ 1, 2, and 3
- ☐ 2 only

Please explain your choice.

Item 6: “The Pendulum’s Weight”

Which pendulum or pendulums would you use for the experiment?

- ☐ 1 and 2
- ☐ 1 and 3
- ☐ 2 and 3
- ☐ 1, 2, and 3
- ☐ 3 only

Please explain your choice.

Item 7: “The Balancing Beam 1”

Where would you hang the 5-unit weight to make the beam balance?

- ☐ Between Mark 3 and 4
- ☐ Mark 7
- ☐ Mark 12
- ☐ Mark 14
- ☐ At the end

Please explain your choice.

Item 8: “The Balancing Beam 2”

Where would you hang the 10-unit weight to make the beam balance?

- ☐ Mark 5
- ☐ Mark 6
- ☐ Between Mark 6 and 7
- ☐ Mark 7
- ☐ Mark 8
- ☐ Mark 9
- ☐ Mark 10
- ☐ Mark 17

Please explain your choice.

Item 9: “The Spheres 1”

Which sphere would you release from the high position to find out if the place a sphere is released from makes a difference in how far the target goes?

- ☐ The heavy sphere
- ☐ The light sphere

Please explain your choice.

Item 10: “The Spheres 2”

Does this experiment prove that Material B can hit a target farther than Material A can?

- ☐ Yes
- ☐ No
- ☐ Need more information

Please explain your choice.

Item 11: "The Metal Box"

The objective of this puzzle is to discover which switch or switches must be flipped to make the light turn on. There are more lines than needed.

Example:

1. y

y - yellow switch

b - blue switch

r - red switch

g - green switch

Your Record:

1. _____

11. _____

21. _____

2. _____

12. _____

22. _____

3. _____

13. _____

23. _____

4. _____

14. _____

24. _____

5. _____

15. _____

25. _____

6. _____

16. _____

26. _____

7. _____

17. _____

27. _____

8. _____

18. _____

28. _____

9. _____

19. _____

29. _____

10. _____

20. _____

30. _____

Item 12: "The Shopping Center"

In a new shopping center, 4 store locations are going to be opened on the ground level.

A Barber Shop, a Drug Store, a Grocery Store, and a Coffee Shop want to move in there. Each one of the stores can choose any one of the 4 locations. Write ALL THE POSSIBLE WAYS that the stores can occupy the 4 locations. Write on the lines below the letter B for Barber Shop, the letter D for Drug Store, the letter G for Grocery Store, and the letter C for Coffee Shop. There are more lines than needed.

[illegible]

Item 13: “The Squares”

Three yellow squares and three red squares are put into a sack. What are the chances of pulling out a red square on the first try?

☐ 1 out of 1	☐ 2 out of 6
☐ 1 out of 2	☐ 4 out of 6
☐ 1 out of 3	☐ 3 out of 3
☐ 1 out of 6	☐ Other

Please explain your choice.

Item 14: “Squares and Diamonds 1”

Three red squares, four yellow squares, and five blue squares are put into a sack. Four red diamonds, two yellow diamonds, and three blue diamonds are put into the same sack. What are the chances of pulling out a red piece on the first try?

☐ 1 out of 1	☐ 1 out of 21
☐ 1 out of 2	☐ 7 out of 21
☐ 1 out of 3	☐ 1 out of 7
☐ 1 out of 4	☐ Other

Please explain your choice.

Item 15: "Squares and Diamonds 2".

Three red squares, four yellow squares, and five blue squares are put into a sack. Four red diamonds, two yellow diamonds, and three blue diamonds are put into the same sack. What are the chances of pulling out a red diamond or a blue diamond on the first try?

☐ 1 out of 1

☐ 8 out of 21

☐ 1 out of 2

☐ 9 out of 21

☐ 1 out of 3

☐ Other

☐ 1 out of 4

Please explain your choice.

END

PART

A

END

PART

B

SA MA A D MD SD I've never really questioned my religion. If it's right for my parents it must be right for me.

SA MA A D MD SD Opinions on men's and women's roles seem so varied that I don't think much about it.

SA MA A D MD SD After a lot of self-examination I have established a very definite view on what my own life style will be.

SA MA A D MD SD I really don't know what kind of friend is best for me. I'm trying to figure out exactly what friendship means to me.

SA MA A D MD SD All of my recreational preferences I got from my parents and I haven't really tried anything else.

SA MA A D MD SD I date only people my parents would approve of.

SA MA A D MD SD My folks have always had their own political and moral beliefs about issues like abortion and mercy killing and I've always gone along accepting what they have.

SA MA A D MD SD My goals, values, and beliefs are a reflection of my individual aptitudes and talents; all of which gives me direction, purpose, and meaning to my life.

SA = Strongly Agree
 MA = Moderately Agree
 A = Agree

D = Disagree
 MD = Moderately Disagree
 SD = Strongly Disagree

SA MA A D MD SD I attend the same church as my family has always attended. I've never really questioned why.

SA MA A D MD SD There are many ways that married couples can divide up family responsibilities. I've thought about lots of ways, and now I know exactly how I want it to happen for me.

SA MA A D MD SD I guess I just kind of enjoy life in general, and I don't see myself living by any particular viewpoint to life.

SA MA A D MD SD I don't have any close friends. I just like to hang around with the crowd.

SA MA A D MD SD I've been experiencing a variety of recreational activities in hope of finding one or more I can really enjoy for some time to come.

SA MA A D MD SD I've dated different types of people and know exactly what my own "unwritten rules" for dating are and who I will date.

SA MA A D MD SD I really have never been involved in politics enough to have made a firm stand one way or the other.

SA MA A D MD SD I just can't decide what to do for an occupation. There are so many possibilities.

SA MA A D MD SD My parents decided a long time ago what I should go into for employment and I'm following through their plans.

SA MA A D MD SD I've gone through a period of serious questions about faith and can now say I understand what I believe in as an individual.

SA MA A D MD SD I've been thinking about the roles that husbands and wives play a lot these days, and I'm trying to make a final decision.

SA MA A D MD SD My parents' views on life are good enough for me, I don't need anything else.

SA MA A D MD SD I've had many different friendships and now I have a clear idea of what I look for in a friend.

SA MA A D MD SD After trying a lot of different recreational activities I've found one or more I really enjoy doing by myself or with friends.

SA MA A D MD SD My preferences about dating are still in the process of developing. I haven't fully decided yet.

SA MA A D MD SD I'm not sure about my political beliefs, but I'm trying to figure out what I can fully believe in.

SA MA A D MD SD It took me a long time to decide but now I know for sure what direction to move in for a career.

SA = Strongly Agree
MA = Moderately Agree
A = Agree

D = Disagree
MD = Moderately Disagree
SD = Strongly Disagree

SA N/A A D MD SD There are so many different political parties and ideals. I can't decide which to follow until I figure it all out.

SA N/A A D MD SD It took me a while to figure it out, but now I really know what I want for a career.

SA MA A D MD SD Religion is confusing to me right now. I keep changing my views on what is right and wrong for me.

SA MA A D MD SD I've spent some time thinking about men's and women's roles in marriage and I've decided what will work best for me.

SA MA A D MD SD In finding an acceptable viewpoint to life itself, I find myself engaging in a lot of discussions with others and some self exploration.

SA MA A D MD SD I only pick friends my parent would approve of.

SA MA A D MD SD I've always liked doing the same recreational activities my parents do and haven't ever seriously considered anything else.

SA MA A D MD SD I only go out with the type of people my parents expect me to date.

SA MA A D MD SD I've thought my political beliefs through and realize I can agree with some and not other aspects of what my parents believe.

SA MA A D MD SD I've chosen one or more recreational activities to engage in regularly from lots of things and I'm satisfied with those choices.

SA MA A D MD SD I don't think about dating much. I just kind of take it as it comes.

SA MA A D MD SD I guess I'm pretty much like my folks when it comes to politics. I follow what they do in terms of voting and such.

SA MA A D MD SD I'm not really interested in finding the right job, any job will do. I just seem to flow with what is available.

SA MA A D MD SD I'm not sure what religion means to me. I'd like to make up my mind but I'm not done looking yet.

SA MA A D MD SD My ideas about men's and women's roles have come right from my parents and family. I haven't seen any need to look further.

SA MA A D MD SD My own views on a desirable life style were taught to me by my parents and I don't see any need to question what they taught me.

SA MA A D MD SD I don't have any real close friends, and I don't think I'm looking for one right now.

SA MA A D MD SD Sometimes I join in leisure activities, but I really don't see a need to look for a particular activity to do regularly.

SA MA A D MD SD I'm trying out different types of dating relationships. I just haven't decided what is best for me.

SA = Strongly Agree
 MA = Moderately Agree
 A = Agree

D = Disagree
 MD = Moderately Disagree
 SD = Strongly Disagree

SA MA A D MD SD While I don't have one recreational activity I'm really committed to, I'm experiencing numerous leisure outlets to identify one I can truly enjoy.

SA MA A D MD SD Based on past experiences, I've chosen the type of dating relationship I want now.

SA MA A D MD SD I haven't really considered politics. It just doesn't excite me much.

SA MA A D MD SD I might have thought about a lot of different jobs, but there's never really been any question since my parents said what they wanted.

SA MA A D MD SD A person's faith is unique to each individual. I've considered and reconsidered it myself and know what I can believe.

SA MA A D MD SD I've never really seriously considered men's and women's roles in marriage. It just doesn't seem to concern me.

SA MA A D MD SD After considerable thought I've developed my own individual viewpoint of what is for me an ideal "life style" and don't believe anyone will be likely to change my perspective.

SA MA A D MD SD My parents know what's best for me in terms of how to choose my friends.

SA MA A D MD SD There are a lot of different kinds of people. I'm still exploring the many possibilities to find the right kind of friends for me.

SA MA A D MD SD I sometimes join in recreational activities when asked, but I rarely try anything on my own.

SA MA A D MD SD I haven't really thought about a "dating style." I'm not too concerned whether I date or not.

SA MA A D MD SD Politics is something that I can never be too sure about because things change so fast. But I do think it's important to know what I can politically stand for and believe in.

SA MA A D MD SD I'm still trying to decide how capable I am as a person and what work will be right for me.

SA MA A D MD SD I don't give religion much thought and it doesn't bother me one way or the other.

SA MA A D MD SD There's so many ways to divide responsibilities in marriage, I'm trying to decide what will work for me.

SA MA A D MD SD I'm looking for an acceptable perspective for my own "life style", but haven't really found it yet.

SA MA A D MD SD There are many reasons for friendship, but I choose friends on the basis of certain values and similarities that I've personally decided on.

Directions:

Read each item carefully. Be sure to respond to the total item and not just a certain part of it. Using the range of responses from strongly agree to strongly disagree, indicate to what degree it fits your own impressions about yourself. You may begin by thinking about whether you agree or disagree. Then you can decide how strongly you feel about it. Remember, we are interested in how you perceive your own situations.

SA = Strongly Agree

D = Disagree

MA = Moderately Agree

MD = Moderately Disagree

A = Agree

SD = Strongly Disagree

SA MA A D MD SD I haven't chosen the occupation I really want to get into, and I'm just working at what is available until something better comes along.

SA MA A D MD SD When it comes to religion I just haven't found anything that appeals and I don't really feel the need to look.

SA MA A D MD SD My ideas about men's and women's roles are identical to my parents'. What has worked for them will obviously work for me.

SA MA A D MD SD There's no single "life style" which appeals to me more than another.

3. Would the students start protesting even more if the principal stopped the newspaper?

4. When the welfare of the school is threatened, does the principal have the right to give orders to students?

5. Does the principal have the freedom of speech to say "no" in this case?

6. If the principal stopped the newspaper would he be preventing full discussion of important problems?

7. Whether the principal's order would make Fred lose faith in the principal.

8. Whether fred was really loyal to his school and patriotic to his country.

9. What effect would stopping the paper have on the student's education in critical thinking and judgments?

10. Whether Fred was in any way violating the rights of others in publishing his own opinions.

11. Whether the principal should be influenced by some angry parents when it is the principal that knows best what is going on in the school.

12. Whether Fred was using the newspaper to stir up hatred and discontent.

From the list of questions above, select the four most important:

Most Important

Second Most Important

Third Most Important

Fourth Most Important

NEWSPAPER

Fred, a senior in high school, wanted to publish a mimeographed newspaper for students so that he could express many of his opinions. He wanted to speak out against the war in Vietnam and to speak out against some of the school's rules, like the rule forbidding boys to wear long hair.

When Fred started his newspaper, he asked his principal for permission. The principal said it would be all right if before every publication Fred would turn in all his articles for the principal's approval. Fred agreed and turned in several articles for approval. The principal approved all of them and Fred published two issues of the paper in the next two weeks.

But the principal had not expected that Fred's newspaper would receive so much attention. Students were so excited by the paper that they began to organize protests against the hair regulation and other school rules. Angry parents objected to Fred's opinions. They phoned the principal telling him that the newspaper was unpatriotic and should not be published. As a result of the rising excitement, the principal ordered Fred to stop publishing. He gave as a reason that Fred's activities were disruptive to the operation of the school.

Should the principal stop the newspaper? Should stop it Can't decide Should not stop it

If you were the principal, how important would each of these questions be in deciding whether or not to stop the newspaper?

IMPORTANCE:

Great	Much	Some	Little	No

1. Is the principal more responsible to students or to the parents?
2. Did the principal give his word that the newspaper could be published for a long time, or did he just promise to approve the newspaper one issue at a time?

WEBSTER

Mr. Webster. Was the owner and manager of a gas station. He wanted to hire another mechanic to help him, but good mechanics were hard to find. The only person he found who seemed to be a good mechanic was Mr. Lee, but he was Chinese. While Mr. Webster himself didn't have anything against Orientals. His customers might take their business elsewhere if Mr. Lee was working in the gas station.

When Mr. Lee asked Mr. Webster if he could have the job, Mr. Webster said that he had already hired somebody else. But Mr. Webster really had not hired anybody, because he could not find anybody who was a good mechanic besides Mr. Lee

What should Mr. Webster have done? (Check one)

Should have hired Mr. Lee Can't decide Should not have hired him

If you were Mr. Webster, how important would each of these questions be in deciding whether or not to hire Mr. Lee?

IMPORTANCE:

Great Much Some Little No

1. Does the owner of a business have the right to make his own business decisions or not?
2. Whether there is a law that forbids racial discrimination in hiring for jobs.
3. Whether Mr. Webster is prejudiced against orientals himself or whether he means nothing personal in refusing the job.
4. Whether hiring a good mechanic or paying attention to his customers' wishes would be best for his business.

5. Does the state have the right to force continued existence on those who don't want to live.

6. What is the value of death prior to society's perspective on personal values.

7. Whether the doctor has sympathy for the woman's suffering or cares more about what society might think.

8. Is helping to end another's life ever a responsible act of cooperation.

9. Whether only God should decide when a person's life should end.

10. What values the doctor has set for himself in his own personal code of behavior.

11. Can society afford to let everybody end their lives when they want to.

12. Can society allow suicides or mercy killing and still protect the lives of individuals who want to live.

From the list of questions above, select the four most important:

Most Important

Second Most Important

Third Most Important

Fourth Most Important

THE DOCTOR'S DILEMMA

A lady was dying of cancer which could not be cured and she had only about six months to live. She was in terrible pain, but she was so weak that a good dose of pain-killer like morphine would make her die sooner. She was delicious and almost crazy with pain, and in her calm periods, she would ask the doctor to give her enough morphine to kill her. She said she couldn't stand the pain and that she was going to die in a few months anyway.

What should the doctor do? (Check one)

_____ He should give the lady an overdose _____ Can't decide _____ Should not give the overdose
that will make her die

If you were the doctor, how important would each of these questions be in deciding whether or not to give the lady an overdose that will make her die?

IMPORTANCE:

Great Much Some Little No

1. Whether the woman's family is in favor of giving her the overdose or not.
2. Is the doctor obligated by the same laws as everybody else if giving her an overdose would be the same as killing her.
3. Whether people would be much better off without society regimenting their lives and even their deaths.
4. Whether the doctor could make it appear like an accident.

6. What benefits would prisons be apart from society, especially for a charitable man?

7. How could anyone be so cruel and heartless as to send Mr. Thompson to prison?

8. Would it be fair to all the prisoners who had to serve out their full sentences if Mr. Thompson was let off?

9. Was Mrs. Jones a good friend of Mr. Thompson?

10. Wouldn't it be a citizen's duty to report an escaped criminal, regardless of the circumstances?

11. How would the will of the people and the public good best be served?

12. Would going to prison do any good for Mr. Thompson or protect anybody?

From the list of questions above, select the four most important:

Most Important

Second Most Important

Third Most Important

Fourth Most Important

ESCAPED PRISONER

A man had been sentenced to prison for 10 years. After one year, however, he escaped from prison, moved to a new area of the country, and took on the name of Thompson. For 8 years he worked hard, and gradually he saved enough money to buy his own business. He was fair to his customers, gave his employees top wages, and gave most of his own profits to charity. Then one day, Mrs. Jones, an old neighbor, recognized him as the man who escaped from prison 8 years before, and whom the police had been looking for.

Should Mrs. Jones report Mr. Thompson to the police and have him sent back to prison? (Check one)

Should report him	Can't decide	Should not report him
1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22	23	24
25	26	27
28	29	30
31	32	33
34	35	36
37	38	39
40	41	42
43	44	45
46	47	48
49	50	51
52	53	54
55	56	57
58	59	60
61	62	63
64	65	66
67	68	69
70	71	72
73	74	75
76	77	78
79	80	81
82	83	84
85	86	87
88	89	90
91	92	93
94	95	96
97	98	99
100	101	102
103	104	105
106	107	108
109	110	111
112	113	114
115	116	117
118	119	120
121	122	123
124	125	126
127	128	129
130	131	132
133	134	135
136	137	138
139	140	141
142	143	144
145	146	147
148	149	150
151	152	153
154	155	156
157	158	159
160	161	162
163	164	165
166	167	168
169	170	171
172	173	174
175	176	177
178	179	180
181	182	183
184	185	186
187	188	189
190	191	192
193	194	195
196	197	198
199	200	201
202	203	204
205	206	207
208	209	210
211	212	213
214	215	216
217	218	219
220	221	222
223	224	225
226	227	228
229	230	231
232	233	234
235	236	237
238	239	240
241	242	243
244	245	246
247	248	249
250	251	252
253	254	255
256	257	258
259	260	261
262	263	264
265	266	267
268	269	270
271	272	273
274	275	276
277	278	279
280	281	282
283	284	285
286	287	288
289	290	291
292	293	294
295	296	297
298	299	300
301	302	303
304	305	306
307	308	309
310	311	312
313	314	315
316	317	318
319	320	321
322	323	324
325	326	327
328	329	330
331	332	333
334	335	336
337	338	339
340	341	342
343	344	345
346	347	348
349	350	351
352	353	354
355	356	357
358	359	360
361	362	363
364	365	366

If you were Mrs. Jones, how important would each of these questions be in deciding whether or not to report Mr. Thompson to the police and have him sent back to prison?

IMPORTANCE:

Great Much Some Little No

1. Hasn't Mr. Thompson been good enough for such a long time to prove he isn't a bad person?
2. Evertime someone escapes punishment for a crime, doesn't that just encourage more crime?
3. Wouldn't we be better off without prisons and the oppression of our legal system?
4. Has Mr. Thompson really paid his debt to society?
5. Would society be failing what Mr. Thompson should fairly expect?

[illegible]

3. Do the students realize that they might be arrested and fined, and even expelled from school?
4. Would taking over the building in the long run benefit more people to a greater extent?
5. Whether the president stayed within the limits of his authority in ignoring the faculty vote.
6. Will the takeover anger the public and give all students a bad name?
7. Is taking over a building consistent with principles of justice?
8. Would allowing one student takeover encourage many other student takeovers?
9. Did the president bring this misunderstanding on himself by being so unreasonable and uncooperative?
10. Whether running the university ought to be in the hands of a few administrators or in the hands of all the people.
11. Are the students following principles which they believe are above the law?
12. Whether or not university decisions ought to be respected by students.

From the list of questions above, select the four most important:

Most Important	Second Most Important	Third Most Important	Fourth Most Important
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

STUDENT TAKE-OVER

At Harvard University a group of students, called the Students for a democratic Society (SDS), believe that the University should not have an army ROTC program. SDS students are against the war in Vietnam, and the army training program helps send men to fight in Vietnam. The SDS students demanded that Harvard end the army ROTC training program as a university course. This would mean that Harvard students could not get army training as part of their regular course work and not get credit for it towards their degrees.

Agreeing with the SDS students, the Harvard professors voted to end the ROTC program as a university course. But the president of the University stated that he wanted to keep the army program on campus as a course. The SDS students felt that the President was not going to pay attention to the faculty vote or to their demands.

So, one day last April, two hundred SDS students walked into the university's administration building, and told everyone else to get out. They said they were doing this to force Harvard to get rid of the army training program as a course.

Should the students have taken over the administration building? (Check one)

____ Yes, they should take it over ____ Can't decide ____ No, they shouldn't take it over

If you were an SDS student, how important would each of these questions be in deciding whether or not to takeover the administration building?

IMPORTANCE:

Great Much Some Little No

1. Are the students doing this to really help other people or are they doing it just for kicks?
2. Do the students have any right to take over property that doesn't belong to them?

5. Whether Heinz is stealing for himself or doing this solely to help someone else.
6. Whether the druggist's rights to his invention have to be respected.
7. Whether the essence of living is more encompassing than the termination of dying, socially and individually.
8. What values are going to be the basis for governing how people act towards each other.
9. Whether the druggist is going to be allowed to hide behind a worthless law which only protects the rich anyhow.
10. Whether the law in this case is getting in the way of the most basic claim of any member of society.
11. Whether the druggist deserves to be robbed for being so greedy and cruel.
12. Would stealing in such a case bring about more total good for the whole society or not.

From the list of questions above, select the four most important:

Most Important _____ Second Most Important _____ Third Most Important _____ Fourth Most Important _____

HEINZ AND THE DRUG

In Europe a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost to make. He paid \$200 for the radium and charged \$2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about \$1,000, which is half of what it cost. He told the druggist that his wife was dying, and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and began to think about breaking into the man's store to steal the drug for his wife.

Should Heinz steal the drug? Should steal it Can't decide Should not steal it

If you were Heinz, how important would each of these questions be in deciding whether or not to steal the drug?

IMPORTANCE:

Great Much Some Little No

					1. Whether a community's laws are going to be upheld.
					2. Isn't it only natural for a loving husband to care so much for his wife that he'd steal?"
					3. Is Heinz willing to risk getting shot as a burglar or going to jail for the chance that stealing the drug might help?
					4. Whether Heinz is a professional wrestler, or has considerable influence with professional wrestlers.

✓				
		✓		
				✓
✓				
				✓

2. Would a used car be more economical in the long run than a new car. (Note that a check was put in the far left space to indicate the opinion that this is an important issue in making a decision about buying a car.)
3. Whether the color was green, Frank's favorite color.
4. Whether the cubic inch displacement was at least 200. (Note that if you are unsure about what "cubic inch displacement" means, then mark it "no importance.")
5. Would a large, roomy car be better than a compact car.
6. Whether the front connibiles were differential. (Note that if a statement sounds like gibberish or nonsense to you, mark it "no importance.")

Instructions for Part B: (Sample Question)

From the list of questions above, select the most important one of the whole group. Put the number of the most important question on the top line below. Do likewise for your 2nd, 3rd and 4th most important choices. (Note that the top choices in this case will come from the statements that were checked on the far left-hand side; statements #2 and #5 were thought to be very important. In deciding what is the most important, a person would re-read #2 and #5, and then pick one of them as the most important, then put the other one as "second most important," and so on.)

Most Important 5 Second Most Important 2 Third Most Important 3 Fourth Most Important 1

Directions:

This questionnaire is aimed at understanding how people think about social problems. Different people often have different opinions about questions of right and wrong. There are no "right" answers in the way that there are right answers to math problems. We would like you to give your opinion about several problem stories. Here is a story as an example.

Frank Jones has been thinking about buying a car. He is married, has two small children and earns an average income. The car he buys will be his family's only car. It will be used mostly to get to work and drive around town, but sometimes for vacation trips also. In trying to decide what car to buy, Frank Jones realized that there were a lot of questions to consider. Below there is a list of some of these questions.

If you were Frank Jones, how important would each of these questions be in deciding what car to buy?

Instructions for Part A: (Sample Question)

On the left hand side check one of the spaces by each statement of a consideration. (For instance, if you think that statement #1 is not important in making a decision about buying a car, check the space on the right.)

IMPORTANCE:

Great Much Some Little No

				✓
--	--	--	--	---

1. Whether the car dealer was in the same block as where Frank lives. (Note: that in this sample, the person taking the questionnaire did not think this was important in making a decision.)

PART

B

Appendix E

Probability Analysis and Misclassification Rates of CTFR

Variable Definitions:

Tc = The number of participants estimated to be truly Concrete Operational.

Tt = The number of participants estimated to be truly Transitional.

Tf = The number of participants estimated to be truly Formal Operational.

j = The probability of someone who is truly Concrete Operational being misclassified as Transitional.

k = The probability of someone who is truly Transitional being misclassified as Concrete Operational.

l = The probability of someone who is truly Transitional being misclassified as Formal Operational.

m = The probability of someone who is truly Formal Operational being misclassified as Transitional.

conc = Abbreviation for being classified as Concrete Operational.

tran = Abbreviation for being classified as Transitional.

form = Abbreviation for being classified as Formal Operational.

#conc = The number of participants classified as Concrete Operational.

#tran = The number of participants classified as Transitional.

#form = The number of participants classified as Formal Operational.

N = The total number of participants.

%conc = Estimated percentage of those classified as Concrete Operational who are misclassified.

%tran = Estimated percentage of those classified as Transitional who are misclassified.

%form = Estimated percentage of those classified as Formal Operational who are misclassified.

Note: Since no distinction is being made between the two split halves of the CTFR, the order of classification does not make a difference. For example, there is no difference between the classifications conc+tran and tran+conc.

Distribution Figures: Classification by two halves of the CTFR

Probability Equations:

$$\#conc + \#conc = Tc*(1-j)^2 + Tt*(k)^2$$

$$\#conc + \#tran = 2*Tc*(j)*(1-j) + 2*Tt*(k)*(1-k-l)$$

$$\#tran + \#tran = Tc*(j)^2 + Tt*(1-k-l)^2 + Tf*(m)^2$$

$$\#conc + \#form = 2*Tt*(k)*(l)$$

$$\#tran + \#form = 2*Tt*(l)*(1-k-l) + 2*Tf*(m)*(1-m)$$

$$\#form + \#form = Tt*(l)^2 + f*(1-m)^2$$

$$N = Tc + Tt + Tf$$

Misclassification Rates:

$$\%conc = (k)*Tt \div ((1-j)*Tc + (k)*Tt)$$

$$\%tran = ((j)*Tc + (m)*Tf) \div ((j)*Tc + (1-k-l)*Tt + (m)*Tf)$$

$$\%form = (l)*Tt \div ((l)*Tt + (1-m)*Tf)$$