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The Effect of Priming, Christian Orthodox Beliefs, and Training on Critical Thinking

by

Cheryl Norry

B.A. University of Windsor, 1984

THESIS

Submitted to the Department of Psychology

in partial fulfillment of the requirements

for the Master of Arts degree

Wilfrid Laurier University

1987

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Abstract

This study investigated the extent to which pro and antireligious individuals responded objectively and critically to religious and nonreligious material. Proreligious (n=72) and antireligious (n=72) individuals, as determined by Fullerton and Hunsberger's (1982) Christian Orthodoxy Scale, were selected from 507 introductory psychology students. They judged the logical soundness of 30 syllogisms (10 proreligious, 10 antireligious and 10 neutral) following a priming task (critical, religious, or neutral). Prior to the analysis of the syllogisms, half of the subjects were given logic training, while the other half did not receive any instruction in logic. Dependent variables included critical ability (i.e., the number of neutral syllogisms correctly answered), number of pro and antireligious syllogism answered correctly, and religious bias scores (the number of proreligious syllogisms marked sound plus the number of antireligious syllogisms marked unsound). Results indicated that there was no substantial link between religiosity and logical analyses. There was some evidence that logic instruction did aid in improving subjects' critical ability scores, and decreasing the effect of religious bias. Unexpectedly, the critical priming questionnaire was not related to improved performance on syllogistic judgements. There were indications that the religious priming questionnaire did bias subjects' responses, but respondents receiving the neutral questionnaire performed better than the other two priming conditions. It is suggested that the relationship between religious attitudes and logical syllogistic analysis is a complex interactive one, rather than a simple linear relationship.

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Human beings have been said to be superior to brute animals because they possess the ability to think, reason, and understand, whereas the latter do not possess such capabilities, at least not at the same level as human beings do. In Creed and Wardman's (1963) translation of The Philosophy of Aristotle, it is suggested that:

> The functions of feeding, growing, and reproducing, which are the sole functions of plants, are found in animals, which are capable of the further activities of feeling, sensation, and locomotion. Man has all these attributes in common with the lower creatures, but he is distinguished from them by his faculty of reason. (p. 229)

Often there are factors, such as a person's attitudes, that interfere with one's ability to reason or to be critical. A person may hold numerous attitudes related to the various aspects of her life, such as religious, political, intellectual, rational, logical attitudes, attitudes toward authority and capital punishment, critical, and moral attitudes. The list can go on almost indefinitely. Problems may arise for an individual if she is placed in a situation in which one attitude becomes more salient or important to the person, thus dictating one course of action, while another, which is necessary for an appropriate response to the situation, dictates another course of action. Such attitudinal conflict has been called cognitive dissonance (Festinger, 1957) by some.

Factors that affect critical ability

This type of dissonance causes an inconsistency or a temporary blockage in the flow of a person's mental life. The occurrence of such mental strife is generally avoided. Throughout a person's life consistency is desired and sought after. A balanced world devoid of any unsettling interruptions is the ideal for many, however, such a state is rarely, if ever, achieved. Life is full of inevitable contradictions and inconsistencies, since very few things are purely black and white (Festinger, 1957). Many factors in a person's life can lead to the arousal of dissonance. Such things as war, propoganda, capitalism versus communism, ethnocentricity, and religiosity sometimes cloud our critical judgements because we are biased by these events, situations, and characteristics.

Beliefs and attitudes predispose a person to act in a particular way (Palmerino, Langer, & McGillis, 1984) which is almost automatic or habitual. When a person holds two or more cognitions at the same time, dissonance will occur if the cognitions have contradictory implications for a person's behavior (Berkowitz, 1980). Thus, if an individual who adheres to a particular attitude happens to encounter a situation in which critical analysis of material (some of which is consistent with and contradictory to the attitude) is required, his ability to reason or to be critical may lead him to one course of action whereas his beliefs and attitudes may compel this person to respond according to what that attitude dictates. If this individual's attitudes are religious, then his ability to respond in a rational and logical manner is believed to be biased by his religious

attitudes. This is not to suggest that because a person is religious he is not rational or logical, but that when religious attitudes are coupled with critical awareness his ability to be logical, rational, and critical is hampered because religious attitudes can bias a person's critical ability. "The danger for man lies in the power of the unverifiable attitudes of ideologies and religions to override clear and incontrovertible logical and empirical considerations" (Open University Course Team, 1975, p. 71).

Many theories in psychology that deal with attitudes and their influences, share the common premise that human beings prefer consistency. The one theory that most appropriately fits the design of this study is the theory of cognitive dissonance proposed by Festinger (1957). This theory proposes that if a person is in a situation where two or more opposing beliefs, thoughts, or cognitions are seen by the individual to contain both positive and negative aspects regarding each alternative's response to the situation (i.e., reasons for and against engaging in a particular response in that particular situation), cognitive dissonance will result and the person may then be motivated to restore balance and consistency. When an opinion must be formed or a decision made, some dissonance is almost unavoidable (Festinger, 1957). The dissonance or psychological discomfort will be between the cognition of the action to be taken and those opinions or knowledge which tend to point to a different action (Festinger, 1957).

Not only can commitment to certain beliefs or attitudes, such as pro or antireligious attitudes, be a source of dissonance when they

conflict with another cognition, but such attitudes can also be used to resolve dissonance. For example, if a proreligious individual is asked to critically evaluate an argument that carries religious connotations, she may at first attempt to analyze the material logically. If a logical argument leads to the conclusion that God does not exist, her critical awareness may lead this person to conclude that the argument is true or logical (i.e., the conclusion logically follows from the premises). However, her religious attitudes entail the belief that God does exist, thus leading her to conclude that the argument is false or illogical. The dilemma of whether to respond on the basis of logic or on the basis of religious attitudes will most likely lead this person to a state of dissonance. In order to reduce or eliminate this psychological discomfort created by these opposing cognitions, the individual could make a choice between these two responses. Since this person is a religious individual, her response will most likely be to summon further cognitions that are in accordance with the belief that God does exist. Such cognitions may include the belief that the Bible is the word of God, her whole religious life is based on the premise that God does exist, the belief that Jesus exists because God exists, the belief that when we die we will see God, and so forth. This will lead the person to respond according to her religious attitudes and thus reduce the dissonance by increasing the number of consonant (i.e., consistent) cognitions, and/or by increasing the importance of the belief that God does exist.

Religious attitudes can thus be used to marshal further cognitive

elements that are consonant with a cognition that is in a dissonant relationship or these attitudes can increase the importance of the cognition in question. "With the number and importance of dissonant cognitions held constant the magnitude of dissonance decreases as the number or importance of consonant cognitions increases" (Wicklund & Brehm, 1976, p. 4). However, cognitive dissonance theory does not guarantee that a person will be successful in reducing or eliminating the dissonance. A person may have trouble trying to change his behavior or knowledge, which is why dissonance, once created, may persist (Festinger, 1957). In order to aid a religious individual in the reduction or removal of such psychological discomfort, while at the same time assisting this person in overcoming his religious biases, some form of external assistance could be utilized to increase the number or importance of the religious cognitions or of the cognition with which it is dissonant, so that balance or a consonant state results.

Some sort of external aid is speculated to be useful in magnifying one dissonant cognition over another cognition since dissonance can be reduced by intensifying the original private opinion or by increasing the number or importance of consonant cognitions (Festinger, 1957). In addition, "people are most likely to persuade themselves of the validity of an act when they feel some choice about it and when it has forseeable consequences" (Myers, 1983, p. 61). The forseeable consequences most likely to be prevalent in this study's subjects' minds, will most likely be related to an attitude which will be made salient. Subjects who are cued to think in religious terms may

respond to the religious material in a manner that is in accordance with their religious attitudes because they may fear that the organization and stability of their life will be disrupted (Open House University Team, 1975).

Subjects who are induced to think logically, rationally, and critically may respond to the material on this basis for fear that they may not be seen as rational persons. Thus, if one of the cognitive elements (e.g., criticality) leading to the psychological discomfort is made the salient behavioral standard, then the religious individual might be able to respond to religious material objectively and logically.

The biasing effect of religious attitudes

Studies on disconfirming information aimed at religious beliefs have suggested that strongly held beliefs, affect subjects' responses to the test materials. For example, Batson (1975) found that religious females who expressed belief in Jesus as the son of God and accepted the veracity of an article that basically stated that Jesus was not the son of God, subsequently reported an increase in the intensity of their belief that Jesus was the son of God. Those who did not express such a belief or thought the article was untrue, did not increase significantly in that belief. Batson consequently stated that his findings were consistent with dissonance theory, insofar as ubjects who both express a given belief and are presented with disconfirming information regarding that belief, emerge even more convinced of the truth of their beliefs.

Further support for the notion that religious beliefs influence a

person's responses, can be found in research on the logical and rational thought processes of religious people. In one of the first studies in this area, Thouless (1935) gave subjects a set of 33 religious belief statements, and a set of statements that had no relationship to religious material. The results of this experiment showed that there was a high degree of certainty regarding the truth or falsehood attached to religious statements, whether or not participants believed or disbelieved these statements. However, examination of the nonreligious statements showed that although there was a high degree of conviction related to these items, the tendency toward certainty was not as strong as it was for statements related to religious beliefs. Thouless (1959) further extended and verified these findings in a later study, by presenting adult students with a series of political and religious arguments presented in syllogistic form. It was found that 40% of the judgements related to the soundness of the arguments were in error. Further, 73% of these errors were the result of thinking that an argument was sound if the conclusion was accepted and unsound if it was rejected. However, when university graduates were tested with the same material Thouless was unable to find evidence of this reasoning prejudice or bias. This group of subjects only had 10% of their errors associated with the soundness of the arguments.

Brown (1962) replicated Thouless' (1935) finding that the "truth" or "falsity" of religious belief statements (contradictory or consistent with existing attitudes) are assented to more strongly than are statements of fact or opinion. That is, subjects tended to use

extreme response categories for their replies. Results also indicated that church membership and attitudinal acceptance of the church, rather than personality variables (i.e., dogmatism, anxiety, humanitarianism, authoritarianism, neuroticism, extraversion, and individualism), were related to the strength of religious beliefs. Brown concluded that "it is easier to be uncertain about a factual matter which can be settled, than to be uncertain about something which is literally a matter of belief; certainty about religious matters is possible because of the social support that can be evoked to sustain these beliefs" (p. 269).

Feather (1964, 1967) carried out two much more direct investigations of the influence of religious beliefs when coupled with critical awareness. Both studies required subjects to judge the logical soundness of 24 religious syllogisms (12 proreligious and 12 antireligious) and 16 neutral syllogisms. Half of the 40 syllogisms were logically sound and the other half were logically unsound. Results of the first study (Feather, 1964) showed that for subjects with a proreligious attitude, syllogism evaluation scores (number of proreligious syllogisms marked sound plus the number of antireligious syllogisms marked unsound) were positively correlated with strength of religious attitude (r = +.22), and negatively correlated with critical ability scores (number of neutral syllogisms correctly answered; r = -.24). The correlation between critical ability and religiosity (r = +.03) was not significant. Thus, Feather concluded that the degree to which subjects with a proreligious attitude check proreligious syllogisms as logically sound and antireligious syllogisms as

logically unsound increased with stronger proreligious attitudes and decreased with stronger critical ability. The results for the antireligious group were not as revealing as those obtained for the proreligious group, because as Feather pointed out, the sample size was very small (N=34) in comparison to the proreligious group (N=131). No significant results were found for the three correlations mentioned above (r = +.13, r = -.26, and r = -.30, syllogism evaluation scores and strength of religious attitude, syllogism evaluation and critical ability scores, critical ability and religiosity, respectively).

The later study conducted by Feather (1967) was basically a replication of the earlier experiment but a deliberate attempt was made to obtain subjects who were strongly antireligious ("atheists") (N=10) and others who were strongly proreligious (N=30). The proreligious subjects were obtained from one of three religious organizations (i.e., Student Christian Movement, Evangelical Union, and Newman Society). The only criterion that was used to distiguish between pro and antireligious subjects was a positive response to the statement "I do not believe in God." (Feather, 1967, p. 4).

The results of this study differed somewhat from those of the earlier study. Syllogism evaluation scores were not found to be positively correlated with strength of proreligious attitude (r = -.07). The correlation between syllogism evaluation scores and strength of proreligious attitude, was one of the major findings in the first study conducted by Feather (1964), but this finding was not replicated in the later study. It appears that it is possible, to some degree, for proreligious individuals to overcome their religious

biases and respond critically to religious material. Another possibility is that Feather (1967) did not tap the proreligious extreme of the population. That is, although his sample of proreligious subjects were fairly homogeneous (M = 44.43, SD = 11.18), they were not as polarized (possible range 0 to +72 for proreligious, -72 to 0 for antireligious) as the sample could have been. This might have contributed to the nonsignificance of the relevant correlation. The correlation between critical ability and proreligious attitude was again nonsignificant (r = -.14). Syllogism evaluation scores were found to be positively related to critical ability for the antireligious group of subjects (r = +.58) which was not found in the first study. This is a somewhat surprising result given that this sample consisted of only 10 subjects and that their mean religious attitude score (M = -31.10, SD = 21.01) was not very extreme on the lower end of the scale and that these scores were fairly divergent. This would seem to indicate that this was not a very homogeneous group. Critical ability and strength of antireligious attitudes again did not correlate significantly (r = +.05). However, Feather did conclude that subjects' evaluation of religious syllogisms was biased by their religious attitude, and influenced by their critical ability.

Feather's (1964, 1967) studies are not without problems. For example, Feather defined religiosity on the basis of the subjects' degree of agreement or disagreement with the conclusions of the religious syllogisms, rather than using some measure of religiosity with established validity and reliability. Also, in relation to the previous statement, Feather "measured" religious attitude one week

after completion of the syllogisms. When religious individuals are presented with material that contradicts their religious attitudes, the intensity of those beliefs becomes stronger (Batson, 1975; Kelley, 1955). Furthermore, "dissonance may be reduced by intensifying the original private opinion" (Festinger, 1957, p. 264). In addition to this, subjects may have recalled the premises that preceded the conclusions and/or they may have recalled whether they thought the syllogism was logical or illogical, which may have influenced their responses to the religious conclusions. Kolers and Ostry (1974) found that after just reading sentences, subjects could recognize sentences seen before from 3 minutes to 32 days after their initial presentation. Consequently, there are doubts that this was an appropriate measure of religiosity.

Other researchers have examined critical thinking related to beliefs other than religion. For example, Alcock and Otis (1980) found that skeptics of the paranormal demonstrated a higher level of critical thinking ability (as measured by Watson and Glaser's (1964) Critical Thinking Appraisal Scale) than did believers in the paranormal. Thus, it appears that prior attitudes can affect a person's ability to be logical, critical, and objective.

The effect of previous beliefs or attitudes

Another factor that affects a person's ability to be critical, rational or logical when faced with an opposing cognition, is prior expectations or cognitions about a particular issue. As noted by Fiske and Taylor (1984), the process of deciding what information is relevant or how one should interpret the information is heavily

influenced by preexisting expectations or schemata. Several studies have illustrated this. For example, Lord, Ross, and Lepper (1979) found that both proponents and opponents of capital punishment rated results and procedures of purported studies that confirmed their own beliefs to be the more convincing and probative ones. The net effect of this study was an increase in attitude polarization.

In another study, Anderson, Lepper, and Ross (1980) gave subjects two case studies that suggested either a positive or negative relationship between risk taking and success as a firefighter. Some of these subjects provided written explanations for the relationship they were presented with regarding these two factors. These explanations appeared to reinforce the written theory developed by a subject on the relationship between risk taking and success of a firefighter. When the information was discredited by the experimenters, the subjects' theories survived; that is, they continued to believe in their self-generated explanations. People who hold opinions on certain issues might examine and interpret empirical evidence in a biased manner.

Lord, Ross, and Lepper (1979) noted that:

> People who hold strong opinions on complex social issues are likely to examine relevant empirical evidence in a biased manner. They are apt to accept 'confirming' evidence at face value while subjecting 'disconfirming' evidence to critical evaluation, and as a result to draw undue support for their initial positions from mixed or random empirical findings. (p. 1037)

Application of this statement to the present study may provide some

valuable insights. Religious individuals, whether pro or anti, hold strong opinions regarding their religious beliefs (Batson & Ventis, 1982). When presented with material that contradicts or confirms their religious attitudes, religious individuals may evaluate the material in a "biased" manner. People sometimes engage in selective exposure, that is, they seek out information that supports their established beliefs and attempt to avoid information that opposes their opinions and beliefs (Berkowitz, 1980). In other words, pro and antireligious individuals may avoid disconfirming evidence while seeking out supportive data. All stimuli present or just preceding the situation, which calls for some sort of judgement, do not receive equal weighting in determining what the final outcome will be (Sherif & Sherif, 1967). It consequently appears that pro and antireligious subjects may assign religious attitudes greater significance, thus responding to religious material on the basis of their salient religious beliefs.

The effect of salient cognitions

Stimuli vary in such dimensions as 'importance' and 'salience' (Brehm & Cohen, 1962). Which element is seen as salient or important could result in an interpretation of the situation or issue that is not in accordance with an adequate judgement of all the factors present. Salient stimuli have been shown to have a disproportionate influence on a person's final judgement (van der Plight & Eiser, 1984). Furthermore, the dimension perceived to be salient can result in extreme or polarized judgements regarding the issue at hand (van der Plight & Eiser, 1984).

Since people do not attend evenly to all aspects of their environment (Fiske & Taylor, 1984), they may focus on a dimension that they perceive as salient or important when attempting to make some sort of judgement. "Although a rational animal, man as a decision-maker can seldom claim to make purely rational judgements" (Janis & Mann, 1968, p. 327). In this study, the focus will be on the possibility that, if a religious individual is placed in a situation in which he is instructed to respond to some material on the basis of logic alone, he will have difficulty being critical of the material if it carries religious connotations. This is believed to be the case because logic and empirical evidence have little to do with the firmness with which religious attitudes are held (Open University Course Team, 1975). That is, pro or antireligious attitudes affect a person's ability to be critical or logical (Feather, 1964, 1967; Thouless, 1959), rational (Baither & Saltzberg, 1978; Thyer, Kramer, Walker, & Papsdorf, 1981), open-minded (Rokeach, 1960), and tolerant of inconsistencies (Feather, 1964, 1967). Religious attitudes have also been found to affect a person's degree of certainty regarding religious statements (Brown, 1962; Thouless, 1935, 1959). Judgements of syllogistic logic have been found to be influenced by whether or not individuals agree or disagree with the conclusions of religious syllogisms (Thouless, 1959). Consequently, it appears that if one of the 3 statements (2 premises and 1 conclusion), in a religious syllogism, runs counter to a religious person's attitudes, dissonance will result and the person will thus have a great deal of difficulty overcoming his religious convictions and responding logically.

In order for religious individuals to respond to religious material on the basis of their critical awareness and not on the basis of religious attitudes, the former must be made more salient than the latter. This is believed to be necessary since salient dimensions are the frames of reference that an individual uses when judging an issue (van der Plight & Eiser, 1984). Also, since religious individuals can be said to be and say that they are religious, the dominant factor for them in a situation which involves religious material, would be religion. It is proposed that if saliency of cognitions is not manipulated, the religiosity of a person will be dominate, thus influencing her responses in a situation that requires critical judgements.

An attempt will be made in the present study to use the findings regarding saliency to help create a situation under which religious individuals will or will not be able to respond to religious material objectively, to show that the findings that religious individuals lack the ability to be critical (Feather, 1964, 1967), logical (Thouless, 1959), rational (Baither & Saltzberg, 1978: Thyer, Kramer, Walker, & Papsdorf, 1981) and open-minded (Rokeach, 1960), may have been in error. The errors may have occurred, not because of the data compiled, but because the material employed made religious attitudes salient and/or challenged participants' religious attitudes, the result being a polarization of attitudes followed by an inappropriate response to the items presented.

Others studies have been successful with the manipulation of the saliency of cognitions. Zanna, Olson, and Fazio (1981) manipulated

the salience of past religion-relevant behaviors, and found that when attitudes are measured after such a manipulation there is greater accuracy for predictions of subsequent behavior. A study conducted by Kelley (1955) attempted to determine whether the saliency of religious group membership has any bearing on the resistance to change in attitudes supported by that group. All subjects were given an opinion questionnaire related to Catholic norms, other roles, and memberships. The results indicated that for high school students (but not for college students), salience of membership in the Catholic Church was heightened by brief reading material that described the Church's leader, symbols, and functions. Two out of every 3 subjects received a slightly modified version of the opinion questionnaire. In addition to the standard questionnaire, these subjects were given information for each question which purported to give the typical students' opinions but were actually fairly divergent opinions from those most acceptable to Catholics. This led to the finding that the greater the initial change in attitudes supported by the Catholic Church, the greater the amount of change retained at a later time. When church membership was low in salience (i.e., the standard questionnaire), these subjects displayed greater immediate change than the high salience (i.e., the modified questionnaire) subjects. Thus, it is argued that it is possible to manipulate the salience of critical attitudes, making them dominant in order to eradicate religious individuals' bias on religious material.

Eiser has been involved in several studies which attempted to influence peoples' attitudes by manipulating the dimension subjects

saw as salient. Eiser and Mower White (1974a) had teenagers rate 10 statements concerning their attitudes towards adult authority. Five of these statements advocated pro-adult authority positions and the other five were broadly anti-adult authority. Subjects were informed that the statements were "comments made by young people" (p. 353). Then they were asked to rate the "sort of person" (p.353) they thought made each statement. These ratings were done on 10 bipolar scales which corresponded to a continuum from anti- to pro-authority. On half of the scales the pro-authority term was evaluatively positive and the anti-authority term was evaluatively negative. The remainder of the scales were the reverse. Subjects' ratings of agreement with each statement were converted to a score which determined whether they were in the pro- group, neutral group or anti- group. They found that their pro- and anti-authority subjects showed more polarization on different scales related to issues on adult authority the more their own evaluations of the items were congruent with the value connotations of the scale labels.

This finding lead to a further investigation by Eiser and Mower White (1974b) in which subjects were given 10 statements to determine whether they were pro- or anti-authority. Then subjects were randomly assigned to one of three conditions, probias, antibias, or the control condition. Determination of what condition a subject was assigned to was based on the instructions given in the second part of the questionnaire. Subjects in the control condition received a shortened version of the instructions all subjects were given in the first part of the questionnaire. The instructions given to subjects in the

probias condition were designed to lead subjects to define the pro-authority extreme of the continuum with evaluatively positive labels. Subjects in the antibias condition were read instructions which were designed to lead them to define the anti-authority extreme of the scale with evaluatively positive labels. That is, the latter two groups were basically told that the questionnaire they were to respond to was to determine if they possessed characteristics associated with a pro- or anti-authority position. Subjects in the probias condition responded to a set of statements regarding adult authority in mostly a pro-authority attitude stance. The antibias group responded in an anti-authority manner.

A less direct manipulation of saliency of attitudes was employed by Eiser and Pancer (1979). First, they measured teenagers' attitudes on the issue of adult authority over teenagers. Then they had their subjects write a short essay on this issue in which the participants were to incorporate a list of words which were either pro- (probias condition) or anti-authority (antibias condition) or they were not given any words to incorporate in the essay (control condition). When the former 2 conditions were compared to the latter, subjects in the probias condition were found to hold a more pro-adult authority position and subjects in the antibias condition were more anti-authority, irrespective of their original position. Since the studies Eiser has conducted were able to increase the saliency of subjects' attitudes towards adult authority, through the implementation of statements regarding such attitudes, it appears that critical attitudes could be made salient over religious attitudes

through the presentation of a series of statements related to the former attitude. Similarly, religious attitudes could be made more salient than critical ability by the same reasoning.

The effect of priming cognitions

Another important factor in this study is the effect of prior context on the interpretation and retrieval of information. This can be applied to the "priming effect" which refers to the findings that recently and frequently activated ideas come to mind more readily than ideas that have not been activated (Fiske & Taylor, 1984). In this study the concept of priming will be used to increase the saliency of a particular attitude. Thus, the terms priming and saliency will be used interchangably. By making certain information primary in a person's mind that category of information is more likely to influence a person's later performance. Even if the perceiver is not aware of it, the prior contexts have an effect in priming memory, judgement, problem solving, and social behavior (Fiske & Taylor, 1984). The most recent behavior is also more likely to be salient in the person's consciousness (Wicklund & Brehm, 1976).

Not only is the most recently activated attitude the most salient, but it is also the one that will affect the interpretation of incoming information. If more than one schema is appropriate for encoding a piece of information, the schema selected to do so should be the one that has been most recently activated (Wyer & Srull, 1980). A good example of this comes from a study conducted by Higgins, Rholes, and Jones (1977). Subjects were unobtrusively exposed to either positive or negative personality trait terms which could or could not be used

to characterize a stimulus person presented in paragraph form. It was found that prior exposure to a trait category led subjects to encode the information in the paragraph according to this prior stimulus information. In other words, subjects' characterizations and descriptions of the stimulus person reflected the trait categories activated or primed by prior exposure, but only when the traits were applicable for encoding the target's behavior. When subjects returned 10 to 14 days after the initial testing, the effect of prior exposure to the trait terms had a more pronounced effect. Subjects' reproductions of the information contained in the paragraph on the stimulus person also became more polarized over time. Prior activation of a category increases its accessibility (Higgins, Rholes, & Jones, 1977). In the context of the present study, this would seem to suggest that subjects' responses to syllogisms could be affected by prior exposure to specific information in a "priming questionnaire". "The act of categorization may in turn affect how the stimulus information is processed" (Higgins, Rholes, & Jones, 1977).

In order to avoid attitude polarization and its biasing effects on a religious individual's evaluation of material that carries religious connotations, some sort of standard should be set, possibly through the use of priming. Behavioral standard refers to a set response schema to which a person alters his behavior in order to conform more closely to it (Carver, 1979). People tend to compare their behavior with an ideal standard, and decide whether it matches the standard (Fiske & Taylor, 1984). The behavioral adjustment and comparison cycle will then continue or cease. When the adjustment process ceases

this indicates that the person believes his behavior is no longer discrepant (Fiske & Taylor, 1984).

A stimulus (or attitude) that is designated as the standard for behavior can become the anchor for the individual's judgement or responses to the material (Sherif & Sherif, 1967). An anchor can enhance the accuracy of a person's judgement for items coinciding with it in value (Sherif & Sherif, 1967). Thus, if no standard is set for a person to compare her behavior to, this individual may typically choose the most extreme stimulus (or attitude) presented as the anchor or behavioral standard (Sherif & Sherif, 1967) when presented with items that run counter to preexisting attitudes. For example, in the present study the behavioral standard would be to respond to syllogisms on the basis of logic and thus subjects should base their responses on logic and rationality which would in turn increase correct responses. If no standard was set or if a religious standard became prevelant, subjects may respond to the religious syllogisms according to what their religious attitudes dictate.

Research on critical thinking

Before any sort of behavioral standard can be set, we must first understand how people reason through or solve problems. "If we understood the process of problem solving, we would be in a better position to teach people how to solve problems quickly and intelligently" (Wessells, 1982, p. 322). Research into the area of problem solving has been quite extensive. In the present study, the nature of problem solving and its ramifications will be restricted to syllogistic reasoning.

Some researchers have used the term validity or soundness to determine the correctness of syllogistic reasoning. It is important that the reader understand the difference between these two terms. Feather (1964, 1967) had his subjects judge the logical soundness of concrete syllogisms while others have instructed their subjects to judge the validity of concrete and/or symbolic syllogisms (e.g., Evans, Barston, & Pollard, 1983; Henle & Michael, 1956; Mason, Bramble, & Mast, 1983). The two terms, validity and soundness, are not synonomous (Copi, 1972). In order to explain the differences between these two concepts we must first backtrack a little. A syllogism is typically composed of propositions or statements. In each syllogism an argument is developed. An argument or syllogism consists of one or more premises and a conclusion. "Truth and falsehood may be predicated of propositions, but never of arguments." (Copi, 1972, p. 32). The terms valid, invalid, sound, and unsound apply only to arguments, but are based on the truth or falsehood of the propositions. A valid argument is one in which its propositions are true or all of its statements are false. The reason why the latter is valid is because "if its premises were true its conclusion would have to be true also, even though in fact they are all false" (Copi, 1972, p. 32). A valid argument can also have a false conclusion but at least one of the premises must be false as well. The term sound refers to a valid argument all of whose propositions are true (Copi, 1972). An invalid argument consists of true premises and a false conclusion. "A deductive argument fails to establish the truth of its conclusion if it is unsound, which means either that it

is not valid or that not all of its premises are true." (Copi, 1972, p. 33). In other words, an unsound argument is any argument whose propositions are not all true. Consequently, whether a syllogism is determined to be logically correct depends on whether one is assessing a correct solution on the basis of validity (valid versus invalid) or soundness (sound versus unsound).

Working specifically with syllogisms as a method to assess problem solving behavior, researchers have found that a priori beliefs influence judgements of the validity of logical arguments. Janis and Frick (1943) presented subjects who had no prior training in formal logic analysis, with syllogisms very similar or the same as the neutral syllogisms to be used in the present study. The results supported their two propositions regarding the relationship between attitudes toward the conclusions and errors in the judgement of logical validity of the syllogisms. When subjects agreed with the conclusion of the syllogism, they made more errors on the invalid rather than on the valid syllogisms. The reverse was found when subjects disagreed with the conclusion of the syllogism. Subjects' attitudes did have a biasing effect on their responses to the syllogisms.

Lefford (1946) suggested that "rational thinking is not free from the influence of the affective processes" (p. 127). This was tested using two types of syllogisms differing in the subject matter. One content type was of a socially controversial nature, intended to excite an emotional reaction in the subjects. The other contained material which was of a neutral nature. Based on his findings,

Lefford concluded that attitudes, beliefs, feelings, and so forth influence reasoning in the direction of these convictions, and that previous knowledge of the truth or falsity of the conclusions of the syllogisms influences reasoning in the direction of that previous knowledge. The former conclusion was made in reference to the emotionally laden syllogisms, whereas the latter statement was made on the basis of the non-emotional syllogisms.

Another study examined the influence of personal prejudices upon reasoning. Morgan and Morton (1944) presented subjects with an equal number of symbolic syllogisms and concrete syllogisms phrased in terms of current issues. Subjects were presented with a major and minor premise and were required to select among four alternative conclusions. Morgan and Morton found that when the symbolic and concrete form of each syllogism were compared, the distortion in reasoning became marked when the terms in the syllogisms were related to personal convictions of the reasoner. They stated that people are more likely to accept a conclusion which is consistent with their convictions, wishes, fears, or personal opinions with little regard being given to the correctness or incorrectness of the syllogism. The evidence derived from this study seems to indicate that the only circumstances under which these subjects were "logical" was when the correct conclusion was the one that coincided with their personal convictions.

A study to further investigate the findings reported by Morgan and Morton (1944), regarding errors in reasoning ability, was conducted by Henle and Michael (1956). As noted by Henle and Michael, Morgan and

Morton (1944) neglected to determine the attitudes of their subjects on the issues presented to them. Instead, Morgan and Morton (1944) made reference to "popular conviction" (p. 51), "prevalent opinion" (p. 47), and "popular feeling" (p. 50) without empirically establishing what their subjects' convictions, opinions, and feelings actually were. Experiment 1 consisted of subjects solving symbolic and popular form syllogisms by choosing the correct conclusion from a set of five possibilities. Then the subjects were asked to indicate their attitudes on the issues presented in the conclusion of the concrete syllogisms. The results of this experiment supported those of Morgan and Morton (1944). That is, significant differences were found between the choices subjects made for most of the two kinds of syllogisms. However, Experiment 1 failed to support the hypothesis that an individual's choice of conclusions in solving syllogisms is dictated by the attitudes held by each subject.

In Henle and Michael's (1956) second experiment, the popular syllogisms were made somewhat simpler and less cumbersome, and were concerned with communism, Russia, or related matters. After completion of the syllogisms the subjects were asked to indicate their attitude toward Russia on a seven-point scale. On the basis of this rating subjects were classified according to their views, that is, anti-Russian or neutral. It was not possible to obtain a pro-Russian group because so few subjects made a strong, positive rating. The proposition that the conclusion chosen would be dictated by the attitudes the subjects hold toward Russia was not supported. If some reliable and valid measure of Russian attitudes had been used,

possibly there would be a greater correspondance between the conclusions chosen and attitudes toward Russia. Nevertheless, anti-Russian and neutral subjects tended to select the same conclusions whether or not their convictions were compatible.

At the conclusion of their experiments, Henle and Michael (1956) concluded that attitudes do influence the reasoning process but not blindly, indifferent to the nature of the material as suggested by Morgan and Morton (1944). This statement was based on the finding that subjects' chosen conclusion, for the concrete syllogisms, did not correspond to the subjects' expressed attitude, nor did their choice correspond to the option chosen for the matched symbolic syllogism. Henle and Michael suggested that needs and attitudes operate in an interactive manner with cognitive processes, the resulting decision being dependent upon the nature of both processes in relation to one another. In a similar vein Bieri (1967) has agreed that our judgements are neither totally devoid of the influence of our feelings nor are they entirely subjugated by these feelings.

In a study conducted by Mason, Bramble, and Mast (1975) graduate students and dental students were asked to analyze three sets of syllogisms. The subjects were presented with symbolic syllogisms, syllogisms containing professional dental terms, and syllogisms composed of lay dental terms. There was no significant difference in performance for the two student types. A significant main effect was found for content which was attributed to higher scores on the shorter and more succinct symbolic content. It was concluded that conditional reasoning performance is not influenced by subjects' familiarity with

the content of the premises. However, the content of these syllogisms was not emotionally laden nor did they touch on any attitudes. If this had been the case, then as Feather (1964, 1967), Thouless (1959), Janis and Frick (1943), Morgan and Morton (1944), Lefford (1946), and Henle and Michael (1956) found, the content of the syllogisms may have influenced subjects' reasoning ability.

Two more recent studies have examined what has been come to be called the "belief-bias effect" in reasoning. The belief-bias effect refers to the notion that in evaluating arguments subjects make judgements based upon a priori beliefs rather than on the basis of logic. Revlin, Leirer, Yopp, and Yopp (1980) conducted a study in which they investigated the influence of knowledge on logic performance. Subjects were asked to judge the logical validity of emotionally neutral conclusions which were preceded by controversial premises in Experiment 1. In Experiment 2, subjects were requested to solve syllogisms which had conclusions that varied in their truth value. Upon examination of the results for the two experiments, these authors concluded that errors in reasoning are a result of "an interrupt to rational processes and reflect conflict between competing goals rather than a switch to irrational decision processes" (p. 584). It appears that preexisting beliefs can bias an individual's reasoning process, but the direction of such a bias is unknown at this point.

An investigation of the weighting people attach to logic and belief in syllogistic reasoning was conducted by Evans, Barston, and Pollard (1983). In each of their three experiments, subjects were

asked to determine if syllogisms were valid or invalid. The three experiments differed in the wording of the instructions to subjects, in order to clarify findings in the previous experiment and to control for response biases. In this study substantial belief biases were observed along with equally substantial effects of logic. That is, a conflict between logic and belief was observed in all three experiments. Consequently, it appears that individuals' responses will be influenced by their beliefs when placed in a situation where they are asked to be critical about information that contradicts a strongly held belief or attitude.

The effect of prior training

Some of the previous research on critical thinking has generally been deficient in considering the logic sophistication of participants before attempting to solve syllogisms. For example, in Feather's (1964, 1967) studies it is unclear in both articles whether or not subjects were given any basic introduction to the composition of a syllogism and if they were given any sort of practice with the syllogisms in order to familiarize them with the task. The "Reasoning Test" used (obtained by the present author from Feather) indicated that a very brief explanation was given to subjects with respect to the composition of a syllogism or "passage", how to judge the soundness of a passage (i.e., an argument is sound if the conclusion logically follows from the premises and is unsound if the conclusion does not logically follow), and that in each passage an argument is developed. It is believed that subjects were not acquainted with any of the precepts that underly logical analysis (e.g., terms such as

"premise", "conclusion", and "logically follows") and the "Reasoning Test" did not contain any filler items to remove the possibility of noise related to becoming familiar with a task never before performed. This criticism leads to the possibility that the results of Feather's studies may have been spurious. That is, the findings may have been due to erroneous understanding of the task (e.g., which of the statements or phrases are the premises and which are the conclusions) or errors in performance due to lack of practice on the "passages", rather than being attributable to the content of the syllogisms. This could be the reason why Feather's subjects only performed slightly better than chance.

Tasks that are not intrinsically easy to accomplish or require some sort of practice to adequately perform, should not be used as test materials, unless some sort of training or educational instruction has preceded these materials in order to accurately and clearly measure the subjects' performance on such material. Thorton and Zorich (1980) employed three training conditions in their study on the improvement of observation accuracy. This study found that the more information subjects were given regarding observation principles, the more accurate they were in their observations. Henle and Michael (1956) employed "full oral instructions on how to solve syllogisms" (p. 125) in Experiment 3. In comparison to Experiment 2 (which was the same as Experiment 3 except for this instruction) Experiment 3 resulted in substantially more correct solutions of concrete and symbolic syllogisms. "With clear and full instruction, subjects were able to solve the syllogisms correctly in more than 80 percent of the

cases" (Henle & Michael, 1956, p. 125). In previous studies that have used syllogisms as their primary method of assessment of logic ability, subjects received instruction regarding some of the rules necessary to solve syllogisms (e.g., Evans, Barston, & Pollad, 1983; Henle & Michael, 1956; Mason, Bramble, & Mast, 1975; Revlin, Leirer, Yopp, & Yopp, 1980; Thouless, 1959), sample syllogisms were presented (Henle & Michael, 1956; Mason, Bramble, & Mast, 1975; Thouless, 1959) or subjects were cautioned to respond to the syllogisms on the basis of logic alone (Evans, Barston, & Pollard, 1983; Mason, Bramble, & Mast, 1975).

In the Thouless (1959) study, he found that graduate students did not display the effects of prejudice on reasoning, in comparison to adult students. Graduate students performed as well as first year dental students on the three types of syllogisms (symbolic, those containing professional dental terms, and those containing lay dental terms) used in the Mason, Bramble, and Mast (1975) study. These studies seem to indicate that education may be a factor in moderating the influence of attitudes and prior knowledge on syllogistic evaluation.

One of the basic premises in psychology and education is that some measure should be instituted to avoid the possibility of errors occurring on a task due to the fact that subjects have never encountered the material before. In cognition experiments subjects are usually given a few trial runs through the task that they will be tested on, so that subjects understand the task and what is required of them. When subjects are given training or practice before the

actual test the scores that result tend to present a more accurate picture of the individuals' standing in the abilities under consideration (Anastasi, 1982). In Feather's (1964) study his subjects performed slightly better than chance. Thus some sort of logic training, which Feather is believed to have not used, may result in a greater number of syllogisms correct.

Hypotheses

In light of the preceding literature review and arguments presented, the following hypotheses are proposed:

1a) Pro and antireligious subjects will not differ in the number of errors made in evaluating the soundness of neutral syllogisms. Thus, no main effect is anticipated for religiosity for the dependent variable critical ability (i.e., the number of neutral syllogisms correct).

b) However, proreligious subjects will make more errors in analyzing the pro and antireligious syllogisms than the antireligious subjects, because the former group is expected to be more homogeneous and religiously biased. This is hypothesized in light of the pilot work by the present author. When the Christian Orthodoxy Scale (Fullerton & Hunsberger, 1982) was administered to a sample similar to that in the present study, it was found that a relatively large number of individuals were clustered near the top of this scale, whereas antireligious individuals were much more dispersed throughout the bottom half of the scale. Feather (1964, 1967) also found his proreligious subjects to be more homogeneous and religiously biased than the antireligious subjects.

Consequently, a main effect for religiosity is anticipated for the three dependent variables: number of proreligious syllogisms correct, number of antireligious syllogisms correct, and religious bias score (i.e., the number of proreligious syllogisms marked sound plus the number of antireligious syllogisms marked unsound). Subjects who are primed with a critical orientation will make fewer errors overall than the neutral group, which in turn will make fewer errors than the religious orientation group. The neutral group will make more errors on the syllogisms than the critical priming group because as Feather (1964, 1967) has shown, pro and antireligious attitudes appear to be the salient or dominant factor that the former group will respond to. However, the neutral group is expected to perform better on the religious syllogisms than the religious priming group. In both of these groups proreligious individuals will respond to the religious syllogisms with a proreligious bias and the antireligious subjects will respond to the same set of syllogisms with a weaker bias, but in an antireligious direction. This should lead the religious priming subjects to react more strongly to the content of the religious syllogisms than the neutral condition subjects because religiosity will be made experimentally more salient for the religious orientation subjects. This is expected to result in a main effect for priming condition for the four dependent variables (critical ability, number of proreligious syllogisms correct, number of antireligious syllogisms correct, and religious bias score).

3 Subjects who are given a brief introduction to logic will make fewer errors on the syllogisms than subjects not given such training. A main effect for training condition is thus anticipated for the four dependent variables.

4 The control or neutral condition subjects should replicate the findings of Brown (1962), Feather (1964, 1967), and Thouless (1935, 1959). Specifically, the proreligious subjects (in the neutral condition) should produce (a) a negative correlation between religious bias scores and the number of neutral syllogisms correctly answered (i.e., critical ability), (b) a positive correlation between religious attitude (i.e., subjects' responses to the religious conclusions) and religious bias scores, and (c) a negative correlation between religious attitude and critical ability. Results for the antireligious subjects in the same condition should produce (a) a negative correlation between religious bias scores and critical ability, (b) a negative correlation between critical ability and religious attitude, and (c) a positive correlation between religious attitude and religious bias scores.

Thus, the hypotheses suggest that there will be significant main effects for religiosity, priming condition and training condition for the four dependent variables (critical ability, number of proreligious syllogisms correct, number of antireligious syllogisms correct, and religious bias score). On the basis of these hypotheses and the literature reviewed, no interactions among the three variables are anticipated.

Further expectations

When Pearson correlations are used to compare subjects' religiosity scores, as determined by the Christian Orthodoxy Scale (Fullerton & Hunsberger, 1982) and subjects' overall scores for responses to the religious conclusions (Feather, 1964, 1967), it is anticipated that no significant correlation will be found between these two measures of religiosity. This is proposed for two reasons. First, the Christian Orthodoxy Scale (Fullerton & Hunsberger, 1982) is an established, reliable, and valid measure of religiosity, whereas the psychometric properties of responses to the religious conclusions are not known. Secondly, the Christian Orthodoxy Scale will be administered prior to subjects encountering consistent or contradictory religious statements, whereas subjects will respond to the conclusions of the religious syllogisms after encountering pro and antireligious statements. Batson (1975) found that when contradictory religious information is presented to religious subjects, polarization of attitudes results.

Method

Subjects

Students enrolled in introductory psychology at Wilfrid Laurier University were asked to voluntarily complete the Christian Orthodoxy (CO) Scale (Fullerton & Hunsberger, 1982) during regular class time. Five hundred and seven subjects signed a sign-up sheet distributed at that time. Attempts were made to contact 172 proreligious and 160 antireligious subjects from this group, for the experimental phase of

this study. Of these, 104 pro and 109 antireligious subjects agreed to participate. Eighty pro and 90 antireligious subjects appeared for their appointment and sucessfully completed the experimental part of the study. For data analysis purposes, some respondents were randomly eliminated such that 144 subjects were selected to equate the number of subjects in each of the 12 cells (n = 12). Subjects scoring in approximately the top one third of the frequency distribution of the CO Scale scores comprised the proreligious group, and those scoring in the bottom one third of the distribution comprised the antireligious group. For the antireligious group, the scores ranged from 26 to 122 and the scores for the proreligious group ranged from 152 to 168. Possible scores on this measure of religiosity ranged from 24 to 168.

Subjects participating in this study were from a Western religious culture, namely a Catholic or Protestant background. All were either raised in such a culture or now identified themselves as a member of one of the Christian religious groups. Other subjects were eliminated from the analyses.

Design

There were three between subjects factors in the study: priming orientation, religiosity, and training. There were three levels of the first factor: critical priming, religious priming, and neutral priming. Religiosity was defined by two levels, proreligious and antireligious. Training consisted of two levels, those who received logic instruction and those who did not (see Figure 1). Dependent variables included the number of neutral syllogisms correctly identified as sound and unsound (critical ability) and this was

TRAINING

		Logic		None	
		RELIGIOSITY			
		Pro	Anti	Pro	Anti
PRIMING CONDITION	Critical Priming	Females=6 Males=6	Females=6 Males=6	Females=7 Males=5	Females=6 Males=6
	Religious Priming	Females=6 Males=6	Females=6 Males=6	Females=8 Males=4	Females=6 Males=6
	Neutral Priming	Females=7 Males=5	Females=6 Males=6	Females=7 Males=5	Females=6 Males=6

Figure 1. Design of the study

further broken down by the content of the religious syllogisms (proreligious and antireligious). Also, a religious bias score (the number of proreligious syllogisms marked sound plus the number of antireligious syllogisms marked unsound) was used as a dependent variable. Feather (1964, 1967) refered to this score as the syllogism evaluation score.

Seventy-two proreligious and 72 antireligious subjects were randomly assigned to the critical priming, religious priming, and neutral or control condition. Half of the pro and antireligious subjects were given a brief introduction to logic and the other half of the subjects did not receive any sort of logic training. An unsucessful attempt was made to have an equal number of males and females in each cell.

To determine the effect of the three independent variables on the four dependent variables, analysis of variance, a priori contrasts, and Pearson correlations were employed. Analysis of covariance was also calculated for the covariates (a) prior logic training and (b) sex of the subjects, for each of the four dependent variables.

Materials

Religiosity of each subject was determined in two ways. First, the CO Scale (Fullerton & Hunsberger, 1982, see Appendix A, questions 2-25) was administered. This scale consists of 24 items related to specific religious beliefs. An equal number of items are worded negatively and positively. All scores were converted from a -3 to +3 format, to a 1 to 7 scale. The range of possible scores on this scale is thus 24 to 168. Further description of the scale, scoring

procedures, and its rationale can be found elsewhere (Fullerton & Hunsberger, 1982).

The CO Scale has been found to have strong psychometric properties (Fullerton & Hunsberger, 1982). Through factor analysis a single factor was found which accounted for a large proportion of the total test variation (69.1%). The mean inter-item correlations were high (.67), Cronbach's alpha was .98, and the 24 items of the scale usually loaded higher than .70 on the single factor. Thus, this test of Christian orthodoxy appears to have good reliability and validity for the tested sample of university students who are very similar to the subjects to be tested in the present study.

Religiosity was also determined after the completion of the syllogisms (i.e., the experimental session). Subjects were asked to indicate the degree to which they agree or disagree (from strongly agree (+3) to strongly disagree (-3)) with the conclusions of the religious syllogisms (see Appendix F), in order to replicate Feather's (1964, 1967) measure of religiosity. All scores were converted to a 1 to 7 scale, resulting in a possible range of 20 to 140. Subjects' responses to each religious conclusion were then summed to obtain an overall score for this measure. According to the CO Scale division of religious subjects, the range for proreligious subjects' scores was from 90 to 140 and the range for antireligious subjects' scores was from 43 to 116 for this second measure of religiosity. Therefore, there was some overlap between these two groups. Fourteen subjects classified as antireligious scored higher than 90.

In the same survey booklet as the CO Scale there appeared some

questions related to another study. These items included the Right-Wing Authoritarianism scale (Altemeyer, 1981) (see Appendix A, questions 26-55) and the Dogmatism scale (Rokeach, 1960) (see Appendix A, questions 56-75). The use of these questions related to topics other than religion, helped to disguise the CO Scale, such that when subjects were later contacted for the second part of the study they were hopefully less inclined to recall the religious content of the questionnaire if it was masked by other topics. There were also some background information questions (see Appendix A, Part II).

During the subsequent testing sessions, all subjects were given 31 fairly difficult syllogisms to analyze in the "Reasoning Test". Difficult syllogisms were used to maximize the possibility that subjects would increase or decrease the number of syllogisms answered correctly, depending on their critical or religious orientation. For example, the following syllogism would be classified as "easy":

PREMISE	ALL As ARE Bs	
PREMISE	ALL Bs ARE Cs.	
CONCLUSION	THEREFORE, ALL As ARE Cs	(LOGICALLY SOUND)

That is, most subjects would analyze the syllogisms solely on the basis of logic since this form is very easy to analyze in comparison to that which was used in this study. The following is an example of a more difficult syllogism of the type that was used in this study:

PREMISE	All members of the finance committee are members of the executive committee.	
PREMISE	No members of the library committee are members of the executive committee.	
CONCLUSION	Therefore no members of the library committee are members of the finance committee.	(LOGICALLY UNSOUND)

Thirty-three concrete syllogisms (i.e., 31 syllogisms in the "Reasoning Test" plus 2 "training" syllogisms) were derived from those used by Feather (1964, 1967). In his study, Feather used 24 religious syllogisms, 12 with a proreligious conclusion and 12 with an antireligious conclusion. Ten of the proreligious and 10 of the antireligious syllogisms were used in the present study. Thirteen of Feather's 16 neutral syllogisms were also used, 2 in the logic training condition, and 11 in the final test (i.e., "Reasoning Test"). The first syllogism in the test booklet, which was neutral, was simply used to orient the respondents to the task. Thus, for data analysis, there were 10 proreligious, 10 antireligious and 10 neutral syllogisms. For each of the three types of syllogisms, half contained sound arguments (i.e., the conclusion logically follows from the premises) and the other half unsound arguments (i.e., the conclusion does not logically follow from the premises) (see Appendix E for the syllogisms used). The three types of syllogisms were matched for length of argument (i.e., approximately the same number of words) and for logical form (i.e., if and only if, then ...; A=B, B=C, therefore A=C; etc.) to control for "atmosphere effect" (Woodworth & Sells, 1935). Atmosphere effect refers to the bias to choose a particular conclusion because of its syntactic features with the premises, regardless of the validity of the syllogism.

Half of the subjects were familiarized with the logic task by giving them two syllogisms (1 sound and 1 unsound) to analyze. Then two of the three priming groups (critical and religious) engaged in a priming task which involved a brief questionnaire. The critical

orientation group was given 20 statements related to their attitudes on critical thinking, logic, and reasoning ability (see Appendix C). The religious orientation group of subjects was given 20 statements related to their religious beliefs and attitudes (see Appendix D). The control group was given a list of 20 neutral statements which were of a political nature (see Appendix E). For the three different tasks, subjects were asked to indicate the extent to which they agreed or disagreed with the statements.

Upon completion of the syllogism task, all subjects were asked to respond to 20 statements about the study (see Appendix H). These questions consisted of 8 statements regarding the subjects' perceptions as to the purpose of the study. In addition, 10 statements were used to ascertain if the subjects believed that their analysis of the syllogisms was influenced in any way by the priming questionnaire, the content of the syllogisms, and the logic instruction and how they analyzed the syllogisms. Finally, 2 additional questions were included to determine (a) how hard subjects felt they had attempted to complete the syllogisms, and (b) how seriously they took the study.

Procedure

The study was conducted in two phases. The first part of the study (the "survey") was administered by Experimenter A (Dr. Bruce Hunsberger) and two assistants. The present author (Experimerter B) administered the second (experimental) phase of the study. Two experimenters were utilized so that subjects would be unlikely to make an association between the two parts of the study.

Survey (Phase I). In the first phase four introductory psychology classes were given a questionnaire during regular class time. It contained the CO Scale, items related to another study, and background information (see Appendix A for the questionnaire and Appendix B for the instructions for both phases of the study). Background information questions asked subjects to indicate their sex, age, which religious group they were raised in, with which religious group they presently identified themselves, if they had taken a logic course, if in that course they had any exposure to syllogisms, and finally, to rate their logic ability. Three other general background questions were added to disguise the logic questions. These asked whether subjects live at home, how many siblings they grew up with, and their political affiliation. Respondents were also asked to write down their name, phone number, and booklet number, on sign-up sheets that were passed around, if they were willing to participate in another study. This was necessary in order to match responses on this questionnaire to the data collected in the second phase of the study. Completion of the entire questionnaire took approximately 10 to 20 minutes.

Experimental session (Phase II). Willing and eligible (in terms of their CO score) subjects were contacted within 4 to 6 weeks after the administration of the first questionnaire, by phone, to arrange a time for their participation in the second phase of the study. Within 1 week of being contacted, subjects participated in the second phase, having been randomly assigned to one of the three groups (critical priming, religious priming, or neutral priming condition). Groups of

1 to 9 people were run together in a research room. The session began, "This study will consist of 4 questionnaires that you will be asked to complete. I think you will find the content interesting, and you should be able to complete the entire study in less than an hour. Later on I will pass around an attendance sheet on which you should print your name and questionnaire number. Your four questionnaires will have the same red number on them which is located in the upper right hand corner on the first page of each questionnaire. Your individual responses will be kept in the strictest confidence. The sheet that contains your name and survery number will never be kept in the same location as your questionnaire, in order to ensure confidentiality of your responses. The information obtained will be analyzed on a group basis only." (see Appendix B).

Priming. The appropriate priming questionnaire (critical, religious, or neutral) was then administered (see Appendix C, Appendix D, and Appendix E). This manipulation was used to insure that subjects would analyze the syllogisms according to the specific priming used for each of the three different groups. The control group's task was utilized such that all subjects in the logic training condition began their analysis of the crucial syllogisms at the same time. This procedure also insured that the three priming conditions not given logic training, began the analysis of the 31 syllogisms at about the same time. It took subjects between 5 and 10 minutes to complete their priming task.

Logic training session. Half of the subjects in each priming condition were shown 2 neutral syllogisms (1 sound and 1 unsound) via

an overhead projector, to introduce them to some of the basic concepts in logic which are important to the analysis of the syllogisms. The other half of the subjects, who did not receive any sort of logic training, proceeded to evaluate the 31 syllogisms following the completion of the priming task.

The two syllogisms in the training session were:

STATEMENT 1 All poets die young,
STATEMENT 2 but many professors are old,
CONCLUSION so we can conclude that not all professors are poets.
(LOGICALLY SOUND)

STATEMENT 1 There is no doubt that some drugs are poisonous.
STATEMENT 2 All brands of beer contain the drug, alcohol.
CONCLUSION Therefore, some brands of beer are poisonous.
(LOGICALLY UNSOUND)

Prior to the presentation of these two syllogisms, a more general overhead was used to illustrate the composition of syllogisms:

STATEMENT 1

STATEMENT 2

CONCLUSION

Subjects were then instructed to analyze the syllogisms as follows: "In order to prepare you for the reasoning task, I would like to introduce you to the kind of material you will be dealing with. You will be given a series of passages. In each passage an argument is presented. These arguments are composed of 3 statements. The first 2 statements are followed by a third statement which is the conclusion of the argument. The conclusion of an argument is a statement which is either affirmed or not affirmed on the basis of the 2 preceding statements of the argument. These preceding statements provide

evidence or reason for accepting the conclusion. In the first argument you can see that "All poets die young" and "but many professors are old" are the first 2 statements of that argument. This is followed by "so we can conclude that not all professors are poets". which is the conclusion of this argument."

"An argument is logically sound if the conclusion logically follows from the 2 preceding statements, regardless of the actual content of the 3 statements. The first argument is logically sound because the conclusion does follow from the 2 preceding statements in the argument."

"An argument is logically unsound if the conclusion does not follow from the 2 preceding statements, again, regardless of the actual content of the 3 statements. The second argument (it was read aloud by the experimenter) is logically unsound because the conclusion does not follow from the first 2 statements in the argument. Just because <u>some</u> drugs are poisonous does not mean that the <u>specific</u> drug mentioned in the second line of this passage, is poisonous That is, whether alcohol <u>is</u> or <u>is not</u> poisonous does not matter here. What is important is the logical progression from the first two statements to the conclusion."

"When you analyze an argument, keep in mind that you can say that an argument is logically sound or logically unsound without committing yourself to the content of the argument. That is, an argument could be sound even though you personally might disagree with one or more of the statements. What is important is whether or not the logic is sound, <u>not</u> whether you personally agree or disagree with the issue at

hand" (see Appendix B). The reason for the latter set of instructions was to impress on the subjects that they did not have to agree with each statement in the argument but that they were to determine if it is sound or unsound on the basis of logic alone. These instructions were taped and played by the experimenter, who gave subjects the opportunity to ask questions before proceeding with the main task. This part of the study lasted approximately 5 minutes.

General instructions. After completion of the priming tasks, for subjects in the no logic training condition or after the logic instruction for those in the logic training condition, all subjects were given the 31 syllogisms (10 proreligious, 10 antireligious, and 11 neutral) to analyze, always in the same order, previously determined by random assignment. The following instructions were then read to all subjects: "This part of the study involves your analysis of some arguments. You should spend approximately 1 minute on each passage. Please follow along as I read the instructions on the front of this booklet." Then instructions on the front of the booklet (see Appendix F) were read aloud, indicating that the subjects were to determine if an argument was logically sound or logically unsound. In addition, the experimenter said: "You may or may not agree with one or more of the statements in the argument. What is important is to determine whether the argument is logically sound or logically unsound." Subjects then proceeded to analyze the syllogisms. It took the subjects approximately 15 to 25 minutes to complete all 31 syllogisms. Upon completion of the syllogism task, they were asked to indicate the degree to which they agreed or disagreed with the

conclusions of the religious syllogisms (see Appendix G). Then they responded to some questions to ascertain how subjects perceived the study and the syllogisms (see Appendix H). These latter two tasks both required about 5 to 10 minutes to complete. Finally, subjects were informed of the purpose of the study and that they would receive further information on the study at a later time (see Appendix I).

Results

Only analyses essential to the examination of Hypotheses 1, 2, 3, and 4, and a few other concerns, are reported in this section. Some of the tabular material has been reported in Appendix J. More exploratory and supplemental analyses are reported in Appendix K. In order to test Hypotheses 1, 2, 3, and 4, and the other concerns the data were subjected to extensive analysis. Since such thorough analysis of the data was conducted caution must be emphasized because some of the findings might be the result of chance.

To test Hypotheses 1, 2, and 3, a 3 × 2 × 2 factorial analysis of variance (ANOVA) and a priori contrasts were calculated for each of the four dependent variables: (a) number of neutral syllogisms correct (critical ability); (b) number of proreligious syllogisms correct, (c) number of antireligious syllogisms correct, and (d) the number of proreligious syllogisms marked sound plus the number of antireligious syllogisms marked unsound (religious bias score). The independent variables were (a) religiosity (pro versus antireligious), (b) priming condition (critical, religious, or neutral), and (c) logic training condition (logic versus no logic training). The three a priori contrasts that will be presented in each ANOVA table will be used to

determine: (a) the effect of the priming treatment (i.e., neutral versus critical and religious priming); (b) the difference between priming treatments (i.e., critical versus religious priming); (c) the difference between religious groups (i.e., pro versus antireligious subjects); and (d) the difference between training conditions (i.e., logic versus no logic) on subjects' analysis of the syllogisms.

For the dependent variable critical ability, a main effect emerged for training condition, $F(1,132) = 6.47$, $p < .01$ (see Table 1, Appendix J for the relevant ANOVA). The mean scores and standard deviations for this analysis, reported in Table 1, indicate that subjects in the logic training condition ($M = 6.24$) answered more of the 10 neutral syllogisms correctly than subjects in the no logic training condition ($M = 5.60$).

Insert Table 1 about here

A three-way interaction of religiosity, condition, and training condition was found, $F(1,132) = 6.04$, $p < .05$, for the dependent variable number of proreligious syllogisms correct (the relevant ANOVA, mean scores and standard deviations can be found in Appendix J, Table 2 and Table 3), indicating that the combination of these three factors did influence subjects' responses to the proreligious syllogisms (see Figure 2). Examination of Figure 2 shows that antireligious subjects in the neutral, no logic training condition scored the highest on the proreligious syllogisms, whereas proreligious subjects in the neutral, no logic training condition scored the lowest. The other six groupings of subjects (i.e.,

Table 1

Mean Scores and Standard Deviations for Critical Ability

Condition	Training condition: Logic M	Logic SD	No logic M	No logic SD
Proreligious (n = 12)				
Critical priming	5.92	1.83	5.17	1.34
Religious priming	5.67	.98	5.75	1.22
Neutral priming	6.42	1.24	5.75	2.38
Adjusted values (neutral)			9.20	3.81
Feather's (1964) study			11.76	1.88
Feather's (1967) study			12.10	2.09
Antireligious (n = 12)				
Critical priming	6.50	1.83	5.17	1.59
Religious priming	6.25	1.42	5.67	1.50
Neutral priming	6.67	.89	6.08	1.24
Adjusted values (neutral)			9.73	1.98
Feather's (1964) study			12.50	1.72
Feather's (1967) study			12.50	1.86

Note. The mean scores and standard deviations for subjects in the neutral, no logic condition, were adjusted to be proportional to the results obtained by Feather (1964, 1967). The original score was multiplied by 16 (the number of neutral syllogisms used by Feather) and then divided by 10 (the number of neutral syllogisms used in the present study).

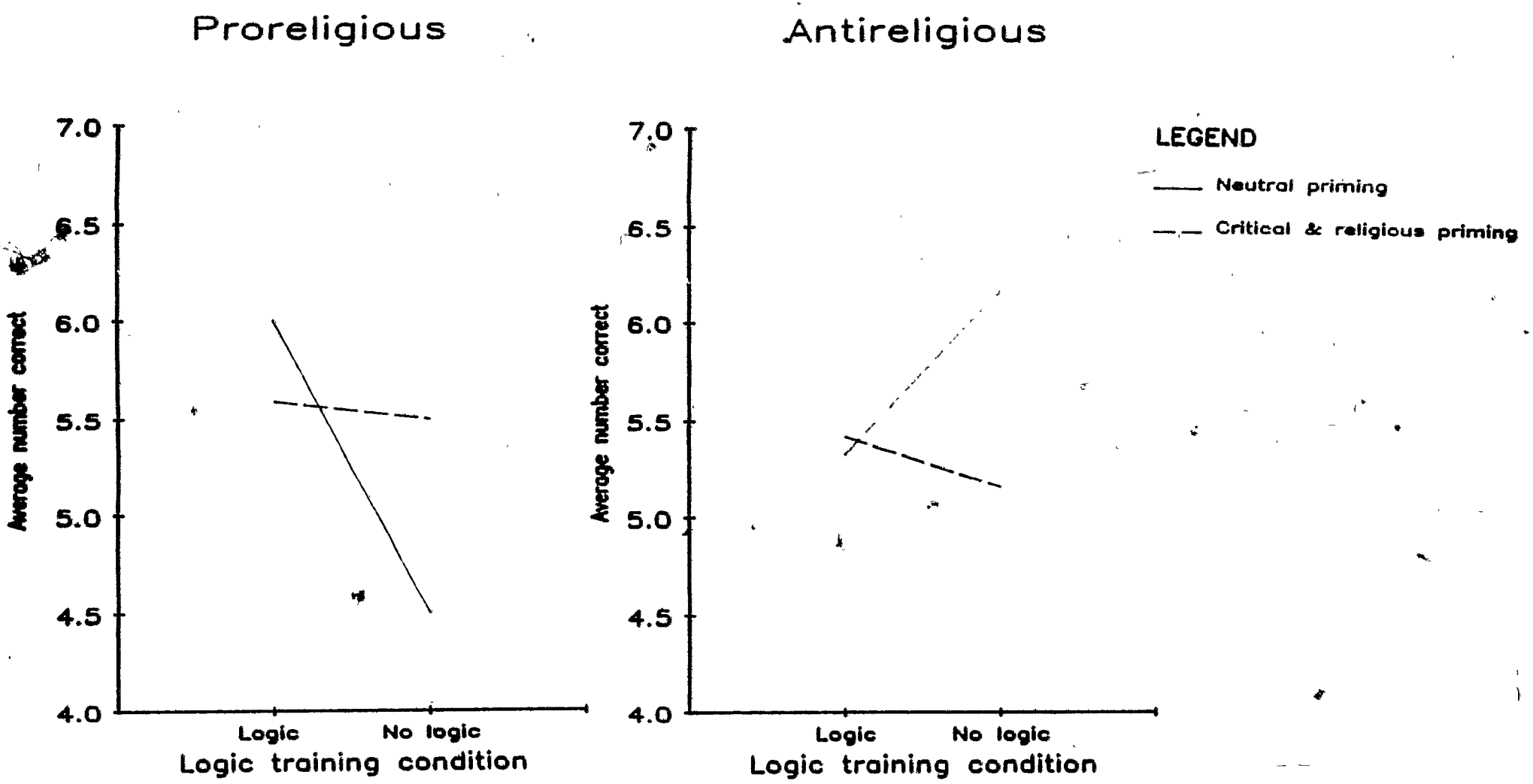

Figure 2. Three-way interaction for proreligious syllogisms

proreligious, neutral, logic; proreligious, critical and religious priming, logic; proreligious, critical and religious priming, no logic; antireligious, neutral, logic; antireligious, critical and religious priming, logic; antireligious, critical and religious priming, no logic) scored approximately the same and fell in between the antireligious, neutral, no logic training condition subjects and the proreligious, neutral, no logic training subjects.

There was a main effect for the priming condition variable, $F(1,132) = 7.41$, $p < .01$, (see Appendix J, Table 4 for this ANOVA and Table 5 for the mean scores and standard deviations), when the dependent variable was the number of antireligious syllogisms correct. This significant effect apparently was the result of the superior performance by subjects in the neutral condition ($M = 6.00$) since they answered more of the antireligious syllogisms correctly than subjects in the critical and religious priming condition ($M = 5.32$).

The ANOVA and a priori contrasts for the dependent variable religious bias score, are presented in Appendix J, Table 6. Table 2 reports the mean scores and standard deviations for this analysis. No significant effects were found for this dependent variable, although the variable religious attitude did approach significance, $F(1,132) = 3.29$, $p < .07$. Proreligious subjects ($M = 11.69$) marginally tended to mark more of the proreligious syllogisms sound and antireligious syllogisms as unsound in comparison to the antireligious subjects ($M = 10.99$).

Insert Table 2 about here

Table 2

Mean Scores and Standard Deviations for Religious Bias Score

Condition	Training condition: Logic M	Logic SD	No logic M	No logic SD
Proreligious				
Critical priming	11.08	2.84	12.08	3.26
Religious priming	11.50	1.98	12.00	2.45
Neutral priming	11.00	1.76	12.50	2.84
Adjusted values (neutral)			15.00	3.41
Feather's (1964) study			14.11	2.30
Feather's (1967) study			13.97	3.39
Antireligious				
Critical priming	11.58	2.02	11.00	1.81
Religious priming	11.00	1.60	10.83	2.52
Neutral priming	10.75	2.49	10.75	1.91
Adjusted values (neutral)			12.90	2.30
Feather's (1964) study			12.12	1.75
Feather's (1967) study			12.90	1.45

Note. The mean scores and standard deviations for subjects in the neutral, no logic condition, were adjusted to be proportional to the results obtained by Feather (1964, 1967). The original score was multiplied by 24 (the number of religious syllogisms used by Feather) and then divided by 20 (the number of religious syllogisms used in the present study).

Two analyses of covariance were performed, one to remove the effect of the covariate sex and the other to remove the effect of the covariate prior logic instruction and/or prior exposure to syllogisms, for each of the four dependent variables. In each of these eight analyses, the covariate was not significant (see Appendix K, Table 2 to Table 9).

The religious bias score measures the direction and degree of subjects' bias without regard to correctness. The range for this score is from 0 to 20. A score of 10 could mean that 5 of the proreligious were marked sound and 5 of the antireligious syllogisms were marked unsound, regardless of correctness. If the 5 proreligious syllogisms marked sound were actually sound and the 5 antireligious syllogisms marked unsound were actually unsound, again a score of 10 would result. Since this score does not provide information about the accuracy of responses it was decided, post hoc, to compute a proreligious error score (the number of proreligious syllogisms incorrectly marked sound plus the number of antireligious syllogisms incorrectly marked unsound) and an antireligious error score (the number of antireligious syllogisms incorrectly marked sound plus the number of proreligious syllogisms incorrectly marked unsound) in order to interpret the religious bias score findings more accurately.

A marginally significant two-way interaction was found for the religiosity by logic training condition, $F(1,132) = 3.28$, $p < .07$, for the proreligious error score (the ANOVA, mean scores and standard deviations for this analysis have been reported in Appendix J, Table 7 and Table 8). It was found that proreligious subjects in the no logic

training condition (M = 5.81) marginally tended to have a higher proreligious error score than antireligious subjects in the no logic condition (M = 4.94), and antireligious subjects in the logic condition (M = 5.08) marginally tended to score higher than the latter group but lower than the former, whereas proreligious subjects in the logic condition (M = 4.86) marginally tended to have the lowest proreligious error score (see Figure 3). Examination of Figure 3 seems to indicate that proreligious subjects in the no logic training condition marginally tended to have the highest proreligious error score. Pro and antirelious subjects in the logic training condition as well as antireligious subjects in the no logic training condition, scored approximately the same for this error score. These three groupings of subjects did not have as high a proreligious error score as proreligious subjects in the no logic training condition.

There were no significant results for the antireligious error score. In Appendix J, Table 9 presents the ANOVA table for the dependent variable antireligious error score, whereas Table 10 displays the mean scores and standard deviations for this analysis.

Table 3 presents the intercorrelations among religious bias scores, critical ability, CO scores, and subjects' responses to the religious conclusions. These correlations were first calculated for all subjects (N=144) (see Table 3), then broken down according to religiosity (see Table 4), priming condition (see Table 5), and training condition (see Table 6). Finally the correlations were divided according to combinations of these three factors (see Table 7, for the neutral, no logic training condition subjects; see Table 11 to

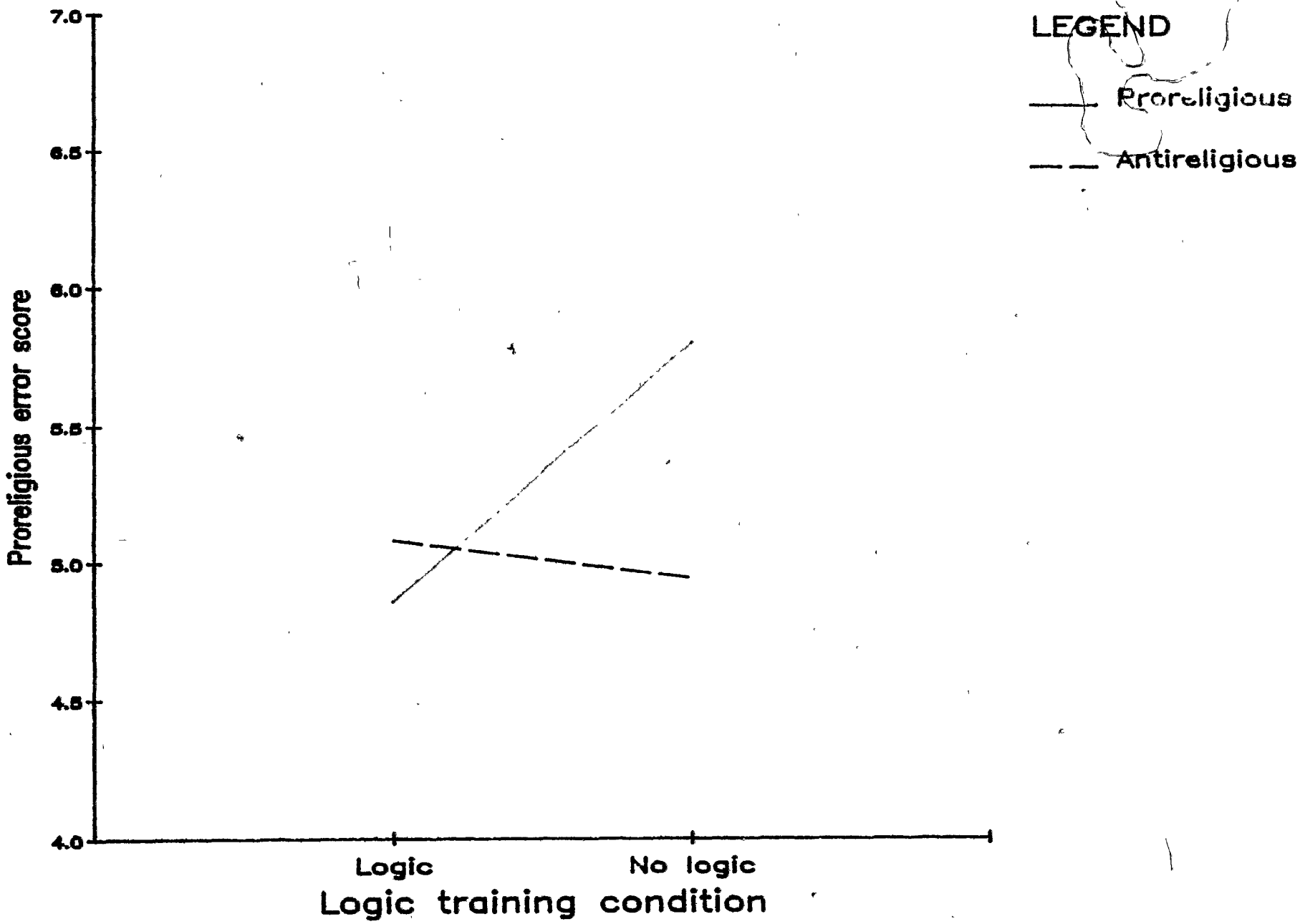

Figure 3. Two-way interaction for the proreligious error score.

15, Appendix J for the other subgroups).

Insert Table 3 to 7 about here

Table 7 indicates the correlations used to assess Hypothesis 4. The correlations correspond to pro and antireligious subjects in the neutral, no logic training condition. The correlations obtained by Feather (1964, 1967) have also been presented in this table. Caution should be exercised when comparing the results obtained from this study with Feather's (1964, 1967) studies since religiosity was determined differently in the different research projects.

In addition to the anaylses performed a priori, concern about the spread of CO scores suggested conducting a post hoc analysis, namely homogeneity of variance, for pro and antireligious subjects' CO scores. It was found that proreligious subjects were more homogeneous than antireligious subjects in their religious attitudes, F (71,71) = 30.67, $p<.001$.

The final analyses that were performed consisted of frequency distributions and four ANOVAs. The purpose of these analyses was primarily to determine if the manipulations were successful (see Appendix H for the questions these analyses were based on). Frequency distributions for all subjects (N = 144) have been reported in Appendix J (see Table 16 to Table 18). Frequency distributions were also broken down by combinations of the three factors, religiosity of subjects (pro versus anti), priming condition (critical, religious or neutral), and training condition (logic versus no logic) for the 12 cells (see Appendix K, Table 10 to Table 24).

Table 3

Intercorrelations of Scores for all Subjects (N=144)

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Religious bias score	-.24**	+.16*	+.23**
Critical ability	- -	-.10	-.14
Christian Orthodoxy		- -	+.90***
Religious conclusions			- -

***p<.001 **p<.01 *p<.05

Table 4

Intercorrelations of Scores by Religiosity

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Proreligious subjects (n = 72)			
Religious bias score	-.42**	+.07	+.29*
Critical ability	- -	-.09	-.12
Christian Orthodoxy		- -	+.46**
Religious conclusions			- -
Antireligious subjects (n = 72)			
Religious bias score	+.03	+.06	+.10
Critical ability	- -	-.05	-.13
Christian Orthodoxy		- -	+.73**
Religious conclusions			- -

**p<.001 *p<.01

Table 5

Intercorrelations of Scores by Priming Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Critical priming (n = 48)			
Religious bias score	-.12	+.10	+.10
Critical ability	- -	-.10	-.15
Christian Orthodoxy		- -	+.87***
Religious conclusions			- -
Religious priming (n = 48)			
Religious bias score	-.31*	+.23	+.33**
Critical ability	- -	-.10	-.13
Christian Orthodoxy		- -	+.92***
Religious conclusions			- -
Neutral priming (n = 48)			
Religious bias score	-.32**	+.15	+.29*
Critical ability	- -	-.11	-.20
Christian Orthodoxy		- -	+.91***
Religious conclusions			- -

***p<.001 **p<.01 *p<.05

Table 6

Intercorrelations of Scores by Training Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Logic training (n = 72)			
Religious bias score	-.18	+.04	-.03
Critical ability	- -	-.13	-.10
Christian Orthodoxy		- -	+.91**
Religious conclusions			- -
No logic training (n = 72)			
Religious bias score	-.26*	+.27*	+.43**
Critical ability		-.06	-.18
Christian Orthodoxy		- -	+.88**
Religious conclusions			- -

**p<.001 *p<.01

Table 7

Intercorrelations of Scores for Pro and Antireligious Subjects in the Neutral, No Logic Training Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Proreligious subjects (n = 12)			
Religious bias score	-.53* (-.24) [-.42]	+ 54*	+ 73** (+ 22) [- 07]
Critical ability	- -	- 65**	- 68** (+ 03) [- 14]
Christian Orthodoxy		- -	+ 58*
Religious conclusions			- -
Antireligious subjects (n = 12)			
Religious bias score	+ 01 (- 26) [+ 58]	- 33	+ 01 (+ 13) [+ 19]
Critical ability		- 05	- 14 (- 30) [+ 09]
Christian Orthodoxy		- -	+ 75**
Religious conclusions			- -

Note. **p < .01 *p < .05
The data in the round brackets is from Feather (1964) (N = 131 for proreligious subjects and N = 34 for antireligious subjects)
The data in the square brackets is from Feather (1967) (N = 30 for proreligious subjects and N = 10 for antireligious subjects)

The first frequency distribution corresponds to subjects' responses to six questions related to what they perceived the purpose of the study to be. From this frequency distribution it appears that 59% at least slightly agreed that the study was examining personality factors, whereas 75% believed that the study might be examining moral judgement, and 90% agreed at least slightly that the study involved an examination of the rationalizations that people make. Only 23% of the subjects agreed even slightly that the study was interested in people's awareness of political issues. Five percent indicated that they had no opinion on what the study was examining. Most of the subjects (83%) at least slightly agreed that the study was related to another study they had participated in.

Frequency of subjects' responses to items dealing with how they analyzed the syllogisms can be found in Table 17, Appendix J. Out of 144 subjects, the precentages that agreed at least slightly that their analysis of the syllogisms was influenced by (a) the instructions to evaluate the arguments on the basis of logic alone, (b) the wording of the statements, and (c) concepts presented in the nonreligious syllogisms, were 82%, 78%, and 64%, respectively However, most of the subjects (58%) felt that their analysis of the arguments was not influenced by the questionnaire filled out prior to their evaluation of the syllogisms. The percentage of subjects who even slightly disagreed that their analysis of the syllogisms was influenced by their (a) disagreement with the premise(s), (b) agreement with the premise(s), (c) disagreement with the conclusion, and/or (d) agreement with the conclusion were 74%, 91%, 54%, and 90% respectively.

The frequency distribution for the questions related to whether subjects felt they had tried very hard to complete the arguments or syllogisms and if they did not take the study very seriously has been presented in Appendix J (see Table 18). Almost all of the subjects (89%) indicated that they had tried very hard to complete the syllogisms. For the latter question, 88% indicated at least slightly that they did take the present study very seriously.

Finally, four ANOVAs were performed on questions 3, 4, 12, and 13 (see Appendix H) to determine if there were any main effects or interactions for these variables. Table 19 in Appendix J presents the ANOVA for question 3 (i.e., subjects' belief that the study dealt with religious attitudes). A main effect for condition was found. As can be seen by the mean scores and standard deviations (presented in Table 20 of Appendix J), subjects in the religious priming condition ($\underline{M}$ = 6.56) held this belief stronger than subjects in the critical priming condition ($\underline{M}$ = 5.91). Only the difference between the religious and critical priming condition was significant. The ANOVA, mean scores and standard deviations or subjects' belief that the study dealt with logical thinking or rational thought processes (question 4) have been presented in Appendix J, Table 21 and Table 22. No significant differences were found for this analysis. Examination of the ANOVA (Table 23 in Appendix J) and mean scores and standard deviations (see Appendix J, Table 24) related to the possibility that the proreligious content of the statements influenced subjects' analysis of the arguments (question 12), shows that no significant findings resulted. Similarly, when subjects were asked whether their evaluation of the

syllogisms was influenced by the antireligious content of the statements (question 13), the relevant ANOVA (see Table 25, Appendix J) revealed no significant results. The mean scores and standard deviations for this analysis have been reported in Table 26 of Appendix J.

Discussion

Hypothesis 1

Consistent with Hypothesis 1a, pro and antireligious subjects did not differ in the number of errors made when evaluating the logical soundness of the neutral syllogisms. Further, the correlations between critical ability and CO scores were nonsignificant for all subjects and within the two religiosity groups (pro and antireligious). It was expected that pro and antireligious subjects would not differ in their scores on the neutral syllogisms because the neutral syllogisms do not contain any religious connotations, thus there would be no reason for a biased response from religious individuals. These results are consistent with Feather's (1967) finding of no difference between pro and antireligious subjects for neutral syllogisms, but contridicts his (Feather, 1964) later finding that proreligious subjects made significantly more errors on these syllogisms.

There is some ambiguity in Feather's (1964, 1967) studies and in some other studies (e.g., Janis & Frick (1943), Lefford (1946), Morgan & Morton (1944)) regarding the use of the terms validity and soundness when analyzing syllogisms. According to Copi (1972) the two terms are not synonymous. However, in the forementioned studies the terms seem

to be used as if they were interchangable. This confusion might lead to other problems, such as an inappropriate interpretaton of the data because subjects analyze the syllogisms on the basis of soundness but what the investigator considers to be a correct response is based on validity.

An extension of Hypothesis 1a was that proreligious subjects would make more errors on the religious syllogisms, thus leading this group of subjects to obtain a higher religious bias score (Hypothesis 1b). This expectation was not supported. However, an unexpected three-way interaction appeared for the number of proreligious syllogisms correct. Since religiosity was one of the variables in this interaction, it did have an effect on their responses when incorporated with the variables priming and logic training condition. Antireligious subjects in the neutral, no logic training condition made the fewest errors on the proreligious syllogisms, whereas proreligious subjects in the neutral, no logic training condition made the most errors. All other groupings of subjects (proreligious, neutral, logic; proreligious, critical and religious priming, logic; proreligious, critical and religious priming, no logic; antireligious, critical and religious priming, logic; antireligious, critical and religious priming, logic; antireligious, critical and religious priming, no logic) scored approximately the same and between the above two groups. It appears as though the less religiously homogeneous group, namely the antireligous subjects, were less religiously biased than proreligious subjects when they were not given any priming nor any logic instruction.

Something happened to this group of subjects (i.e., antireligious, neutral, no logic training) such that logic instruction did not aid in improving their performance. Rather, this instruction appeared to have interfered with their logical analyses when compared to those who did not receive such instruction. This finding may be due to chance since there was such an extensive analysis of the data. Another possibility is that the prorelious syllogisms were so difficult to solve, that for antireligious subjects the logic instruction only aided in further confusing them as to what their task was when they were placed in the neutral priming condition. Thus, when no logic instruction was given, antireligious subjects in the neutral condition made fewer errors than all other groups.

It is difficult to say exactly what caused antireligious subjects in the neutral, no logic training condition to perform the best. Certainly, the present author would suggest that the influence of religious attitudes on logical analyses, and vice versa, is not as straight forward as originally anticipated. If a proreligious person responds to a proreligious syllogism this does not necessarily mean that this individual will totally disregard her beliefs and respond in a logical manner nor does it imply that she will respond solely on the basis of her religious beliefs. Henle and Michael (1956) may have been correct when they stated that the response an individual settles upon depends on the nature of both processes and their relationship to one another. The response will depend on the interaction of both processes and not one process in isolation negating the influence of the other.

Inconsistent with Hpothesis 1b, no difference was found between the two religious groups for their analysis of the antireligious syllogisms. These findings are generally consistent with Feather's (1964, 1967) studies in which pro and antireligious subjects were not found to differ on the number of errors made on the pro and antireligious syllogisms (i.e., the religious syllogisms were not separated in his analysis, pro versus antireligious, as in this study).

Possibly Feather (1964, 1967) found no difference between pro and antireligious subjects' scores on the religious syllogisms because the antireligious subjects were as biased as the proreligious subjects, but in opposite directions. This would cancel out the effect of religiosity since both groups would respond in a polarized (but opposite) manner to one another, resulting in both groups making the same number of errors on both types of religious syllogisms. This does not appear to be totally plausible since proreligious subjects were found to be more homogeneous or polarized in their religious attitudes than antireligious subjects in both of Feather's (1964, 1967) studies and in this study. Thus, because proreligious subjects were found to be more polarized on the CO Scale this group would be expected to be more extreme in their responses. However, this was not found. The relationship between religiosity and critical ability is apparently not the simple linear relationship originally anticipated. The influence of religious attitudes may not necessarily interfere with logical reasoning. The two processes may interact in ways that are not apparent in this kind of study.

Part of Hypothesis 1b dealt with the religious bias score. Feather (1964) found that proreligious subjects had a higher religious bias score than antireligious subjects. The correlation between religious bias scores and CO scores was not significant for either the pro or antireligious subjects. The analysis of variance for religious bias score indicated a marginal tendency in the same direction in this study as was found in Feather's earlier study. The religiosity by logic training condition interaction, for the proreligious error score, indicated that proreligious subjects in the no logic training condition marginally tended to have the most difficulty in overcoming their proreligious biases when responding to the pro and antireligious syllogisms.

According to Hypothesis 1b, it was anticipated that proreligious, in comparison to antireligious subjects, would make more errors on the religious syllogisms because they were expected to be more polarized on the CO Scale and consequently more religiously biased. Hypothesis 3 predicted that subjects in the no logic training condition would not perform well on the pro and antireligious syllogisms because they were not afforded as much information on how to conduct logical analyses as subjects in the logic training condition. Consequently, proreligious subjects in the no logic training condition marginally tended to have the highest proreligious error score. Since this interaction only approached significance and because subjects did not score well above chance, this finding may be the result of chance.

The antireligious subjects' CO scores were more dispersed and less polarized on the CO Scale than proreligious subjects' scores. In

fact, some of the subjects in the antireligious group actually had mildly proreligious CO scores (i.e., antireligious scores as defined in this study ranged as high as 122 when the "neutral" point on the scale is 96). In addition, when CO scores were compared to subjects' responses to the religious conclusions it was found that 14 subjects classified as "antireligious" in this study would have been designated as proreligious by Feather. This complicates the results. Thus, it is conceivable that a significant difference might have been found between the two religious groups on the religious syllogisms and the religious bias score (rather than a marginally significant tendency which was found), if the antireligious subjects had been as polarized in their religious attitudes as the proreligious subjects. An extension of this reasoning is that a positive correlation would have been found between CO scores and religious bias scores.

It is possible that no consistent difference was found between pro and antireligious subjects in the present study and in Feather's (1964, 1967) studies because of the high difficulty level of the syllogisms, especially the proreligious syllogisms. It is believed that even though the three types of syllogisms were equated by having approximately the same number of words and logical form in each type, the neutral syllogisms were still easier to solve because the effect of logic training was only found for the neutral syllogisms. The syllogisms need to be simplified in such a way that subjects could improve their performance (and thus increase variability). In addition, subjects may not have felt that the religious syllogisms were totally consistent with or contradictory to their beliefs because

the difficulty of the syllogisms may have confused them as to exactly what kind of statement was being made in the syllogisms. Subjects may have perceived the statements which composed the CO Scale as much more explicit or refined in challenging or confirming their beliefs in comparison to the statements made in the religious syllogisms.

Subjects' religious attitudes did not seem to have a consistent biasing effect on their responses. This finding is somewhat inconsistent with earlier findings that religious attitudes do influence people's responses (e.g., Baither and Saltzberg (1981), Batson (1975), Brown (1962), Feather (1964, 1967), Kelley (1955), Rokeach (1960), Thouless (1935, 1959), Thyer, Kramer, Walder, and Papsdorf (1981)). That is, highly pro or antireligious people have been found to be less rational, critical, open-minded, tolerant of inconsistencies, and objective about religious statements. In addition, the former group has been found to react in a more polarized fashion when presented with contradictory and inconsistent statements regarding their beliefs. Attitudes may influence reasoning in the direction of those convictions (Lefford, 1946) but not consistently as was found in this study and Feather's (1964, 1967) studies. The relationship between religious attitudes and logic seems to indicate that judgements are neither totally devoid of the influence of our attitudes nor are they entirely subjugated by these attitudes (Bieri, 1967), as indicated by the lack of an effect of religiosity on the religious syllogisms in the present study.

In future related research it might be advisable to include equally polarized pro and antireligious participants as well as a

"middle" (mildly religious) group for comparison purposes. The two extreme religious groups, pro and antireligious subjects, would be much more religiously biased than the middle group. Consequently, it might be predicted that this additional group of subjects may indicate whether pro and antireligious subjects' deficient performance is due to their strong religious biases or an insufficient ability to solve these difficult syllogisms.

Hypothesis 2

It was predicted that subjects in the critical priming condition would make fewer errors on the three types of syllogisms than subjects in the neutral group, who in turn would make fewer errors on the syllogisms than subjects in the primed religion condition. It was further anticipated that subjects in the religious orientation condition would have a higher religious bias score than subjects in the neutral condition, and the critical priming condition subjects were expected to obtain the lowest religious bias score. However, the data analyses did not reveal enough evidence to support these predictions.

It is not suprising that the religious priming condition did not affect responses for the neutral syllogisms, since these syllogisms have no religious connotation which might draw out religious biases. Nevertheless, subjects in the critical priming condition were believed to have been given an advantage over the other two priming conditions since they were being cued to respond to the syllogisms more accurately.

When subjects responded to the religious syllogisms, priming

condition apparently did influence their evaluations insofar as it interacted with the variables religiosity and training condition, for the dependent variable proreligious syllogisms. Antireligious subjects in the neutral, no logic training condition scored the highest of all groups for this dependent variable, whereas proreligious subjects in the same priming and training condition had the lowest score. Neutral priming did not consistently have a positive influence on subjects' responses, nor did critical priming. It appears as though something unanticipated and almost unexplainable happened to antireligious subjects in the neutral, no logic training condition when they responded to the proreligious syllogisms. Again this may be due to chance factors, possibly associated with the poor performance of all subjects overall on the three types of syllogisms. Another possibility might be that the proreligious syllogisms were more difficult to analyze and consequently the no logic training condition was more beneficial to antireligious subjects in the neutral condition than was logic instruction. That is, because the syllogisms were so difficult and the logic instruction too simplistic, such instruction only confused them rather than aiding them.

A main effect for priming was found for the dependent variable number of antireligious syllogisms correct. Subjects in the neutral condition performed the best on these syllogisms, whereas critical and religious priming condition subjects made about the same number of errors. Priming condition was not found to affect subjects' religious bias scores. When the correlations were broken down by priming condition, only one significant correlation was found for subjects in the critical priming condition. This would seem to indicate that critical priming condition subjects were not as influenced by their

religious beliefs as subjects in the neutral or religious priming condition, however, this finding might be due to chance. Consequently, Hypothesis 2 did receive some support for the predictions that priming condition would have an effect. However, the results were more often in the opposite direction to that anticipated, and even then there were inconsistencies between the ANOVA and the correlational data, which means that there was only partial support for the neutral condition performing better than subjects in the critical and religious priming condition.

Why the critical priming condition subjects did not score better than subjects in the neutral and religious priming groups is perplexing. One suspects that the critical priming manipulation was simply not effective. That is, the questionnaire given to the critical group may not have made logical, rational, and critical thinking dominant in their minds, or if it did, this did not carry over into better performance on the syllogisms. The critical priming questionnaire could have affected subjects' motivations, rather than saliency of cognitions. That is, after completion of this questionnaire the subjects may have wanted to appear more logical and/or consistent with their religious beliefs, rather than subjects thinking in an objective, rational, and logical frame of mind. Consequently, the critical priming questionnaire may have engendered a motivational response rather than a perceptual bias.

The questionnaire given to subjects in the critical condition was the most difficult priming questionnaire for the author to devise. In spite of pre experimental revisions and adjustments, it appears that

the questionnaire given to the critical priming condition subjects did not engender critical thinking as effectively as the religious priming questionnaire contributed to religious thinking. Since the critical priming questionnaire was simply a collection of items constructed for this study it can not be used as a scale to derive a "criticality score" (i.e., comparable to a "religiosity score" such as that derived from the CO Scale). This is unfortunate since it means that we have no reliable check to assess the extent to which participants in the various priming conditions were effectively primed as expected.

The relationship between judging the logical soundness of syllogisms and religious attitudes seems to be quite complex. It appears that Henle and Michael (1956) were correct when they suggested that attitudes operate in an interactive manner with cognitive processes, the result being dependent on the nature of both processes in relation to one another. Revlin, Leirer, Yopp and Yopp (1980) also suggested that reasoning errors are a result of an interruption to the rational processes of an individual and furthermore reflect a conflict between competing goals rather than a regression to irrational processes.

Precisely how logical processes affect religious attitudes and vice versa apparently requires an investigation that more effectively manipulates critical awareness. That is, in the context of the present investigation, it would be desirable to have a critical priming instrument which would tap what people think, feel, and believe about critical awareness, rational and logical thinking in much the same way as the religious priming questionnaire draws upon

individuals' views, beliefs, and opinions on religious matters. For example, a set of statements that correlate positively with a high level of critical thinking (as assessed by some measure similar in nature to Watson & Glaser's (1964) Critical Thinking Appraisal Scale) or a series of simple nonsyllogistic problems requiring rational and logical thinking, could be utilized. If subjects were bluntly told that "This study is investigating whether pro and antireligious subjects can be critical of religious material," this might be inducement enough for them to respond in a critical and logical manner rather than with a religious bias. The result could be an increase in the number of neutral and religious syllogisms correct by critical priming condition subjects, which might in turn result in a main effect for the four dependent variables because this group of subjects performed significantly better than subjects in the religious or neutral condition. It is also possible that any critical priming would not affect subjects' responses to the syllogisms. However, all of this must remain speculation, pending further research.

Hypothesis 3

Subjects who received some basic logic instruction were predicted to make fewer errors on the three types of syllogisms than subjects who were not given any such instruction. Partial support was obtained for this hypothesis, such that subjects in the logic training condition did make fewer errors on the neutral syllogisms. Thus, it appears that the brief introduction to an area about which most participants had no knowledge (87% of 131 subjects reporting their logic background reported no prior exposure to logic or syllogisms)

did improve their syllogism performance. This finding is in accordance with Thorton and Zorich's (1980) discovery that the more information individuals are given regarding a complex task (i.e., observation of others), the more acccurate their performance will be. Both of these findings are consistent with Anastasi's (1982) proposal that training or practice for certain tasks can result in a more accurate reflection of an individuals' ability for that area. Therefore, it is recommended that at least some minimal training should be involved in research of this nature since many subjects had little or no background in this area. those who had prior instruction in the area of logic did not score better than subjects who lacked such instruction, and because even a 5 minute presentation on some of the precepts underlying logical analysis apparently aided subjects in making fewer errors on the neutral syllogisms.

Hypothesis 3 was not supported by other relevant findings, namely when the dependent variable was the number of antireligious syllogisms correct or the religious bias score. It is important to note the intercorrelations among religious bias scores, critical ability, CO scores, and subjects' responses to the religious conclusions for all subjects, broken down by logic training condition. For subjects in the logic training condition, the only correlation that was found to be significant was a high, positive correlation between CO scores and subjects' responses to the religious conclusions. For subjects in the no logic training condition, the same correlation was found to be high, positive, and significant. In addition, the correlation between religious bias scores and critical ability was negative. Religious

bias scores positively correlated with CO scores. The relationship between religious bias scores and subjects' responses to the religious conclusions was found to be positive. The latter three correlations were found for subjects in the no logic training condition. This correlational data suggests that when subjects are trained in some of the principles underlying logical analyses, the biasing effect of religious attitudes disappears, however, if such instruction is omitted the biasing effect returns.

No consistent main effect was found for logic training. This could be due to various methodological problems such as the syllogisms being too difficult, inappropriate assessment of the relationship between logical analyses and religious attitudes, insufficient logic instruction, and so forth. The complexities of logical analysis can be difficult to master. Copi (1968) has suggested that it requires "a special kind of thinking" (p. 5). Thus, it might be suggested that more than a brief introduction to syllogisms is necessary for subjects to be able to overcome their biases. For example, in the present study, no attempt was made to explain terminology such as "all", "some", the different forms of syllogisms, nor explicitly why the first practice syllogism was sound and the second unsound.

It would seem prudent to decrease the level of difficulty associated with the syllogisms. This could be accomplished by shortening the syllogisms slightly (i.e., using fewer words). Also, the syllogisms could be presented in a form other than that which was used in the present study. For example, the two premises could be followed by three possible conclusions. One of the conclusions would

correspond to an option that that might be chosen by someone with a proreligious bias, whereas the second would reflect an antireligious bias, and the third option would correspond to a pro or antireligious bias but it would be the correct alternative. This should improve subjects' performance, increase the variability, and quite possibly contribute to significant differences which in this study might have been masked by the high difficulty level of the syllogisms (i.e., a kind of basement effect).

Subjects' responses to the syllogisms, in this study and in Feather's (1964, 1967) studies, were not substantially above the level of chance. Comparison of Feather's mean scores and standard deviations derived for pro and antireligious subjects for the dependent variables critical ability and religious bias scores were also conducted. (The reader should refer back to Table 1 and Table 2 in the results section.) When the critical ability scores for pro and antireligious subjects in the neutral, no logic training condition were adjusted in order to be proportional to the results obtained by Feather, it was found that Feather's subjects in both of his studies consistently scored better than subjects in the present study. Pro and antireligious subjects' adjusted religious bias scores were compared to pro and antireligious subjects' scores in both of Feather's studies. No significant differences were found. Consequently, Feather's results for this measure were replicated in the present study.

Other researchers (Henle & Michael, 1956, Mason, Bramble, & Mast 1975) have found it necessary to simplify syllogisms or to focus on

certain (i.e., easier) syllogisms in order to increase the number of correct judgements in syllogism evaluation tasks, in an effort to improve the success of syllogistic reasoning. It might be impossible to improve performance on these syllogisms since they are so difficult to analyze. Individuals with an extensive background in logic may be the only people to correctly solve these syllogisms well above the chance level.

There were some indications that participants might not have devoted a sufficient amount of time to a careful consideration of the logic in each syllogism. The study was carried out in the last two weeks of the term before final examinations, and in fact some participants were tested the day prior to the commencement of final exams. It is possible that concerns about final exams, study time, and the like, might have led students to complete the syllogisms faster than they normally would have, and this might have had a detrimental effect on syllogistic judgements. It took most participants between 15 and 25 minutes to complete the 31 syllogisms. By comparison, Feather (1964) reported that most of his participants completed 40 syllogisms in 40 minutes. However, in the present study, all participants were observed by the researcher throughout the experimental phase, and it is believed that in general, they were attentive, careful and made an earnest effort to complete the syllogisms as requested. Furthermore, subjects' personal post experimental reports regarding how hard they had attempted the arguments indicated that most of the subjects believed that they had made a serious effort to solve the arguments. This information seems

to point to the conclusion that subjects had put forth some time and effort in "solving" the arguments but because of the level of difficulty of the syllogisms, the time frame of the experiment, and lack of previous experience in logic, their performance was not well above chance.

It is also possible that intellectual or educational level might affect performance. Pro and antireligious graduate students would probably make fewer errors (i.e., performance well above chance) and show little or no religious bias. This is proposed since Thouless (1959) found that university graduate students made fewer errors on political and religious arguments presented in syllogistic form than adult undergraduate students. Moreover, only 10% of the errors made by the graduate students were associated with a political or religious bias. Mason, Bramble, and Mast (1975) also found that graduate students performed as well as dental students on syllogisms containing professional and lay dental terms. It would be interesting to see how well logic experts do on these syllogisms. Thus, further research might further investigate the role of level of education in syllogism judgement tasks

Hypothesis 4

Hypothesis 4 dealt with the replication of some of Feather's (1964, 1967) correlational findings. The present study appears to have replicated some of Feather's results. In both of his studies and in the present study, as predicted, a significant negative correlation was found between religious bias scores and critical ability for proreligious subjects. This correlation appeared to be greater in

magnitude in the present study than in Feather's two investigations. This correlation was found to be positive for antireligious subjects in one of Feather's (1964) studies. Contrary to the prediction made, no relationship was found in the present study (or in Feather's later investigation). This might have occurred because of the homogeneity of variance among antireligious subjects as discussed earlier. The predicted significant positive correlation was found between religious bias scores and and subjects' responses to the religious syllogisms for proreligious subjects. Once again the correlation in this study appeared greater in magnitude than in Feather's (1964) study. For antireligious subjects, no correlation was found in either of Feather's or the present studies. A significant negative correlation was found between critical ability and proreligious subjects' responses to the religious conclusions, as anticipated. Feather had found no relationship between these two variables. For antireligious subjects the anticipated negative correlation was not found. This corresponds with both of Feather's findings of no relationship between these two variables. Thus it appears that for proreligious subjects, a high level of religiosity is positively associated with a high level of religious bias, and negatively associated with critical ability. None of these statements apparently hold true for antireligious subjects, since comparable correlations were not significant.

Overall, when one compares the intercorrelations reported by Feather (1964, 1967) with the comparable correlations in the present study (i.e., obtained for pro and antireligious subjects in the neutral, no logic training condition), it is clear that some, but not

all of Feather's correlations were replicated. The lack of complete consistency with Feather's findings is not surprising since there were important differences (and inconsistencies in findings) between his own two studies. One must certainly be cautious when comparing Feather's (1964, 1967) findings to the present results. As discussed earlier, differences exist between the two studies with respect to the classification of subjects as pro or antireligious.

It could be argued that various aspects of the research situation were better controlled in this study, as compared to Feather's (1964, 1967) investigations. For example, a reliable and valid measure was used to select and classify subjects religiously, logic instruction was included in order to insure that subjects adequately understood syllogistic analysis, subjects were selected from a larger pool, judgements of syllogistic soundness were consistently used for analysis purposes, and statistical analyses were apparently more sophisticated in the present study. Consequently, it might be argued that the present study more accurately reflects the true relationship between religious attitudes and logical evaluation of arguments.

Further comparisons to Feather's studies

The next issue that will be dealt with is the correlation between CO scores and subjects' responses to the religious conclusions. This correlation was found to be positive and significant for all subjects and for virtually all subgroups. On the basis of the overwhelming evidence of a significant positive correlation between these two measures of religiosity, it appears that Feather (1964, 1967) may have used an adequate measure of religiosity when he tested his subjects.

Subjects' perceptions of the study and its content

The final measure that subjects in the present study were asked to complete dealt with their perceptions of the study and its content. The findings from the post experimental questionnaire suggest that the religious priming manipulation was successful. That is, subjects in the religious priming condition apparently perceived the study to be examining religious attitudes, more so than subjects in the critical priming condition.

The suggestion that the critical priming manipulation was not effective is supported by the failure to find significant differences among priming groups for the post experimental question tapping subjects' perceptions that the study was examining logical and rational thought processes. Since subjects in the critical priming condition were primed regarding logical, rational, and critical thinking it was anticipated that they would believe that the study was examining rational processes more than subjects in the other two priming conditions.

When subjects were asked whether they perceived their analysis of the syllogisms to have been influenced by the proreligious or antireligious content of the statements, no significant findings resulted. However, in view of the findings discussed earlier (that there did seem to be at least some biasing effect of religious content), it seems likely that Lord, Ross, and Lepper (1979) were correct in concluding that when a person holds a strong opinion on a complex social issue, such as religion, there is a tendency to examine pertinent information in a biased manner. At the same time, the

perceiver may not always be aware of this influence (Fiske & Taylor, 1984). Subjects may have had some difficulty in perceiving the influence of pro and antireligious content on their analyses because it might not have been the only factor that affected how they would respond.

Theoretical interpretation

Cognitive dissonance theory may not have been the most appropriate theoretical model for this study since there was not a lot of evidence to indicate that there should be dissonance reduction in favour of one cognition or the other. In view of the findings, cognitive dissonance theory (or at least the interpretation of it presented in this paper) was relatively unsuccessful in making accurate predictions in this research. Dissonance theory was not directly tested in this study. Consequently, it is not so much the model or theory it proposes that is under fire, but the interpretation used in the present study to provide some sort of theoretical basis for this study and its proposed effects.

Subjects in the present study were believed to have been placed in a state of psychological tension or cognitive dissonance because pro and antireligious subjects were asked to respond in a critical, logical, and rational manner to pro and antireligious syllogisms. Critical ability and religious attitudes were believed to be dissonant to one another because critical awareness may dictate that a particular syllogism is logically sound, whereas religious attitudes may suggest that the syllogism is logically unsound. Dissonance could arise from such inconsistencies. The result would be the existence of

two opposing cognitions which would generate an unpleasant state which would in turn motivate the individual to alter one or both of these cognitions (Berkowitz, 1980). Subjects in the present study had some difficulty with the syllogisms, as evidenced by the fact that their judgements were correct just 56% of the time, overall. It is possible that they encountered some problems when they tried to resolve their dissonance, if dissonance was created. However, it is also possible that the syllogisms were generally too difficult for them to solve, resulting in near chance performance. Thus, it is quite possible that dissonance was not the cause of the poor performance on the syllogisms. Furthermore, subjects' responses to the syllogisms did not indicate analyses based soley on logic or religious attitudes but it appears as though there was some sort of an interaction between these two processes. Dissonance theory would seem to imply that one would be chosen over the other.

Proreligious subjects were expected to make more errors in their evaluations of the religious syllogisms than antireligious subjects because the former group of subjects were believed to be more homogeneous in their religious attitudes. This would appear to be an appropriate prediction according to dissonance theory. When two cognitions are in a dissonant relationship the amount of dissonance experienced is a direct function of how important those cognitions are to the individual (Wicklund & Brehm, 1976). Religious beliefs would seem to be more important to proreligious subjects than antireligious subjects because the former were found to be, on average, more extreme (in terms of the CO Scale) than the latter. Thus, in line with

dissonance theory, it would appear that proreligious subjects would experience more dissonance because their religious beliefs are more important to them than antireligious subjects. The greater the dissonance, the greater will be the intensity to reduce the dissonance (Festinger, 1957). Consequently, it would be expected that proreligious subjects would be more polarized or biased in their evaluations than antireligious subjects. As a result, proreligious subjects would be expected to make more errors on the religious syllogisms than antireligious subjects. This was not the case.

Cognitive dissonance theory would seem to imply that priming subjects would affect their responses. Recent behavior is more likely to be salient in a person's mind and behaviors which are not so vivid are less resistant to change (Wicklund & Brehm, 1976). In dissonance theory behavioral commitment, such as responses to the priming questionnaire, "is by definition the primary consonant cognition" (Wicklund & Brehm, 1976, p. 25) and is consequently assumed to be the cognition most resistant to change. The only group that seemed to have been affected by the priming questionnaire involved the religious priming. Possibly this was because the questionnaire served to reinforce other consistent cognitions. The critical priming questionnaire did not have the desired effect proposed on subjects' analyses. It could be that a recent behavior or behavioral commitment (such as completion of the priming questionnaire) although usually the most resistent to change, could have been less resistant which is occasionally found (Wicklund & Brehm, 1976)

Cognitive dissonance theorists might well argue that our present

findings <u>are</u> consistent with dissonance theory. The theory does not assert that a person will be sucessful in reducing or eliminating the dissonance, only that once created the dissonance will motivate the individual to <u>attempt</u> to reduce it (Wicklund & Brehm, 1976). Forseeability and choice or personal responsibility are necessary for dissonance reduction. Dissonance reduction will only take place when the dissonant elements have been brought together through the personal responsibility of the individual (Wicklund & Brehm, 1976). Subjects must understand the consequences of their discrepant actions and believe they had a choice in the matter or else dissonance might not be aroused (Wicklund & Brehm, 1976). Subjects in the present study may not have comprehended all of the consequences involved in participating in this study when it came time to analyze the syllogisms. They may also have felt a lack of choice in completing the study once they found out what was involved. Consequently, dissonance may not have arisen and if it had subjects may not have resolved the tension by the time they had finished the syllogisms.

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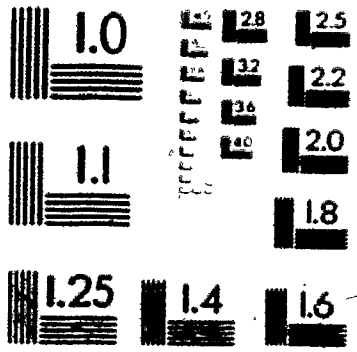

Summary

The intention in carrying out this study was to test the idea that, at least under some circumstances, pro and antireligious individuals can be critical, logical, and objective about religious material that could be consistent or contradictory with their religious beliefs. It was predicted that if subjects were primed to think critically they could be objective about religious material, whereas subjects cued to think in a religious manner could not be totally objective about the material. Furthermore, it was anticipated that a brief introduction to logic would improve subjects' performance over those who did not receive such instruction. The relationship between religiosity and logical syllogistic analyses was not appropriately tapped in this study since no consistent results emerged for religiosity, priming condition, and logic training condition. However, an introduction to some of the basic principles underlying syllogistic analyses not only aided in the improvement of critical ability but examination of the correlational data indicates that it aided in the reduction of religious biases. Difficulty in analyzing the toilsome syllogisms used in the present study, could be the reason why no consistent inter group differences were found. In concluding it is suggested that the relationship between religious attitudes and logical analyses is more intricate than originally suggested. A "logical" response does not necessarily negate the influence of a religious bias and vice versa.

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Footnotes

[1]Table 1 also reports the means and standard deviations Feather (1964, 1967) obtained in his two studies for critical ability. The adjusted means, for pro and antireligious subjects in the neutral, no logic training condition, have also been reported in this table. The original means and standard deviations for this group of subjects were adjusted to be proportional to the results obtained by Feather (1964, 1967). This was accomplished by multiplying the original score by 16 (the number of neutral syllogisms used by Feather) and then dividing by 10 (the number of neutral syllogisms used in the present study). T-tests were performed to determine if there was a significant difference between the scores obtained for subjects in the neutral, no logic training condition and Feather's (1964, 1967) subjects. The t-test results indicated that Feather's (1964) proreligious subjects answered more of the neutral syllogisms correctly than proreligious subjects in the present study, $t(141) = -2.30$, $p < .05$. The same situation existed for antireligious subjects in Feather's (1964) study versus antireligious subjects in this study, $t(44) = -3.94$, $p < .001$. When pro and antireligious subjects' responses were compared to Feather's (1967) more recent study, again his subjects scored higher than subjects in the present study, $t(40) = -2.49$, $p < .05$ and $t(20) = -3.37$, $p < .01$, for pro and antireligious participants, respectively.

[2]Table 2 also presents the means and standard deviations obtained by Feather (1964, 1967) in his two studies for religious bias scores. The adjusted means and standard deviations for pro and antireligious subjects in the neutral, no logic condition have also been reported.

These adjusted values were obtained by multiplying the original score by 24 (the number of religious syllogisms used by Feather) and then divided by 20 (the number of religious syllogisms used in the present study). To determine if there was a significant difference between subjects in the neutral, no logic condition and Feather's (1964, 1967) subjects t-tests were calculated. No significant difference was found between the scores obtained for pro and antireligious subjects in the present study in comparison to the scores obtained for pro and antireligious subjects in both of Feather's (1964, 1967) studies. However, a significant difference did emerge between pro and antireligious subjects in the neutral, no logic training condition, $t(22) = 1.77$, $p < .05$.

Appendix A

Christian Orthodoxy Scale and background information

STUDENT SURVEY

This survey asks questions concerning your background, as well as your thinking patterns and attitudes on a variety of topics. You should complete the survey quickly and efficiently, and not spend too much time on any single item. If a particular alternative answer does not express your position fully, check the alternative that comes closest to it, and feel free to make explanatory comments in the margin.

Your individual responses will be kept in the strictest confidence. The sign-up sheet that contains your name and phone number will never be kept in the same location as your questionnaire, in order to help ensure confidentiality of responses. The information obtained will be analyzed on a group basis only, not on an individual basis.

You are free to withdraw from this study at any time, in which case none of your responses will be included in the analysis. Should you wish further information about the study, please contact the individual listed below.

Thank you for your cooperation.

Researcher: Dr. Bruce Hunsberger,
Department of Psychology,
Room 3-113, Central Teaching Building,
Wilfrid Laurier University,
Waterloo, Ontario

Telephone: (519) 884-1970, ext. 2219

Part I: Attitude Survey

This survey includes a number of statements related to specific religious beliefs and other issues. You will probably find that you AGREE with some of the statements, and DISAGREE with others, to varying extents. Please mark your opinion on the line to the left of each statement, according to the amount of agreement or disagreement, by using the following scale:

Write down a -3 in the space provided if you STRONGLY DISAGREE with the statement.
" " -2 in the space provided if you MODERATELY DISAGREE with the statement.
" " -1 in the space provided if you SLIGHTLY DISAGREE with the statement.

Write down a +1 in the space provided if you SLIGHTLY AGREE with the statement.
" " +2 in the space provided if you MODERATELY AGREE with the statement.
" " +3 in the space provided if you STRONGLY AGREE with the statement.

If you feel exactly and precisely NEUTRAL about an item, write down "0" in the space provided.

1. _____ The only real result of prayer is the comfort one may get from saying it.
2. _____ God exists as: Father, Son, and Holy Spirit.
3. _____ Man is NOT a special creature made in the image of God, he is simply a recent development in the process of animal evolution.
4. _____ Jesus Christ was the divine Son of God.
5. _____ The Bible is the word of God given to guide man to grace and salvation.
6. _____ Those who feel that God answers prayers are just deceiving themselves.
7. _____ It is ridiculous to believe that Jesus Christ could be both human and divine.
8. _____ Jesus was born of a virgin.
9. _____ The Bible may be an important book of moral teachings, but it was no more inspired by God than were many other such books in the history of Man.
10. _____ The concept of God is an old superstition that is no longer needed to explain things in the modern era.
11. _____ Christ will return to the earth someday.
12. _____ Most of the religions in the world have miracle stories in their traditions; but there is no reason to believe any of them are true, including those found in the Bible.
13. _____ God hears all of our prayers.
14. _____ Jesus Christ may have been a great ethical teacher, as other men have been in history. But he was not the divine Son of God.

-3 = strongly disagree
-2 = moderately disagree
-1 = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

15. _____ God made man of dust in His own image and breathed life into him.

16. _____ Through the life, death, and resurrection of Jesus, God provided a way for the forgiveness of man's sins.

17. _____ Despite what many people believe, there is no such thing as a God who is aware of Man's actions.

18. _____ Jesus was crucified, died, and was buried but on the third day He arose from the dead.

19. _____ In all likelihood there is no such thing as a God-given immortal soul in Man which lives on after death.

20. _____ If there ever was such a person as Jesus of Nazareth, he is dead now and will never walk the earth again.

21. _____ Jesus miraculously changed real water into real wine.

22. _____ There is a God who is concerned with everyone's actions.

23. _____ Jesus' death on the cross, if it actually occurred, did nothing in and of itself to save Mankind.

24. _____ There is really no reason to hold to the idea that Jesus was born of a virgin. Jesus' life showed better than anything else that he was exceptional, so why rely on old myths that don't make sense.

25. _____ The Ressurrection proves beyond a doubt that Jesus was the Christ or Messiah of God.

26. _____ The way things are going in this country, it's going to take a lot of "strong medicine" to straighten out the troublemakers, criminals and perverts.

27. _____ It is wonderful that young people today have greater freedom to protest against things they don't like, and to "do their own thing."

28. _____ It is always better to trust the judgment of the proper authorities in government and religion, than to listen to the noisy rabble-rousers in our society who are trying to create doubt in people's minds.

29. _____ People should pay less attention to the Bible and the other old traditional forms of religious guidance, and instead develop their own personal standards of what is moral and immoral.

30. _____ It would be best for everyone if the proper authorities censored magazines and movies to keep trashy material away from the youth.

31. _____ It may be considered old fashioned by some, but having a decent, respectable appearance is still the mark of a gentleman and, especially, a lady.

-3 = strongly disagree
-2 = moderately disagree
-1 = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

32. ____ The sooner we get rid of the traditional family structure, where the father is the Head of the family and the children are taught to obey authority aytomatically, the better. The old-fashioned way has a lot wrong with it.

33. ____ There is nothing wrong with premarital sexual intercourse.

34. ____ The facts of crime, sexual immorality, and the recent public disorders all show we have to crack down harder on deviant groups and troublemakers if we are going to save our moral standards and preserve law and order.

35. ____ There is nothing immoral or sick in somebody's being a homosexual.

36. ____ It is important to protect fully the rights of radicals and deviants.

37. ____ Obedience and respect for authority are the most important virtues children should learn.

38. ____ Rules about being "well-mannered" and respectable are chains from the past which we should question very thoroughly before accepting.

39. ____ Once our government leaders and the authorities condemn the dangerous elements in our society, it will be the duty of every patriotic citizen to help stomp out the rot that is poisoning our country from within.

40. ____ "Free speech" means that people should even be allowed to make speeches and write books urging the overthrow of the government.

41. ____ Some of the worst people in our country nowadays are those who do not respect our flag, our leader, and the normal way things are supposed to be done.

42. ____ In these troubled times laws have to be enforced without mercy, especially when dealing with the agitators and revolutionaries who are stirring things up.

43. ____ Atheists and others who have rebelled against the established religions are no doubt every bit as good and virtuous as those who attend church regularly.

44. ____ Young people sometimes get rebellious ideas, but as they grow up they ought to get over them and settle down.

45. ____ The self-righteous "forces of law and order" threaten freedom in our country a lot more than most of the groups they claim are "radical" and "godless."

46. ____ The courts are right in being easy on drug users. Punishment would <u>not</u> do any good in cases like these.

47. ____ If a child starts becoming unconventional and disrespectful of authority, it is his parents' duty to get him back to the normal way.

48. ____ In the final analysis the established authorities, like parents and our national leaders, generally turn out to be right about things, and all the protestors don't know what they're talking about.

-3 = strongly disagree
-2 = moderately disagree
-1 = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

49. _____ A lot of our rules regarding modesty and sexual behaviour are just customs which are not necessarily any better and holier than those which other people follow.

50. _____ It is best to treat dissenters with leniency and an open mind, since new ideas are the lifeblood of progressive change.

51. _____ The real keys to the "good life" are obedience, discipline, and sticking to the straight and narrow.

52. _____ There is absolutely nothing wrong with nudist camps.

53. _____ The biggest threat to our freedom comes from the Communists and their kind, who are out to destroy religion, ridicule patriotism, corrupt the youth, and in general undermine our whole way of life.

54. _____ Students in high schools and university must be encouraged to challenge their parents' ways, confront established authorities, and in general criticize the customs and traditions of our society.

55. _____ One reason we have so many troublemakers in our society nowadays is that parents and other authorities have forgotten that good old-fashioned physical punishment is still one of the best ways to make people behave properly.

56. _____ In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted.

57. _____ My blood boils whenever a person stubbornly refuses to admit he's wrong.

58. _____ There are two kinds of people in this world: those who are for the truth and those who are against the truth.

59. _____ Most people just don't know what's good for them.

60. _____ Of all the different philosophies which exist in this world there is probably only one which is correct.

61. _____ The highest form of government is a democracy and the highest form of democracy is a government run by those who are most intelligent.

62. _____ The main thing in life is for a person to want to do something important.

63. _____ I'd like it if I could find someone who would tell me how to solve my personal problems.

64. _____ Most of the ideas which get printed nowadays aren't worth the paper they are printed on.

65. _____ Man on his own is a helpless and miserable creature.

66. _____ It is only when a person devotes himself to an ideal or cause that life becomes meaningful.

-3 = strongly disagree
-2 = moderately disagree
-1 = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

67. _____ Most people just don't give a "damn" for others.

68. _____ To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side.

69. _____ It is often desirable to reserve judgment about what's going on until one has had a chance to hear the opinions of those one respects.

70. _____ The present is all too often full of unhappiness. It is only the future that counts.

71. _____ The United States and Russia have just about nothing in common.

72. _____ In a discussion I often find it necessary to repeat myself several times to make sure I am being understood.

73. _____ While I don't like to admit this even to myself, my secret ambition is to become a great man, like Einstein, or Beethoven, or Shakespeare.

74. _____ Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.

75. _____ It is better to be a dead hero than to be a live coward.

Part II: Background Information

Please check the appropriate answer in the space provided.

1. Sex: Male _____ Female _____

2. Age: _____

3. In which of the following religious groups were you raised?

_____ Protestant (which denomination? _____)
_____ Catholic
_____ Some other religious group (specify: _____)
_____ No religion

4. With which religious group do you presently identify yourself or think of yourself as being?

_____ Protestant (which denomination? _____)
_____ Catholic
_____ A personal religion, with no affiliation to any other religious group
_____ Some other religion (specify: _____)
_____ No religion, though I am not an atheist ("agnosticism")
_____ No religion, since I am an atheist

5. Have you ever taken a course in logic?

_____ Yes _____ No (If no, skip to number 7.)

6. If you have taken a course in logic, did it deal with material similar to the following?

ALL As ARE Bs
ALL Bs ARE Cs
THEREFORE, ALL As ARE Cs

_____ Yes _____ No

7. On the following scale, of 1 to 10, how would you rate your logic ability?

1 2 3 4 5 6 7 8 9 10 (CIRCLE ONE)
Poor Excellent

8. Do you live at home?

_____ Yes _____ No

9. How many siblings did you have when you were growing up?

_____

10. What is your political affiliation?

_____ Liberal
_____ Conservative
_____ New Democrat
_____ Communist
_____ Some other party (specify: _____)
_____ None

Appendix B

Instructions

Instructions for the Proposed Study

First Phase

The following are the instructions that were read by Experimenter A to all subjects at the beginning of the first phase of the study:

"Hi, my name is Dr. Bruce Hunsberger, and I am currently working on a psychology research project. I would appreciate it if you would fill out this questionnaire. It should only take between 10 and 20 minutes of your time and your instructor has agreed to give us some class time for this purpose."

"This survey asks questions concerning your background, as well as your thinking patterns and attitudes on a variety of topics, such as religion and social issues. Please fill out the questionnaire according to the instructions on the top of the second page. You should complete the survey quickly and efficiently, and not spend too much time on any single item. If a particular alternative answer does not express your position fully, check the alternative that comes closest to it, and feel free to make explanatory comments in the margin."

"Your individual responses will be kept in the strictest confidence. We will be passing around an attendance sheet on which you should print your name, survey number (which is on the front of the booklet in red ink), and telephone number. We need this information so that we have a record of who has participated, and we could then contact some of you for a follow-up study. You are of course under no obligation to participate in the follow-up study, if you are asked. The sign-up sheet that contains your name and phone number will never be kept in the same location as your questionnaire, in order to help ensure confidentiality of responses. The information obtained will be analyzed on a group basis only, not on an individual basis."

"Your participation in this study is completely voluntary, thus you can withdraw from this study at any time, in which case none of your responses will be included in the analysis. Should you wish further information about the study, please contact Dr. Hunsberger, as listed on the front page of your questionnaire. Thank you for your cooperation. Any questions? Please begin."

The experimenter's name appeared on the front page of this booklet which contained this information.

Second Phase

All instructions for this phase of the study were presented to the subjects by the present author (Experimenter B).

This was the first statement to all subjects, just before the second session began:

"Thank you for helping me out in this project. to complete. I think you will find the content interesting, and you should be able to complete the entire study in less than an hour." Later on I will pass around an attendance sheet on which you should print your name and questionnaire number. Your 4 questionnaires will have the same red number on them which is located in the upper right hand corner on the first page of each questionnaire. Your individual responses will be kept in the strictest confidence. The sheet that contains your name and survey number will never be kept in the same location as your questionnaire, in order to help ensure confidentiality of your responses. The information obtained will be analyzed on a group basis only."

The following are the instructions that preceded the administration of the priming task:

"I am presently testing 3 different groups. To equate the 3 conditions, I would like you to complete the first questionnaire. Please read the instructions on the top of the first page. Please begin."

The next set of instructions were only read to subjects who were in the logic training condition:

"In order to prepare you for the reasoning task, I would like to introduce you to the kind of material you will be dealing with. You will be given a series of passages. In each passage an argument is presented. These arguments are composed of 3 statements. The first 2 statements are followed by a third statement which is the conclusion of the argument. The conclusion of an argument is a statement which is either affirmed or not affirmed on the basis of the 2 preceding statements of the argument. These preceding statements provide evidence or reasons for accepting the conclusion. In the first argument you can see that "All poets die young" and "but many professors are old" are the first 2 statements of that argument. This is followed by "so we can conclude that not all professors are poets",

which is the conclusion of this argument."

"An argument is logically sound if the conclusion logically follows from the 2 preceding statements, regardless of the actual content of the 3 statements. The first argument is logically sound because the conclusion does follow from the 2 preceding statements in the argument."

"An argument is logically unsound if the conclusion does not follow from the 2 preceding statements, again, regardless of the actual content of the 3 statements. The second argument (it will be read aloud by the experimenter) is logically unsound because the conclusion does not follow from the first 2 statements in the argument. Just because <u>some</u> drugs are poisonous does not mean that the specific drug mentioned in the second line of this passage is poisonous. That is, whether alcohol <u>is</u> or <u>is not</u> poisonous does not matter here. What is important is the logical progression from the first two statements to the conclusion."

"When you analyze an argument, keep in mind that you can say that an argument is logically sound or logically unsound without committing yourself to the content of the argument. That is, an argument could be sound even though you personally might disagree with one or more of the statements. What is important is whether or not the logic is sound, <u>not</u> whether you personally agree or disagree with the issue at hand."

"Are there any questions?"

Prior to the administration of the 31 syllogisms, these instructions were read to all subjects:

"This part of the study involves your analysis of some arguments. You should be spending approximately 1 minute on each passage. Please follow along as I read the instructions on the front of the booklet entitled 'Reasoning Test'."

The instructions on the front of the booklet containing the syllogisms were read:

"Here is a test of reasoning ability. The test consists of 31 short passages in each of which an argument is developed. For each of the passages you are to judge whether the argument is <u>sound</u> or <u>unsound</u> (i.e., whether or not the conclusion follows logically from the first 2 statements). If you think that the argument is <u>sound</u> (i.e., the conclusion follows logically from the preceding statements), draw a circle around the S in the margin to the left of the passage. If you think the argument is <u>unsound</u> (i.e., the conclusion does <u>not</u> follow logically from the preceding statements), draw a circle around the U

in the margin to the left of the passage.

Think clearly and carefully. Make sure that you give an answer to every item; do not leave any item unanswered.

Remember to circle S if you think the argument is logically sound and U if you think the argument is logically unsound. You may or may not agree with one or more of the statements in the argument. What is important is to determine whether the argument is logically sound or logically unsound. Please work steadily at these passages, but take the time necessary to think carefully about each one. Please begin."

Prior to the administration of the second measure of religiosity, the following was read to all subjects:

"Now I would like you to complete the third questionnaire. Please respond to the statements according to the instructions at the top of the questionnaire. Please begin."

Prior to the administration of the questions related to how subjects perceived the study and the syllogisms, the following was read to all subjects:

"Finally, this is the last questionnaire you will be asked to complete. Please respond to the statements according to the instructions at the top of the questionnaire. Please begin."

Appendix C

Critical priming questionnaire

Questionnaire

Below are 20 general statements. You will probably find that you AGREE with some of the statements, and DISAGREE with others, to varying extents. Please mark your opinion on the line to the left of each statement, according to the amount of agreement or disagreement, by using the following scale:

Write down a -3 in the space provided if you STRONGLY DISAGREE with the statement.
" " -2 in the space provided if you MODERATELY DISAGREE with the statement.
" " -1 in the space provided if you SLIGHTLY DISAGREE with the statement.

Write down a +1 in the space provided if you SLIGHTLY AGREE with the statement.
" " +2 in the space provided if you MODERATELY AGREE with the statement.
" " +3 in the space provided if you STRONGLY AGREE with the statement.

If you feel exactly and precisely NEUTRAL about an item, write down "0" in the space provided.

1. _____ I often think about things subjectively, rather than objectively.
2. _____ I find it difficult to talk to someone when he/she is being illogical or irrational.
3. _____ Often I react on the basis of emotions, rather than letting my reason guide me.
4. _____ I think I possess a good ability to reason things out.
5. _____ If a situation is examined logically and objectively, it will not aid in understanding it any better.
6. _____ Often I do not accept things at face value, but question the underlying evidence.
7. _____ I believe that since I have been in university I have come to look at things more logically and critically.
8. _____ I do not enjoy engaging in philosophical or theoretical discussions because they make me think about things I had never thought about before or simply took for granted.
9. _____ When I encounter a complex problem, I do not even bother to attempt to solve it.
10. _____ I think that humans are separate and distinct from animals because we possess a greater ability to think, reason, and understand.
11. _____ I think I have an above average IQ.
12. _____ I do not think that a test or exam can adequately indicate my knowledge or understanding of an area of study.
13. _____ I often do not study very hard for a test because I am competent in my ability to perform well.
14. _____ Sometimes when I listen to someone tell me about how something happened, I wonder if they are telling me how things actually happened.
15. _____ I sometimes find it difficult to talk to people who have not had as much education as I have had.

-3 = strongly disagree
-2 = moderately disagree
-1 = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

16. _____ I am fairly knowledgeable about some things. but do not know a lot about other important things or issues.

17. _____ If I do not know anything about an issue a person is talking to me about, I will act as if I am knowledgeable about the area.

18. _____ People should be careful not to believe everything they read or hear.

19. _____ The world would be a better place if people stopped to <u>think</u> about important issues more.

20. _____ Most people could improve their ability to reason clearly and carefully if they would work at it.

Appendix D

Religious priming questionnaire

Questionnaire

Below are 20 general statements. You will probably find that you AGREE with some of the statements, and DISAGREE with others, to varying extents. Please mark your opinion on the line to the left of each statement, according to the amount of agreement or disagreement, by using the following scale:

Write down a -3 in the space provided if you STRONGLY DISAGREE with the statement.
" " -2 in the space provided if you MODERATELY DISAGREE with the statement.
" " -1 in the space provided if you SLIGHTLY DISAGREE with the statement.

Write down a +1 in the space provided if you SLIGHTLY AGREE with the statement.
" " +2 in the space provided if you MODERATELY AGREE with the statement.
" " +3 in the space provided if you STRONGLY AGREE with the statement.

If you feel exactly and precisely NEUTRAL about an item, write down "0" in the space provided.

1. _____ I often think about my religious beliefs.

2. _____ When I am in trouble or having difficulties, I often find myself turning to God for assistance.

3. _____ Man is NOT a special creature created in the image of God, he is simply a recent development in the process of animal evolution.

4. _____ I do not need to read the Bible because I know what is in it.

5. _____ I regularly attend church.

6. _____ If I miss church I feel very guilty.

7. _____ I do not attend church because I do not believe in the premises upon which the church is based.

8. _____ I have my doubts about the validity of the Bible, because it has been translated so many times from so many different languages. It is like the old saying "Something is lost in the translation."

9. _____ I often think about the possibility of an afterlife.

10. _____ I believe that I can be a good, moral person without having to subscribe to any formal religion.

11. _____ Jesus was born of a virgin.

12. _____ I believe that prayer can help a person.

13. _____ I believe that doing what the clergy tell us to do will lead us to salvation.

14. _____ I think that "miracles" can be explained if the situation in which it occurred is examined objectively.

15. _____ God exists as: Father, Son, and Holy Spirit.

-3 = strongly disagree
-2 = moderately disagree
-1 = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

16. _____ I sometimes wonder if everything that is in the Bible happened at all.

17. _____ I believe the Genesis version of creation is just a story devised in an attempt to explain the beginning of the world.

18. _____ I sometimes try to convert others to my religious beliefs.

19. _____ I often feel that without the love and guidance of God I would not make it through the day.

20. _____ I believe Jesus was the Son of God.

Appendix E

Neutral priming questionnaire

Questionnaire

Below are 20 general statements. You will probably find that you AGREE with some of the statements, and DISAGREE with others, to varying extents. Please mark your opinion on the line to the left of each statement, according to the amount of agreement or disagreement, by using the following scale:

Write down a -3 in the space provided if you STRONGLY DISAGREE with the statement.
" " -2 in the space provided if you MODERATELY DISAGREE with the statement.
" " -1 in the space provided if you SLIGHTLY DISAGREE with the statement.

Write down a +1 in the space provided if you SLIGHTLY AGREE with the statement.
" " +2 in the space provided if you MODERATELY AGREE with the statement.
" " +3 in the space provided if you STRONGLY AGREE with the statement.

If you feel exactly and precisely NEUTRAL about an item, write down "0" in the space provided.

1. ____ I believe we should always treat others as we would like to be treated.

2. ____ I believe that "Communism" as Karl Marx intended it to be, is the best way to run a country.

3. ____ I believe that I will see the end of the world.

4. ____ I believe the end of the world will be the result of a nuclear accident.

5. ____ I think that a lot of what we know about the Societ Union is a result of propoganda on the part of our government.

6. ____ I think that the United States is militarily stronger than the Soviet Union.

7. ____ I would never want to participate in a war.

8. ____ I would not be involved in fighting a war unless I felt that we were directly threatened.

9. ____ I would not want to survive a nuclear war.

10. ____ I think that if 2 countries decided to declare war on one another, the 2 leaders from each country should fight it out.

11. ____ I believe that our system of government was initially established on the precept that the government would be established for the people and would be run by the people. This does not seem to be the case any longer.

12. ____ I feel that the Canadian government is too passive in its dealings with other governments.

13. ____ I think that our laws do not adequately deal with minors who violate the law.

14. ____ I usually vote in every election.

15. ____ I usually do not vote because I do not know what the issues are or what each candidate's platform is.

-3 = strongly disagree
-2 = moderately disagree
-I = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

16. _____ I believe that men and women should be treated equally.

17. _____ I think that more appropriate housing has to be found for the poor in our society.

18. _____ I believe that whenever a Conservative government comes into power, funding for social services is always cut.

19. _____ I do not believe Prime Minister Brian Mulroney is a good leader.

20. _____ I believe that our government is full of liars.

Appendix F

Reasoning Test

Reasoning Test

Here is a test of reasoning ability. The test consists of 31 short passages in each of which an argument is developed. For each of the passages you are to judge whether the argument is sound or unsound (i.e., whether or not the conclusion follows logically from the first 2 statements). If you think that the argument is sound (i.e., the conclusion follows logically from the preceding statements), draw a circle around the S in the margin to the left of the passage. If you think the argument is unsound (i.e., the conclusion does not follow logically from the preceding statements), draw a circle around the U in the margin to the left of the passage.

Think clearly and carefully. Make sure that you give an answer to every item; do not leave any item unanswered.

Remember to circle S if you think the argument is logically sound and U if you think the argument is logically unsound. You may or may not agree with one or more of the statements in the argument. What is important is to determine whether the argument is logically sound or logically unsound. Please work steadily at these passages, but take the time necessary to think carefully about each one.

Circle S if you think the argument is logically sound;
Circle U if you think the argument is logically unsound.
Answer all questions. Work steadily and carefully.

S U 1. All novelists are idealists and all novelists are writers. Therefore, some writers are idealists.

S U 2. Good citizens take advantage of their privilege of voting. All members of the North End Political Club, being conscious of their civic duties, are good citizens. Therefore, all members of the North End Political Club will vote on Election Day.

S U 3. The reality of any phenomenon is established by scientific investigation and treatment. The existence of God is not established by scientific investigation and treatment. Therefore, the existence of God is not real.

S U 4. Personal behavior which is in agreement with the teachings of Christ must always be supported. Attendance at Church and charity to others agree with the teachings of Christ. Therefore, attendance at Church and charity to others should always be supported.

S U 5. The development of sanctimonious and hypocritical behavior among people is a symptom of a sick society too willing to accept doctrines without questioning. The Christian religion is a symptom of a sick society which accepts doctrines without questioning. Therefore, the Christian religion leads to the development of sanctimonious and hypocritical behavior among people.

S U 6. No one has ever done any harm to his health by moderate indulgence in a mild drug. Nicotine is a mild drug and few cigarette smokers can afford to smoke excessively. Therefore, few people are harmed by cigarette smoking.

S U 7. People would agree that all arguments against Christianity are theological arguments. However, if a reasonable person is to argue against Christianity it is not sufficient that an argument should be merely theological. So no reasonable person should argue against Christianity.

S U 8. If the Christian religion tolerated a wide variety of conflicting opinions about the purpose of life it would want a true, universal brotherhood of man. The Christian religion does not tolerate a wide variety of conflicting opinions about the purpose of life. It follows that the Christian religion does not want a true, universal brotherhood of man.

S U 9. Religion has a harmful effect on a culture only if it creates attitudes of complacency and conformity. The Christian religion has not created attitudes of complacency and conformity. Therefore, the Christian religion does not have a harmful effect on a culture.

S U 10. If the barometer reading does not change, it means that the weather will remain the same. The barometer reading has changed; therefore, the weather will change.

S U 11. Enlightened people who believe in the divinity of Christ experience a meaningfulness and order in life about them. Some fortunate people show this ability to experience meaningfulness and pattern in life, so we may be sure that some fortunate people are enlightened and believe in the divinity of Christ.

Circle S if you think the argument is logically sound;
Circle U if you think the argument is logically unsound.
Answer all questions. Work steadily and carefully.

S U 12. All normative sciences dealing with the problem of order may be considered to be a branch of mathematics. Logic is a normative science dealing with the problem of order, therefore, logic is a branch of mathematics.

S U 13. We must admit that Christian miracles are unusual events, but, to excite the legitimate interest of a reasonable person, it is not sufficient that an event should be merely unusual. So, no reasonable person should be interested in Christian miracles.

S U 14. Christian people believe in the existence of a divine Creator. We may be sure that no one would believe in the existence of a divine Creator if the Scriptures were not founded on fact. It follows that we can dismiss the arguments that the Scriptures are not founded on fact.

S U 15. If the material of which a vessel is constructed is lighter than water, then the vessel will float. The S.S. America has recently been sucessfully launched and floated. We may therefore conclude that the S.S. America has been constructed of materials which are lighter than water.

S U 16. A charitable and tolerant attitude towards mankind helps to bring people together in love and harmony. Christianity always helps to bring people together in love and harmony. Therefore, a consequence of Christianity is a charitable and tolerant attitude towards mankind.

S U 17. Careful study by economists has revealed that if the cost of production of a commodity is reduced, it comes into greater demand. With the diversion of machine tools to defence industries, the cost of production of automobiles has not been reduced. Therefore, automobiles will not come into greater demand.

S U 18. Many reasonable people argue that Christ did not rise from the dead. It is certain that no one would argue against the resurrection of Christ if most events in the Bible actually happened as described. Therefore, the argument that most events in the Bible actually happened as described can be dismissed.

S U 19. If the Resurrection had not occurred then we must agree that the divinity of Christ would be a myth. But the Resurrection did occur, Christ did rise from the dead, so it follows that the divinity of Christ is not a myth but real.

S U 20. All members of the finance committee are members of the executive committee. No members of the library committee are members of the executive committee; therefore, no members of the library committee are members of the finance committee.

S U 21. Those people who believe that Christ is immortal are misguided in their belief and must come to understand that religion is, after all, manmade and not a communion with God. Christians believe that Christ is immortal. Therefore, Christians must come to understand that religion is created by man and is not a communion with God.

Circle S if you think the argument is logically sound;
Circle U if you think the argument is logically unsound.
Answer all questions. Work steadily and carefully.

S U 22. If an argument opposing the Christian religion is to be truly convincing it must accept the divine nature of Christ. Philosophical arguments opposing the godliness and immortality of Christ do not accept His divine nature. So it follows that philosophical arguments opposing the godliness and immortality of Christ are not truly convincing arguments.

S U 23. Many people fear that the prosperity of American industry may decline under increasing government control. They should remember, however, that the tariff system is itself a form of government control of industry, and that our industries have prospered. This shows that government control is not harmful to industry.

S U 24. If Christians favoured a theological system where man is creator and God is a fiction they would have good reason to doubt the divine nature of Christ. But Christians do not favour a theological system where man is creator and God is a fiction. Therefore, Christians do not have good reason to doubt the divine nature of Christ.

S U 25. No man can be blamed for any characteristic with which he was born or for any consequence of such a characteristic. Some men are criminals because they were born with criminal characteristics. So it follows that some criminals are not to be blamed for being criminals.

S U 26. The right to criticize established institutions which place restrictions on thought and action is consistent with a liberal approach to life and must be defended at all costs. Criticism of the Christian church because it places restrictions on thought and action is consistent with a liberal approach. Therefore, the right to criticize the Christian church because it is restrictive must be defended at all costs.

S U 27. All really convincing discussions about the value of the Christian religion must be firmly based upon proven facts and logical argument. A lot of the discussion by Christians about their religion is not based on proven facts and logic at all, but on unreliable emotional conviction. Therefore, none of the discussions by Christians about their religion is really convincing.

S U 28. If thorough scientific investigation cannot prove that the Christian religion is superstition then belief in Christian miracles is justified. But thorough scientific investigation is able to prove that the Christian religion is superstition, so it follows that belief in Christian miracles is not justified.

S U 29. People who are without religion are spiritually devoid and need the Christian teachings to show them the true way of life. Atheists and agnostics are people without religion and devoid of spiritual life. Therefore, atheists and agnostics need Christian teachings to show them the true way of life.

S U 30. It is found that houses in which a dog is kept are never visited by burglars. It is also found that houses with telephones are seldom visited by burglars. So it follows that some houses in which a dog is kept are fitted with telephones.

S U 31. If the Christian religion is to survive the years to come it must be accepted with open hearts by all men. No religion is ever accepted wholeheartedly by all men. So it follows that the Christian religion will not survive in the years to come.

Appendix G

Religious conclusions

Questionnaire

Using the same scale as in the first questionnaire, as noted below, please indicate the degree to which you agree or disagree with each statement.

-3 = strongly disagree
-2 = moderately disagree
-1 = slightly disagree
+3 = strongly agree
+2 = moderately agree
+1 = slightly agree
0 = neutral

1. _____ The existence of God is not real.
2. _____ Attendance at Church and charity to others should always be supported.
3. _____ The Christian religion leads to the development of sanctimonious and hypocritical behavior among people.
4. _____ No reasonable person should argue against Christianity.
5. _____ The Christian religion does not want a true, universal brotherhood of man.
6. _____ The Christian religion does not have a harmful effect on a culture.
7. _____ Some fortunate people are enlightened and believe in the divinity of Christ.
8. _____ No reasonable person should be interested in Christian miracles.
9. _____ We can dismiss the arguments that the Scriptures are not founded on fact.
10. _____ A consequence of Christianity is a charitable and tolerant attitude towards mankind.
11. _____ The argument that most events in the Bible actually happened as described can be dismissed.
12. _____ The divinity of Christ is not a myth but real.
13. _____ Christians must come to understand that religion is created by man and is not a communion with God.
14. _____ Philosophical arguments opposing the godliness and immortality of Christ are not truly convincing arguments.
15. _____ Christians do not have good reason to doubt the divine nature of Christ.
16. _____ The right to criticize the Christian church because it is restrictive must be defended at all costs.
17. _____ None of the discussions by Christians about their religion is really convincing.
18. _____ Belief in Christian miracles is not justified.
19. _____ Atheists and agnostics need Christian teachings to show them the true way of life.
20. _____ The Christian religion will not survive in the years to come.

Appendix H

Questionnaire on perceptions of the study and its content

Questionnaire

Now I would like you to answer some questions related to what you think about this study. Please continue to use the same scale as in the first questionnaire, which is noted below. Please try to answer these statements as honestly as possible.

-3 = strongly disagree	+3 = strongly agree	
-2 = moderately disagree	+2 = moderately agree	0 = neutral
-1 = slightly disagree	+1 = slightly agree	

1. _____ This study is examining personality factors.
2. _____ This study is examining moral judgment.
3. _____ This study is examining religious attitudes.
4. _____ This study is examining logical thinking or rational thought patterns.
5. _____ This study is examining the rationalizations that people make.
6. _____ This study is examining peoples' awareness of political issues.
7. _____ I have no opinion on what this study is examining.
8. _____ This study is related to another study I participated in this term.
9. _____ My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone.
10. _____ My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments.
11. _____ My analysis of the arguments was influenced by the wording of the statements.
12. _____ My analysis of the arguments was influenced by the pro-religious content of the statements.
13. _____ My analysis of the arguments was influenced by the anti-religious content of the statements.
14. _____ My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage.
15. _____ If I disagreed with one or more of the first 2 statements, I marked the argument as unsound.
16. _____ If I agreed with one or more of the first 2 statements, I marked the argument unsound.
17. _____ If I disagreed with the conclusion of an argument, I marked the argument unsound.
18. _____ If I agreed with the conclusion of an argument, I marked the argument unsound.
19. _____ I tried very hard to complete the arguments.
20. _____ I did not take this study very seriously.

Appendix I

Debriefing statements

Debriefing Statements

Now I would like to tell you a bit about the study, and answer any questions you might have. First, there have been some studies in the past which have shown that individuals' responses to certain material may be influenced by prior beliefs, opinions, or cognitions. That is, some people seem to pay more attention to the connotations of the material, than to the problems inherent in the material. This was one of the main issues in this study. We also gave different people different questionnaires, prior to the arguments or passages, to see if it would affect how they respond to the material. The actual purpose of this study was not disclosed to you, since we were worried that if you knew precisely what we were looking at, it might have biased your responses to the questionnaires.

Please, do not reveal any information about this study to anyone, because this could jeopardize the results of this study, essentially rendering it useless at great cost in terms of time and money to both the university and the researcher. Participation in this study was completely voluntary. Thus, if you do not want your questionnaires included in the data analysis please speak to me afterwards. Further information on the study will hopefully be available by December 15. The results will be posted on the bulletin board, beside the elevator, in the Psychology Department.

The information obtained from this study will be analyzed on a group basis only, and not individually. Your personal responses will

be kept completely confidential.

Please do not be worried if you do not think you did very well on the passages. They are very hard to analyze. Are there any questions? Thank you for your help. It is greatly appreciated.

Appendix J

Tabular tables

Table 1

ANOVA for Critical Ability (the Number of Neutral Syllogisms Correct)

Source	df	MS	F
Religious orthodoxy(1)	1	2.78	1.22
Priming condition(1)	1	7.03	3.10
Priming condition(2)	1	.51	.22
Logic training(1)	1	14.69	6.47*
R(1) X P(1)	1	.00	.00
R(1) X P(2)	1	.01	.00
R(1) X L(1)	1	1.36	.60
P(1) X L(1)	1	.00	.00
P(2) X L(1)	1	3.76	1.66
R(1) X P(1) X L(1)	1	1.00	.44
R(1) X P(2) X L(1)	1	.01	.00
Error	132	2.27	

Note. *$p < .01$

Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training (1) refers to the contrast between the logic and no logic training condition.

Table 2

ANOVA for the Number of Proreligious Syllogisms Correct

Source	df	MS	F
Religious orthodoxy(1)	1	.00	.00
Priming condition(1)	1	.22	.11
Priming condition(2)	1	2.67	1.29
Logic training(1)	1	1.78	.86
R(1) X P(1)	1	4.50	2.17
R(1) X P(2)	1	.17	.08
R(1) X L(1)	1	4.00	1.93
P(1) X L(1)	1	.22	.11
P(2) X L(1)	1	1.50	.72
R(1) X P(1) X L(1)	1	12.50	6.04*
R(1) X P(2) X L(1)	1	2.67	1.29
Error	132	2.07	

Note. *$p < .05$
Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training (1) refers to the contrast between the logic and no logic training condition.

Table 3

Mean Scores and Standard Deviations for the Number of Proreligious Syllogisms Correct

Condition	Training condition: Logic M	Logic SD	No logic M	No logic SD
Proreligious (n = 72)				
Critical priming	6.00	1.54	5.33	1.56
Religious priming	5.17	1.27	5.67	1.07
Neutral priming	6.00	1.65	4.50	1.51
Antireligious (n = 72)				
Critical priming	5.58	1.44	5.42	1.31
Religious priming	5.25	1.06	4.92	1.62
Neutral priming	5.33	1.15	6.17	1.85

Table 4

ANOVA for the Number of Antireligious Syllogisms Correct

Source	df	MS	F
Religious orthodoxy(1)	1	.17	.09
Priming condition(1)	1	14.67	7.41*
Priming condition(2)	1	1.26	.64
Logic training(1)	1	1.56	.79
R(1) X P(1)	1	.17	.09
R(1) X P(2)	1	.26	.13
R(1) X L(1)	1	.56	.28
P(1) X L(1)	1	.03	.02
P(2) X L(1)	1	.51	.26
R(1) X P(1) X L(1)	1	.78	.39
R(1) X P(2) X L(1)	1	.26	.13
Error	132	1.98	

Note. *p < .01
Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.

Table 5

Mean Scores and Standard Deviations for the Number of Antireligious Syllogisms Correct

Condition	Training condition: Logic M	Logic SD	No logic M	No logic SD
Proreligious (n = 72)				
Critical priming	5.58	1.62	5.42	1.16
Religious priming	5.50	1.45	4.83	.94
Neutral priming	6.17	1.19	6.00	1.86
Antireligious (n = 72)				
Critical priming	5.33	1.50	5.42	1.68
Religious priming	5.25	1.71	5.25	1.66
Neutral priming	6.08	.51	5.75	.97

Table 6

ANOVA for Religious Bias Score

Source	df	MS	F
Religious orthodoxy(1)	1	18.06	3.29@
Priming condition(1)	1	.59	.11
Priming condition(2)	1	.26	.05
Logic training(1)	1	5.06	.92
R(1) X P(1)	1	1.53	.28
R(1) X P(2)	1	1.76	.32
R(1) X L(1)	1	14.06	2.56
P(1) X L(1)	1	2.53	.46
P(2) X L(1)	1	.01	.00
R(1) X P(1) X L(1)	1	.28	.05
R(1) X P(2) X L(1)	1	1.26	.23
Error	132	5.49	

Note. @ approaches significance $p < .07$
Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.

Table 7

ANOVA for Proreligious Error Score

Source	df	MS	F
Religious orthodoxy(1)	1	3.67	1.14
Priming condition(1)	1	6.42	1.99
Priming condition(2)	1	1.26	.39
Logic training(1)	1	5.84	1.81
R(1) X P(1)	1	2.17	.67
R(1) X P(2)	1	.51	.16
R(1) X L(1)	1	10.56	3.28@
P(1) X L(1)	1	1.25	.39
P(2) X L(1)	1	.09	.03
R(1) X P(1) X L(1)	1	2.53	.79
R(1) X P(2) X L(1)	1	1.26	.39
Error	132	3.22	

Note. @ approaches significance $p < .07$
Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.

Table 8

Mean Scores and Standard Deviations for Proreligious Error Score

Condition	Training condition			
	Logic		No logic	
	M	SD	M	SD
Proreligious (n = 72)				
Critical priming	4.75	2.05	5.67	2.06
Religious priming	5.42	1.68	5.75	1.54
Neutral priming	4.42	1.68	6.00	2.52
Antireligious (n = 72)				
Critical priming	5.33	1.30	5.08	1.83
Religious priming	5.25	1.29	5.33	1.92
Neutral priming	4.67	1.62	4.42	1.68

Table 9

ANOVA for Antireligious Error Score

Source	df	MS	F
Religious orthodoxy(1)	1	5.44	2.47
Priming condition(1)	1	3.13	1.42
Priming condition(2)	1	2.67	1.21
Logic training(1)	1	.03	.01
R(1) X P(1)	1	.06	.03
R(1) X P(2)	1	.38	.17
R(1) X L(1)	1	.25	.11
P(1) X L(1)	1	.22	.10
P(2) X L(1)	1	.04	.02
R(1) X P(1) X L(1)	1	1.25	.51
R(1) X P(2) X L(1)	1	.00	.00
Error	132	2.20	

Note. Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.

Table 10

Mean Scores and Standard Deviations for Antireligious Error Score

Condition	Training condition: Logic M	Logic SD	No logic M	No logic SD
Proreligious (n = 72)				
Critical priming	3.67	1.87	3.58	1.78
Religious priming	3.92	1.51	3.75	1.29
Neutral priming	3.42	1.38	3.50	1.24
Antireligious (n = 72)				
Critical priming	3.75	1.91	4.08	1.00
Religious priming	4.25	1.29	4.50	1.69
Neutral priming	3.92	1.16	3.67	1.37

Table 11

Intercorrelations of Scores for Pro and Antireligious Subjects in the Neutral, Logic Training Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Proreligious subjects (n = 12)			
Religious bias score	-.58*	-.26	-.06
Critical ability	- -	+.41**	+.32
Christian Orthodoxy		- -	+.61*
Religious conclusions			- -
Antireligious subjects (n = 12)			
Religious bias score	+.37	-.02	+.06
Critical ability		-.10	-.05
Christian Orthodoxy		- -	+.87**
Religious conclusions			- -

**p < .001 *p < .05

Table 12

Intercorrelations of Scores for Pro and Antireligious Subjects in the Critical, No Logic Training Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Proreligious subjects (n = 12)			
Religious bias score	-.48	+.25	+.44
Critical ability	- -	+.15	-.20
Christian Orthodoxy		- -	+.26
Religious conclusions			- -
Antireligious subjects (n = 12)			
Religious bias score	+.38	+.10	-.20
Critical ability		-.14	-.39
Christian Orthodoxy		- -	+.80*
Religious conclusions			- -

*$p < .001$

Table 13

Intercorrelations of Scores for Pro and Antireligious Subjects in the Critical Logic Training Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Proreligious subjects (n = 12)			
Religious bias score	-.19	+.15	-.02
Critical ability	- -	+.17	+.12
Christian Orthodoxy		- -	+.52*
Religious conclusions			- -
Antireligious subjects (n = 12)			
Religious bias score	-.04	+.39	+.15
Critical ability		+.28	+.14
Christian Orthodoxy		- -	+.43
Religious conclusions			- -

*p < .05

Table 14

Intercorrelations of Scores for Pro and Antireligious Subjects in the Religious, No Logic Training Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Proreligious subjects (n = 12)			
Religious bias score	-.24	-.41	+.33
Critical ability	- -	+.14	+.05
Christian Orthodoxy		- -	+.61*
Religious conclusions			- -
Antireligious subjects (n = 12)			
Religious bias score	-.28	+.44	+.87***
Critical ability		-.09	-.08
Christian Orthodoxy		- -	+.70**
Religious conclusions			- -

***p<.001 **p<.01 *p<.05

Table 15

Intercorrelations of Scores for Pro and Antireligious Subjects in the Religious, Logic Training Condition

Variable	Critical ability	Christian Orthodoxy	Religious conclusions
Proreligious subjects (n = 12)			
Religious bias score	-.65*	-.04	+.14
Critical ability	- -	-.38	-.12
Christian Orthodoxy		- -	+.35
Religious conclusions			- -
Antireligious subjects (n = 12)			
Religious bias score	-.16	-.10	-.15
Critical ability		-.02	-.13
Christian Orthodoxy		- -	+.73*
Religious conclusions			- -

*p < .01

Table 16

Frequency Distribution for Six Questions Related to the Purpose of the Study for all Subjects (N=144)

	Score						
Question	1	2	3	4	5	6	7
Personality factors	11	22	20	6	38	36	11
Moral judgement	6	13	9	8	33	55	20
Rationalizations	0	5	5	5	34	47	48
Politics	46	30	30	5	25	4	4
No opinion	67	29	10	31	3	2	2
Other study	14	2	1	8	14	23	82

Note. Question 1 "This study is examining personality factors."; Question 2 "This study is examining moral judgement."; Question 3 "This study is examining the rationalizations that people make."; Question 4 "This study is examining peoples' awareness of political issues."; Question 5 "I have no opinion on what this study is examining."; Question 6 "This study is related to another study I participated in this term." (see Appendix H).

Scoring: 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = neutral

Table 17

Frequency Distribution for Eight Questions Regarding how Subjects Analyzed the Syllogisms for all Subjects (N=144)

	Score						
Question	1	2	3	4	5	6	7
Logic instructions	9	4	8	5	14	42	62
Prior questionnaire	41	27	15	15	36	8	2
Wording of statements	5	11	13	3	36	42	34
Non-religious concepts	16	19	5	12	27	35	30
Premise(s) - disagree	71	24	11	6	15	14	3
Premise(s) - agree	81	36	14	5	5	2	1
Conclusion - disagree	48	22	8	5	16	11	34
Conclusion - agree	83	32	15	6	2	2	4

Note. Question 1 "My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone."; Question 2 "My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments."; Question 3 "My analysis of the arguments was influenced by the wording of the statements."; Question 4 "My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage."; Question 5 "If I disagreed with one or more of the first 2 statements, I marked the argument as unsound."; Question 6 "If I agreed with one or more of the first 2 statements, I marked the argument unsound."; Question 7 "If I disagreed with the conclusion of an argument, I marked the argument unsound."; Question 8 "If I agreed with the conclusion of an argument, I marked the argument unsound." (see Appendix H).

Scoring: 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = neutral

Table 18

Frequency Distribution for Questions Related to how Seriously Subjects Attempted the Syllogisms and the Entire Study for all Subjects (N=144)

	Score						
Question	1	2	3	4	5	6	7
The arguments	2	2	4	8	12	55	61
The study	74	41	11	5	8	1	4

Note. Question 1 "I tried very hard to complete the arguments."; Question 2 "I did not take this study seriously." (see Appendix H).

Scoring: 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = neutral

Table 19

ANOVA for Subjects' Belief that the Study Dealt with Religious Attitudes

Source	df	MS	F
Religious orthodoxy(1)	1	3.36	2.22
Priming condition(1)	1	.78	.52
Priming condition(2)	1	10.01	6.61*
Logic training(1)	1	.03	.02
R(1) X P(1)	1	1.25	.83
R(1) X P(2)	1	.09	.06
R(1) X L(1)	1	.69	.46
P(1) X L(1)	1	.59	.39
P(2) X L(1)	1	.26	.17
R(1) X P(1) X L(1)	1	.00	.00
R(1) X P(2) X L(1)	1	.84	.56
Error	132	1.51	

Note. *$p < .01$
Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.
This dependent variable refers to the statement "This study is examining religious attitudes." (see Appendix H).

Table 20

Mean Scores and Standard Deviations for Question 3

Condition	Training condition			
	Logic		No logic	
	M	SD	M	SD
Proreligious (n = 72)				
Critical priming	6.08	.79	6.25	1.42
Religious priming	6.75	.62	6.75	.45
Neutral priming	6.25	1.71	6.58	.79
Antireligious (n = 72)				
Critical priming	5.92	1.68	5.42	2.02
Religious priming	6.33	.89	6.42	.79
Neutral priming	6.33	1.23	6.42	1.24

Table 21

ANOVA for Subjects' Belief that the Study Dealt with Logical Thinking or Rational Thought Patterns

Source	df	MS	F
Religious orthodoxy(1)	1	2.01	1.75
Priming condition(1)	1	.03	.03
Priming condition(2)	1	.09	.08
Logic training(1)	1	.17	.15
R(1) X P(1)	1	.17	.15
R(1) X P(2)	1	.01	.01
R(1) X L(1)	1	.84	.73
P(1) X L(1)	1	2.92	2.54
P(2) X L(1)	1	1.26	1.10
R(1) X P(1) X L(1)	1	.17	.15
R(1) X P(2) X L(1)	1	3.01	2.62
Error	132	1.15	

Note. Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.

This dependent variable refers to the statement "This study is examining logical thinking or rational thought patterns." (see Appendix H).

Table 22

Mean Scores and Standard Deviations for Question 4

Condition	Training condition: Logic M	Logic SD	No logic M	No logic SD
Proreligious (n = 72)				
Critical priming	6.42	.79	6.00	.85
Religious priming	5.75	.87	6.50	.52
Neutral priming	6.50	.67	5.92	1.73
Antireligious (n = 72)				
Critical priming	5.75	1.22	6.25	1.15
Religious priming	5.83	.94	6.08	.90
Neutral priming	5.92	1.24	5.83	1.40

Table 23

ANOVA for Subjects' Belief that Their Analysis of the Arguments were Influenced by the Pro-religious Content of the Statements

Source	df	MS	F
Religious orthodoxy(1)	1	6.67	1.69
Priming condition(1)	1	.13	.03
Priming condition(2)	1	.38	.09
Logic training(1)	1	.84	.21
R(1) X P(1)	1	.89	.22
R(1) X P(2)	1	6.00	1.52
R(1) X L(1)	1	.06	.02
P(1) X L(1)	1	.35	.09
P(2) X L(1)	1	.04	.01
R(1) X P(1) X L(1)	1	.00	.00
R(1) X P(2) X L(1)	1	1.50	.38
Error	132	3.96	

Note. Religious orthodoxy(1) refers to the contrast for pro versus antireligious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.

This dependent variable refers to the statement "My analysis of the arguments was influenced by the pro-religious content of the statements." (see Appendix H).

Table 24

Mean Scores and Standard Deviations for Question 12

Condition	Training condition			
	Logic		No logic	
	M	SD	M	SD
Proreligious (n = 72)				
Critical priming	3.92	2.15	4.00	2.37
Religious priming	3.50	1.73	3.17	2.04
Neutral priming	3.58	2.07	3.25	2.42
Antireligious (n = 72)				
Critical priming	3.08	1.31	2.75	1.82
Religious priming	3.17	2.04	3.42	1.51
Neutral priming	3.33	1.92	3.08	2.19

Table 25

ANOVA for Subjects' Belief that Their Analysis of the Arguments were Influenced by the Anti-religious Content of the Statements

Source	df	MS	F
Religious orthodoxy(1)	1	.11	.03
Priming condition(1)	1	.59	.18
Priming condition(2)	1	.84	.25
Logic training(1)	1	.00	.00
R(1) x P(1)	1	.59	18
R(1) x P(2)	1	1.26	.38
P(1) x L(1)	1	.25	.08
P(1) x L(1)	1	1.53	.46
P(2) x L(1)	1	6.51	1.96
R(1) x P(1) x L(1)	1	.03	.01
R(1) x P(2) x L(1)	1	.26	.08
Error	132	3.33	

Note. Religious orthodoxy(1) refers to the contrast for pro versus anti-religious subjects. Priming condition(1) refers to the contrast for the neutral condition versus the critical and religious priming condition. Priming condition(2) refers to the contrast for the critical priming condition versus the religious priming condition. Logic training(1) refers to the contrast between the logic and no logic training condition.

This dependent variable refers to the statement "My analysis of the arguments was influenced by the anti-religious content of the statements." (see Appendix H).

Table 26

Mean Scores and Standard Deviations for Question 13

Condition	Training condition: Logic M	Logic SD	No logic M	No logic SD
Proreligious (n = 72)				
Critical priming	3.50	2.20	3.00	2.30
Religious priming	2.67	1.37	3.00	1.60
Neutral priming	2.83	1.75	3.25	2.38
Antireligious (n = 72)				
Critical priming	3.58	1.44	2.75	1.66
Religious priming	3.00	1.76	3.42	1.51
Neutral priming	2.83	1.47	3.00	2.09

Apoendix K

Exploratory tables

Table 1

Number of Syllogisms Correct

	Training			
	Logic		No logic	
	Religiosity			
Variable	Pro	Anti	Pro	Anti
Critical priming condition (n = 48)				
Critical ability	71	78	62	62
Proreligious syllogisms	72	67	64	65
Antireligious syllogisms	67	64	65	65
Religious priming condition (n = 48)				
Critical ability	68	75	61	68
Proreligious syllogisms	62	63	68	59
Antireligious syllogisms	66	63	58	63
Neutral priming condition (n = 48)				
Critical ability	77	80	65	73
Proreligious syllogisms	72	64	54	74
Antireligious syllogisms	74	73	72	73

Note. Critical ability, number of proreligious and antireligious syllogisms correct is out of 120.

Table 2

Analysis of Covariance for Sex for Critical Ability

Source	df	MS	F
Covariant	1	3.31	1.46
Religious orthodoxy	1	2.36	1.04
Priming condition	2	3.84	1.70
Logic training	1	14.09	6.22*
R X P	2	.01	.00
R X L	1	1.54	.68
P X L	2	1.94	.86
R X P X L	2	.57	.25
Error	131	2.26	

Note. *$p < .01$
Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 3

Analysis of Covariance for Prior Logic for Critical Ability

Source	df	MS	F
Covariant	2	1.45	.66
Religious orthodoxy	1	.96	.43
Priming condition	2	3.04	1.38
Logic training	1	17.59	7.97*
R X L	2	.16	.07
R X P	1	2.48	1.13
P X L	2	3.32	1.50
R X P X L	2	.89	.40
Error	117	2.21	

Note. *$p < .01$

Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 4

Analysis of Covariance for Sex for the Number of Proreligious Syllogisms Correct

Source	df	MS	F
Covariant	1	.02	.01
Religious orthodoxy	1	.00	.00
Priming condition	2	1.45	.69
Logic training	1	1.79	4.86
R X P	2	2.34	1.12
R X L	1	4.02	1.93
P X L	2	.86	.41
R X P X L	2	7.56	3.62*
Error	131	2.09	

Note. *p<.05
Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 5

Analysis of Covariance for Prior Logic for the Number of Proreligious Syllogisms Correct

Source	df	MS	F
Covariant	2	1.84	.87
Religious orthodoxy	1	.26	.12
Priming condition	2	1.30	.62
Logic training	1	5.38	2.54
R X P	2	2.34	1.10
R X L	1	2.71	1.28
P X L	2	1.69	.80
R X P X L	2	2.92	1.38
Error	117	2.12	

Note. Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 6

Analysis of Covariance for Sex for the Number of Antireligious Syllogisms Correct

Source	df	MS	F
Covariant	1	.04	.02
Religious orthodoxy	1	.16	.08
Priming condition	2	7.96	3.99*
Logic training	1	1.58	.79
R X P	2	.22	.11
R X L	1	.57	.29
P X L	2	.27	.14
R X P X L	2	.53	.26
Error	131	2.00	

Note. *$p < .05$
Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 7

Analysis of Covariance for Prior Logic for the Number of Antireligious Syllogisms Correct

Source	df	MS	F
Covariant	2	.83	.39
Religious orthodoxy	1	.82	.38@
Priming condition	2	5.58	2.60
Logic training	1	1.37	.64
R × P	2	.31	.14
R × L	1	1.07	.50
P × L	2	.30	.14
R × P × L	2	.53	.25
Error	117	2.14	

Note. @approaches significance $p < .08$
Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 8

Analysis of Covariance for Sex for Religious Bias Scores

Source	df	MS	F
Covariant	1	5.60	1.02
Religious orthodoxy	1	19.40	3.53@
Priming condition	2	.39	.07
Logic training	1	5.51	1.00
R X P	2	1.73	.31
R X L	1	14.79	2.69
P X L	2	1.16	.21
R X P X L	2	.69	.13
Error	131	5.49	

Note. @approaches significance $p < .06$
Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 9

Analysis of Covariance for Prior Logic for Religious Bias Scores

Source	df	MS	F
Covariant	2	4.37	.77
Religious orthodoxy	1	27.69	4.88*
Priming condition	2	2.54	.45
Logic training	1	3.68	.65
R X P	2	1.95	.34
R X L	1	7.84	1.38
P X L	2	1.98	.35
R X P X L	2	2.21	.39
Error	117	5.67	

Note. *$p < .05$

Due to lack of information supplied by subjects regarding their logic background, only 131 subjects out of 144 have been included in this analysis. Seventeen subjects reported prior logic instruction (16 had prior exposure to logic, for 12 of these subjects this included instruction on syllogisms and only 1 subject reported only having encountered syllogisms before).

Table 10

Frequency Distribution for Six Questions Related to the Purpose of the Study for Subjects in the Critical Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Personality factors	1	5	1	0	0	4	1
Moral judgement	0	3	0	0	2	4	3
Rationalizations	0	0	0	0	3	4	5
Politics	5	6	0	0	1	0	0
No opinion	8	3	0	0	0	0	0
Other study	1	1	0	0	2	0	8
Antireligious (n = 12)							
Personality factors	1	0	2	2	3	4	0
Moral judgement	0	2	0	2	4	4	0
Rationalizations	0	0	0	3	5	2	2
Politics	2	6	1	2	0	1	0
No opinion	6	0	1	5	0	0	0
Other study	0	0	0	3	3	1	5

Note. Question 1 "This study is examining personality factors."; Question 2 "This study is examinning moral judgement."; Question 3 "This study is examining the rationalizations that people make."; Question 4 "This study is examining peoples' awareness of political issues."; Question 5 "I have no opinion on what this study is examining."; Question 6 "This study is related to another study I participated in this term." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 11

Frequency Distribution of Six Questions Related to the Purpose of the Study for Subjects in the Critical, No Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Personality factors	1	0	2	0	5	3	1
Moral judgement	1	0	0	0	3	5	3
Rationalizations	0	1	1	0	2	2	6
Politics	2	4	4	0	1	1	0
No opinion	7	3	1	0	0	1	0
Other study	2	0	0	1	1	2	6
Antireligious (n = 12)							
Personality factors	2	2	3	0	3	1	1
Moral judgement	2	2	2	0	2	3	1
Rationalizations	0	0	1	0	5	2	4
Politics	6	1	3	0	2	0	0
No opinion	6	2	1	3	0	0	0
Other study	3	0	0	1	0	2	6

Note. Question 1 "This study is examining personality factors."; Question 2 "This study is examinning moral judgement."; Question 3 "This study is examining the rationalizations that people make."; Question 4 "This study is examining peoples' awareness of political issues."; Question 5 "I have no opinion on what this study is examining."; Question 6 "This study is related to another study I participated in this term." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 12

Frequency Distribution for Six Questions Related to the Purpose of the Study for Subjects in the Religious, Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Personality factors	0	2	1	0	1	6	2
Moral judgement	0	0	1	2	1	7	1
Rationalizations	0	1	1	1	3	3	3
Politics	9	0	2	0	1	0	0
No opinion	9	1	0	1	0	0	1
Other study	0	0	0	1	1	2	8
Antireligious (n = 12)							
Personality factors	1	1	2	1	4	1	2
Moral judgement	0	1	0	1	5	4	1
Rationalizations	0	1	0	0	2	3	6
Politics	7	1	1	1	1	1	0
No opinion	4	0	1	6	0	1	0
Other study	0	0	0	0	0	2	10

Note. Question 1 "This study is examining personality factors."; Question 2 "This study is examinning moral judgement."; Question 3 "This study is examining the rationalizations that people make."; Question 4 "This study is examining peoples' awareness of political issues."; Question 5 "I have no opinion on what this study is examining."; Question 6 "This study is related to another study I participated in this term." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 13

Frequency Distribution for Six Questions Related to the Purpose of the Study for Subjects in the Religious, No Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Personality factors	0	2	1	2	4	3	0
Moral judgement	1	0	1	1	2	6	1
Rationalizations	0	0	1	0	0	9	2
Politics	3	1	4	0	3	1	0
No opinion	2	6	1	3	0	0	0
Other study	0	0	0	0	0	4	8
Antireligious (n = 12)							
Personality factors	1	5	0	1	3	2	0
Moral judgement	0	2	1	0	3	4	2
Rationalizations	0	1	1	0	5	1	4
Politics	7	1	2	1	1	0	0
No opinion	4	1	1	4	2	0	0
Other study	1	0	0	0	2	3	6

Note. Question 1 "This study is examining personality factors."; Question 2 "This study is examinning moral judgement."; Question 3 "This study is examining the rationalizations that people make."; Question 4 "This study is examining peoples' awareness of political issues."; Question 5 "I have no opinion on what this study is examining."; Question 6 "This study is related to another study I participated in this term." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 14

Frequency Distribution for Six Questions Related to the Purpose of the Study for Subjects in the Neutral, Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Personality factors	1	2	1	0	5	2	1
Moral judgement	0	2	1	0	2	6	1
Rationalizations	0	0	0	0	2	6	4
Politics	2	4	0	0	5	0	1
No opinion	7	2	0	2	0	0	1
Other study	0	1	1	1	2	2	5
Antireligious (n = 12)							
Personality factors	0	0	3	0	4	4	1
Moral judgement	0	1	1	0	3	5	2
Rationalizations	0	0	0	0	2	7	3
Politics	0	2	6	0	3	0	1
No opinion	3	6	0	3	0	0	0
Other study	3	0	0	0	2	3	4

Note. Question 1 "This study is examining personality factors."; Question 2 "This study is examinning moral judgement."; Question 3 "This study is examining the rationalizations that people make."; Question 4 "This study is examining peoples' awareness of political issues."; Question 5 "I have no opinion on what this study is examining."; Question 6 "This study is related to another study I participated in this term." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 15

Frequency Distribution for Six Questions Related to the Purpose of the Study for Subjects in the Neutral, No Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Personality factors	3	1	3	0	2	1	2
Moral judgement	1	0	1	1	2	4	3
Rationalizations	0	1	0	1	3	3	4
Politics	2	0	4	1	3	0	2
No opinion	6	2	3	1	0	0	0
Other study	3	0	0	0	0	2	7
Antireligious (n = 12)							
Personality factors	0	2	1	0	4	5	0
Moral judgement	1	0	1	1	4	3	2
Rationalizations	0	0	0	0	2	5	5
Politics	1	4	3	0	4	0	0
No opinion	5	3	1	2	1	0	0
Other study	1	0	0	1	1	0	9

Note. Question 1 "This study is examining personality factors."; Question 2 "This study is examinning moral judgement."; Question 3 "This study is examining the rationalizations that people make."; Question 4 "This study is examining peoples' awareness of political issues."; Question 5 "I have no opinion on what this study is examining."; Question 6 "This study is related to another study I participated in this term." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 16

Frequency Distribution for Eight Questions Regarding how Subjects Analyzed the Syllogisms for Subjects in the Critical, Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Logic instructions	0	0	0	0	1	4	7
Questionnaire content	4	4	1	2	1	0	0
Wording of statements	1	0	1	0	3	5	2
Non-religious content	1	4	0	0	1	3	3
Premise(s) - disagree	5	5	1	0	1	0	0
Premise(s) - agree	7	5	0	0	0	0	0
Conclusion - disagree	3	6	0	0	1	1	1
Conclusion - agree	6	6	0	0	0	0	0
Antireligious (n = 12)							
Logic instructions	1	0	1	3	2	1	4
Questionnaire content	2	3	1	3	3	0	0
Wording of statements	0	2	2	2	1	3	2
Non-religious content	2	2	0	3	2	3	0
Premise(s) - disagree	7	0	1	3	0	1	0
Premise(s) - agree	6	0	3	3	0	0	0
Conclusion - disagree	5	0	2	2	1	1	1
Conclusion - agree	8	0	2	2	0	0	0

Note. Question 1 "My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone."; Question 2 "My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments."; Question 3 "My analysis of the arguments was influenced by the wording of the statements."; Question 4 "My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage."; Question 5 "If I disagreed with one or more of the first 2 statements, I marked the argument as unsound."; Question 6 "If I agreed with one or more of the first 2 statements, I marked the argument unsound."; Question 7 "If I disagreed with the with the conclusion of an argument, I marked the argument unsound."; Question 8 "If I agreed with the conclusion of an argument, I marked the argument unsound." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 17

Frequency Distribution for Eight Questions Regarding how Subjects Analyzed the Syllogisms for Subjects in the Critical, No Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Logic instructions	2	1	1	0	2	3	3
Questionnaire content	5	1	1	1	3	1	0
Wording of statements	1	2	1	0	4	3	1
Non-religious content	1	1	1	0	4	2	3
Premise(s) - disagree	5	2	2	0	1	2	0
Premise(s) - agree	6	3	2	0	1	0	0
Conclusion - disagree	3	2	0	0	4	0	3
Conclusion - agree	7	2	3	0	0	0	0
Antireligious (n = 12)							
Logic instructions	2	2	0	0	2	2	4
Questionnaire content	5	2	1	1	2	0	1
Wording of statements	0	0	2	0	3	3	4
Non-religious content	1	0	0	4	2	2	3
Premise(s) - disagree	6	0	1	0	3	2	0
Premise(s) - agree	8	2	1	0	1	0	0
Conclusion - disagree	5	1	0	0	0	2	4
Conclusion - agree	9	2	0	0	0	0	1

Note. Question 1 "My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone."; Question 2 "My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments."; Question 3 "My analysis of the arguments was influenced by the wording of the statements."; Question 4 "My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage."; Question 5 "If I disagreed with one or more of the first 2 statements, I marked the argument as unsound."; Question 6 "If I agreed with one or more of the first 2 statements, I marked the argument unsound."; Question 7 "If I disagreed with the with the conclusion of an argument, I marked the argument unsound."; Question 8 "If I agreed with the conclusion of an argument, I marked the argument unsound." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 18

Frequency Distribution for Eight Questions Regarding how Subjects Analyzed the Syllogisms for Subjects in the Religious, Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Logic instructions	2	0	0	0	0	4	6
Questionnaire content	3	3	1	1	4	0	0
Wording of statements	0	0	4	0	2	5	1
Non-religious content	1	0	1	1	0	4	5
Premise(s) - disagree	8	2	0	0	1	1	0
Premise(s) - agree	8	4	0	0	0	0	0
Conclusion - disagree	4	1	2	0	0	0	5
Conclusion - agree	9	3	0	0	0	0	0
Antireligious (n = 12)							
Logic instructions	0	0	0	1	2	1	8
Questionnaire content	5	1	0	0	4	2	0
Wording of statements	1	0	0	0	4	2	5
Non-religious content	3	1	0	0	2	3	3
Premise(s) - disagree	6	5	0	0	0	1	0
Premise(s) - agree	8	4	0	0	0	0	0
Conclusion - disagree	6	1	0	0	1	0	4
Conclusion - agree	10	1	0	1	0	0	0

Note. Question 1 "My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone."; Question 2 "My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments."; Question 3 "My analysis of the arguments was influenced by the wording of the statements."; Question 4 "My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage."; Question 5 "If I disagreed with one or more of the first 2 statements, I marked the argument as unsound."; Question 6 "If I agreed with one or more of the first 2 statements, I marked the argument unsound."; Question 7 "If I disagreed with the with the conclusion of an argument, I marked the argument unsound."; Question 8 "If I agreed with the conclusion of an argument, I marked the argument unsound." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 19

Frequency Distribution for Eight Questions Regarding how Subjects Analyzed the Syllogisms for Subjects in the Religious, No Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Logic instructions	0	0	1	0	0	4	7
Questionnaire content	2	4	1	0	4	1	0
Wording of statements	0	2	1	0	3	3	3
Non-religious content	2	2	0	1	4	3	0
Premise(s) - disagree	7	1	1	0	2	1	0
Premise(s) - agree	8	3	1	0	0	0	0
Conclusion - disagree	5	1	1	0	1	1	3
Conclusion - agree	7	2	2	0	0	0	1
Antireligious (n = 12)							
Logic instructions	1	0	4	0	2	1	4
Questionnaire content	3	2	2	2	2	1	0
Wording of statements	1	2	1	0	2	2	4
Non-religious content	0	1	0	2	5	0	4
Premise(s) - disagree	2	2	2	0	3	2	1
Premise(s) - agree	4	5	3	0	0	0	0
Conclusion - disagree	1	3	0	1	3	2	2
Conclusion - agree	4	5	2	1	0	0	0

Note. Question 1 "My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone."; Question 2 "My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments."; Question 3 "My analysis of the arguments was influenced by the wording of the statements."; Question 4 "My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage."; Question 5 "If I disagreed with one or more of the first 2 statements, I marked the argument as unsound."; Question 6 "If I agreed with one or more of the first 2 statements, I marked the argument unsound."; Question 7 "If I disagreed with the with the conclusion of an argument, I marked the argument unsound."; Question 8 "If I agreed with the conclusion of an argument, I marked the argument unsound." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 20

Frequency Distribution for Eight Questions Regarding how Subjects Analyzed the Syllogisms for Subjects in the Neutral, Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Logic instructions	0	0	1	0	1	6	4
Questionnaire content	3	0	1	3	4	1	0
Wording of statements	0	0	0	1	4	4	3
Non-religious content	1	2	1	0	3	2	3
Premise(s) - disagree	6	2	0	1	2	1	0
Premise(s) - agree	6	3	0	1	2	0	0
Conclusion - disagree	5	2	0	1	2	0	2
Conclusion - agree	6	2	2	1	1	0	0
Antireligious (n = 12)							
Logic instructions	0	0	0	0	1	5	6
Questionnaire content	3	3	3	0	3	0	0
Wording of statements	0	0	1	0	5	3	3
Non-religious content	2	2	1	0	2	4	1
Premise(s) - disagree	7	1	1	2	1	0	0
Premise(s) - agree	7	1	2	1	1	0	0
Conclusion - disagree	4	3	1	1	0	2	1
Conclusion - agree	5	4	1	1	0	1	0

Note. Question 1 "My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone."; Question 2 "My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments."; Question 3 "My analysis of the arguments was influenced by the wording of the statements."; Question 4 "My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage."; Question 5 "If I disagreed with one or more of the first 2 statements, I marked the argument as unsound."; Question 6 "If I agreed with one or more of the first 2 statements, I marked the argument unsound."; Question 7 "If I disagreed with the with the conclusion of an argument, I marked the argument unsound."; Question 8 "If I agreed with the conclusion of an argument, I marked the argument unsound." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 21

Frequency Distribution for Eight Questions Regarding how Subjects Analyzed the Syllogisms for Subjects in the Neutral, No Logic Training Condition

	Score						
Question	1	2	3	4	5	6	7
Proreligious (n = 12)							
Logic instructions	1	1	0	1	0	5	4
Questionnaire content	4	2	1	1	1	2	1
Wording of statements	1	1	0	0	3	5	2
Non-religious content	2	1	0	1	1	6	1
Premise(s) - disagree	5	1	1	0	1	2	2
Premise(s) - agree	6	3	1	0	0	1	1
Conclusion - disagree	3	1	2	0	1	1	4
Conclusion - agree	4	3	2	0	0	1	2
Antireligious (n = 12)							
Logic instructions	0	0	0	0	1	6	5
Questionnaire content	2	2	2	1	5	0	0
Wording of statements	0	2	0	0	2	4	4
Non-religious content	7	3	1	0	0	0	1
Premise(s) - disagree	7	3	1	0	0	1	0
Premise(s) - agree	4	1	0	0	2	1	4
Conclusion - disagree	8	2	1	0	1	0	0
Conclusion - agree	0	3	1	0	1	3	4

Note. Question 1 "My analysis of the passages was influenced by the instructions to analyze the arguments on the basis of logic alone."; Question 2 "My analysis of the arguments was influenced by the content of the questionnaire I filled out prior to analyzing the arguments."; Question 3 "My analysis of the arguments was influenced by the wording of the statements."; Question 4 "My analysis of the non-religious arguments was influenced by the concepts (i.e., ideas and notions) presented in the passage."; Question 5 "If I disagreed with one or more of the first 2 statements, I marked the argument as unsound."; Question 6 "If I agreed with one or more of the first 2 statements, I marked the argument unsound."; Question 7 "If I disagreed with the with the conclusion of an argument, I marked the argument unsound."; Question 8 "If I agreed with the conclusion of an argument, I marked the argument unsound." (see Appendix H).

Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 22

Frequency Distribution for Questions Related to how Seriously Subjects in the Critical Condition Attempted the Syllogisms and the Entire Study

	Logic training condition						
	Score						
Question	1	2	3	4	5	6	7
Proreligious subjects (n = 12)							
Arguments	0	0	0	0	1	8	3
Study	5	6	0	0	0	0	1
Antireligious subjects (n = 12)							
Arguments	0	1	1	3	1	6	0
Study	2	4	4	2	0	0	0
	No logic condition						
Proreligious (n = 12)							
Arguments	0	0	0	0	2	2	8
Study	7	4	1	0	0	0	0
Antireligious (n = 12)							
Arguments	0	0	1	1	1	5	4
Study	6	2	0	2	2	0	0

Note. Question 1 "I tried very hard to complete the arguments."; Question 2 "I did not take this study very seriously." (see Appendix H).
Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 23

Frequency Distribution for Questions Related to how Seriously Subjects in the Religious Condition Attempted the Syllogisms and the Entire Study

	Logic training condition						
	Score						
Question	1	2	3	4	5	6	7
Proreligious subjects (n = 12)							
Arguments	0	0	0	0	0	6	6
Study	8	2	2	0	0	0	1
Antireligious subjects (n = 12)							
Arguments	1	1	0	1	0	5	4
Study	6	4	0	0	1	0	1
	No logic condition						
Proreligious (n = 12)							
Arguments	0	0	0	0	2	2	8
Study	9	2	1	0	0	0	0
Antireligious (n = 12)							
Arguments	0	0	0	1	2	7	2
Study	5	4	1	1	1	0	0

Note. Question 1 "I tried very hard to complete the arguments."; Question 2 "I did not take this study very seriously." (see Appendix H).
Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)

Table 24

Frequency Distribution for Questions Related to how Seriously Subjects in the Neutral Condition Attempted the Syllogisms and the Entire Study

	Logic training condition						
	Score						
Question	1	2	3	4	5	6	7
Proreligious subjects (n = 12)							
Arguments	1	0	0	0	0	4	7
Study	4	5	1	0	0	1	1
Antireligious subjects (n = 12)							
Arguments	0	0	1	2	0	4	5
Study	8	4	0	0	0	0	0
	No logic condition						
Proreligious (n = 12)							
Arguments	0	0	0	0	1	2	9
Study	7	2	2	0	1	0	0
Antireligious (n = 12)							
Arguments	0	0	1	0	2	4	5
Study	7	2	0	0	3	0	0

Note. Question 1 "I tried very hard to complete the arguments.": Question 2 "I did not take this study very seriously." (see Appendix N).
Scoring 1 = -3 (strongly disagree) 5 = +1 (slightly agree)
2 = -2 (moderately disagree) 6 = +2 (moderately agree)
3 = -1 (slightly disagree) 7 = +3 (strongly agree)
4 = 0 (neutral)