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SELF-SCHEMA, TASK INFORMATION, EXTRINSIC REWARD, AND INTRINSIC MOTIVATION

by

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M. A., University Of Texas At El Paso, 1976.

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ABSTRACT

The purpose of the present study was to examine the effects of self-schema and cognitive priming on the intrinsic motivation of people in the presence or absence of extrinsic reward.

Individuals' self-schemata with respect to internal versus external control of their life events were assessed by the Rotter I-E control scale. Based on their scores, sixty internal schematic and sixty external schematic subjects were selected. The experimental procedure involved paying some subjects to solve a number of puzzles and later measuring the amount of time they spent on additional puzzles while they were alone during a free time period. Subjects were given either an intrinsic, extrinsic, or mixed priming questionnaire immediately after the puzzle task. The priming questionnaire (presented as a confidential survey by the Psychology Department) was designed to manipulate the subjects' cognitive accessibility of intrinsic or extrinsic task information of the experiment.

The results showed that intrinsic motivation as measured by self-report and behavioral measures was significantly affected by extrinsic reward, self-schema, and cognitive priming. No interaction effects were observed. In general, internal schematic subjects displayed greater intrinsic motivation than external schematic subjects. When subjects were paid, their intrinsic motivation was lower than when they received no pay. Finally, subjects presented with intrinsic information about experiments showed higher intrinsic motivation than when they

were presented with extrinsic information. In the mixed information condition, the level of intrinsic motivation fell in between the other two conditions.

The results were discussed with reference to several social cognition models, and Markus' expanded concept of self-knowledge was employed to explain the relationship between self-schema and motivated behaviors.

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A. Introduction

Schematic processing of social information

In the field of social cognition, the concept of schema has generated widespread interest and a surge in research activities. Drawing heavily from the cognition literature for theoretical models and experimental paradigims, social cognitive researchers are concerned with the manners in which schemata affect the processing of socially significant information.

There are two commonly held assumptions about the human information processing system: it is a limited capacity system (e.g. Miller, 1956), and it constantly strives toward cognitive economy (Taylor, 1981). With a limited processing capacity, an individual can only handle a relatively small portion of all potential stimuli at any one time. Therefore to function efficiently in a complex social environment, an individual needs to make the most optimal and economical use of this limited resource. One way to do this is to reduce the complexity of our social experiences through cognitive categorization or schematization (Cantor, 1981). This is possible because the social environment is relatively predictable and replete with redundancy. Through repeated experiences, individuals have developed a vast amount of knowledge about themselves, other

people, and events in their environment. The cognitive representation of this knowledge is called a social schema. Although based on social regularity, social schemata are not static structures. The continual assimilation of new information dervied from novel experiences constantly changes the organization and the content of the social schemata.

There is a growing body of data bearing on the information processing consequences of social schemata. In the area of person perception, it has been shown that information about others is often organized around personality or person schemata (e.g. Cantor & Mischel, 1977; Tsujimoto, 1978). Once an individual has formed an impression of another person, the representation of this impression provides the basis for subsequent evaluation of and behaviors toward that person (e.g. Hamilton, 1981; Higgins, Rholes, & Jones, 1977; Wyner, Srull & Gordon, 1984). When a schema is activated or generated upon encountering a social stimulus, this schema will determine the chunking of the incoming information (e.g. Cohen & Ebbesen, 1979; Massad, Hubbard & Newtson, 1979), the time required to make a judgment concerning the stimulus, and the recall of information related to the stimulus (e.g. Lingle & Ostrom, 1979; Burnstein & Schul, 1983). There is evidence that trait information even presented sublimially can influence a person's impression judgment (Bargh & Pietromonaco, 1982).

Another area to which a cognitive schema approach has been applied is social stereotype. In stereotyping, an individual

often ascribes attributes to a person according to his memberships in various social categories such as sex or race. Subsequent judgment and recall of information about that person are then influenced by the stereotyped information supplied by the schemata (e.g. Taylor, Fiske, Etcoff, & Ruderman, 1981). Even children as young as 7 or 8 years old were found to reconstruct stories according to their sex-role schemata (Carlsson & Jaderquist, 1983). Together these data suggest that cognitive schemata serve an important processing function for information about others. It should also be noted that a substantial portion of social information is concerned with no one else but ourselves, and one categorizes and encodes information about the self just as one would for other stimuli array (Cantor, 1981).

The concept of self schemata

As noted earlier, our information processings, rather than random, are highly selective. Among a multitude of potential stimuli, we tend to focus upon behavioral events or things that are of concern to us. In fact, it seems we hardly stop thinking about ourselves (Posner, 1981). As a result of this investment in areas that are self-relevant, we have developed an elaborated network of knowledge about our self.

According to Markus (1977), the formation of self-schemata results from constant attempts to organize and interpret

information about the self. Based on behavioral regularity and pattern in social events, self-schemata can be viewed as natural outcomes of the behavioral invariances discovered by individuals. They allow an individual to understand a situation with relatively ease and to anticipate a sequence of events with confidence. Thus, self-schemata can be defined as

> cognitive generalizations about the self, derived from past experience, that organize and guide the processing of self-related information contained in the individual's social experiences (Markus, 1977, p.64).

Once established, a self-schema exerts important influence on the processing of information related to the self, and serves as a framework within which judgments, inferences, and prediction about the self are made.

Markus (1977) conducted an experimental test of the construct validity of the self-schema. Specifically, she attempted to demonstrate that a self-schema facilitated the processing of schema-relevant information, contained readily available knowledge about the self, provided guidelines for future actions, and exhibited stable and consistent characteristics. In this study, the individual's self-schema with respect to independence was first assessed by a set of rating scales and checklists. Based on their ratings, three groups of subjects were identified: independent schematic, dependent schematic, and aschematic. All subjects were given a number of cognitive tasks in which schematics and aschematics

were expected to display differential performances. In a self-judgment task, for instance, subjects were shown a set of words associated with independence and dependence. For each word, they pressed a 'me' button or a 'not-me' button to indicate whether the word described them. It was reasoned that an individual with a self-schema in a particular domain would find it relatively easy to make a 'me' decision about a word associated with that domain. As expected, independent schematics were faster to make their judgments of independent words than dependent words while dependent subjects displayed a similarly quick decision for dependent words. In other tasks, independent schematics were able to provide specific behavioral examples for each self-descriptive trait adjective, and indicated that they were likely to behave independently in future. Furthermore, independent subjects resisted information that contradicted their self-schema about independence. Parallel results were found for dependent schematics. In contrast, aschematics who lacked a well-developed self-schema showed little differences in their decision time between independent and dependent words, and in their estimated likelihood of independent and dependent behaviors in future. They were also more willing to accept rigged information as self-diagnostic. Additionally, in a study citied by Markus and Smith (1981) schematic subjects were found to be faster in recognizing schema-relevant adjectives than schema-irrelevant adjectives.

Markus' schema approach represents a significant development in self-perecption for two reasons. First, by postulating the existence of cognitive structures whose effects can be predicted, it provides substance to the vague notion of self-concept. Second, it describes in a more precise manner the processes that underly individual differences in processing self-relevant information (Hampson, 1982).

A person's sex is probably the most important characteristic that exerts a pervasive influence on his social life, thus most people have developed a well-articulated self-schema about their gender. Markus, Crane, Bernstein & Siladi (1982) have documented the effect of the gender schema on information processing in an experiment. This study, which followed the basic design of Markus' original study of self-schema, involved four kinds of subjects: masculine schematic, feminine schematic, low androgyenuous, and high androgyenuous. In general, feminine schematics were found 1) to recall more feminine attributes that they endorsed earlier in an inventory, 2) to endorse more feminine qualities, 3) to respond faster to self-descriptive feminine adjectives, and 4) to show more confidence in their judgment. Parallel patterns of results were found for masculine schematics. Similar findings for sex-typed individuals were reported by Mills (1983).

Cacioppo, Petty, and Sidera (1982) performed an experiment to investigate the effects of the self-schema on the evaluation of a schema-relevant message. In this study, subjects' attitudes

toward a number of issues such as capital punishment and abortion were assessed. Half of the subjects were given a persuasive message which reflected a religious perspective on these issues; the other half a message with a legalistic perspective. It was found that subjects who championed the religious argument evaluated the message reflecting a religious perspective as more persuasive, and listed more positive thoughts about the message. Similar patterns of results were observed for subjects who were exposed to a legalistic argument which they believed. The author argued that cognitive responses in persuasion were often subjective rather than objective. This subjectivity reflected the ways in which the incoming information was organized by a self schema.

A study by Bargh (1982) produced some interesting data that might shed some light on the selective mechanism of self-schema stressed by Markus (1977). Bargh asked subjects to attend to either one of the channels on a dichotic listening task. Self-relevant information was found to require far less attentional effort when presented to the attended channel than the ignored channel relative to neutral words. Bargh contended that people developed automatic attention to information related to the self. Thus it required a great deal of effort to maintain one's focus on something else in the presence of self-relevant information.

Additional evidence of the information processing consequences of the self come from a series of experiments

concerned with self-reference effect. Rogers, Kuiper, and Kirker (1977) asked subjects to make either structural, phonemic, semantic, or self-reference ratings on a list of adjectives. Later in an unexpected memory task, subjects displayed superior recall for the adjectives rated under self-reference, relative to other conditions. Rogers et al argued that the superior incidental recall was a result of the involvement of the self in encoding the incoming information. Other information processing consequences of the self were further demonstrated by Rogers and his colleagues in a series of studies. Rogers, Rogers, and Kuiper (1979) documented the 'false alarm effects' of self reference in an empirical study involving a recognition task. When asked to indicate which words they had seen before, subjects tended to falsely identify new words that described them as seen before. In another experiment the reaction time of self descriptive judgment in a paired-comparison task was examined (Rogers, Kuiper, & Rogers, 1979). The results indicated that subjects displayed shorter judgment latencies when one adjective in a pair was highly self-descriptive and the other was not. And the latencies decreased as the difference in self-reference between the two adjectives increased. Similarly, Kuiper and Rogers (1979) found that the decision time for judging self descriptive versus non-self-descriptive words was relatively fast. Keenan and Baillet (1980) also found that the speed of judgment of traits applicability and the recall for the traits increased with the familarity of the target person. A

study by Bower and Gilligan (1979) showed that recall for trait stimuli was better when subjects were asked to judge the relevance of traits to personal experiences and to experiences involving one's mother. Warren, Chattin, Thompson and Tomsky (1983) employed an 'autobiographical elaboration' method to induce self-reference processes. In this study, subjects presented with a list of word were asked to think of a personal experience that the word reminded them of. The results indicated that recall for words significantly increased with autobiographical elaboration. Self-reference effect could also occur when simply imaging about one self. Anderson (1983) asked subjects to imagine themselves or others performing or not performing a series of behaviors. The results showed that thinking about a self-referent behavioral script could lead to a change in intentions toward that behaviors in the direction that was imagined.

To account for various self-reference effects, Rogers (1981) proposed that the self was structured and functioned as a prototype. According to this self-prototype model, the self consists of a collection of hierachically organized features, ranging from general traits to values to specific behaviors and events, and it serves as a background against which inputs are encoded. Thus the self-reference process basically involves a comparison of the incoming stimuli with features of the prototype to determine the extent to which the inputs 'fit' the structure.

Although few social cognition researchers dispute the reference effects, not everyone agrees with Roger and Markus' view of the self as a unique structure with special properties. For instance, Keenan and Baillet (1980) interpreted the enhanced memory effects of familarity as a consequence of deep encoding by a rich conceptual structure. Similarly, Bower and Gilligan (1979) asserted that good memory resulted from relating inputs to a highly differentiated memory structure. These researchers attempted to maintain a pure cognitive account within an associationist framework, and preferred not to accord special status to the self. For them, a self-schema was simply a well differentiated cognitive structure. In addition, there is some evidence that the self may not be different from other structures. In a study by Hamilton and Leirer (cited in Hamilton, 1981), subjects were presented with a series of sentences describing four personality categories under different instructions. Later, subjects performed a recall task, and rated the sentences in terms of self-descriptiveness. Cluster analyses of free recall data showed that recalled items were organized in terms of a prior personality categories to a greater extent than in terms of self-descriptiveness. The results suggested that the same personality schemata were employed in organizing information about others and the self as well.

On the other hand, Rogers (1981) argued that the self possessed some special properties that set it apart from other structures. First, everyone has a distinctive sense of one's

self as a separate, unitary entity. Second, the self is plausibly the largest and richest memory structure. Third, the self contains a strong affective component. Finally, the self and other structures differ in their organization and cognitive processes involved in the self- and other-referent tasks. In a review of the relationship between the self and memory, Greenwald (1983) also listed several special properties to support the view that the self was a unique structure. These included a) self-activation, b) a bias to recall favourable information about the self, c) privileged treatments given to certain types of inputs such as self-evaluations.

Self schema and person perception

According to Markus and Smith (1981), the self-structure is a central component of the human information processing system, and is activated by inputs perceived as self-relevant. Among a wide array of potential stimuli, other people are more likely to be perceived as self-relevant because they are potent sources of social influences. The extent to which a person is perceived as self-relevant depends on how much the information about him is relevant to a particular self-schema of the perceiver. It follows that if a person is aschematic with respect to a particular area, any information about others pertaining to that area may not be noticed or processed unless required by the situation. On the other hand, the schema-relevant information

about others would be automatically processed and imputed with rich personal meanings by the perceiver. Thus,

> ...feeling and thinking about others in self-schema relevant domains should exhibit a pattern of attention to data and a systematic discrimination and consistency in response that is characteristic of thoughts and feelings about the self in these domains (Markus and Smith, 1981, p247)

In their review of the empirical evidence, Markus and Smith (1981) reported and discussed the findings of a dissertation study by Hamill. In this study, subjects who were schematic or aschematic with respect to independence rated a number of faces along a physical dimension or an independence dimension. In a subsequent recognition memory task, subjects were asked to identify among a collection of faces those presented earlier. The schematics showed better recognition memory in the self-relevant condition than in the physical judgment condition, while the aschematic showed no differences in their performances in these two conditions. The results suggested that rich encodings of the stimuli by the self-schema were responsible for enhanced memory performance.

In a study concerned with the effect of self-schema on the perception of others, Markus and Fong (cited in Markus & Smith, 1981) asked subjects with or without an independence self-schema to read one of three stories about a female target person. The target was described as behaving independently in all situations

in the first story (100% independence), half of the situations in the second (50% independence), and none in the third (0% independence). Subjects then rated the target on a number of dimensions on independence vs dependence, and predicted how independent or dependent she would be. The results showed that the target person was rated as more independent by the schematics in the 100% confidence story but was rated less independent in the zero confidence story. In the 50% condition, the target's ratings were similar to the schematics' own ratings. The same pattern was observed for the behavioral prediction data.

Markus and Fong argued that the self-schema functioned as an anchor or standard against which the level of independence exhibited by the target was evaluated. Thus the relative independence/dependence of the target was judged according to how far and in what direction the target's behaviors departed from the schematics' own positions.

In another study, Markus, Crane, and Siladi (cited in Markus & Smith, 1981) investigated the influence of sex-role self-schema on person-perception and the manner in which schema-relevant information was integrated. In this study, male subjects with or without a masculine self-schema observed a film which showed a male student engaging in some stereotypically masculine behaviors. Another control film showed the same actor performing some routine activities. While watching the film, subjects were instructed to divide the actions into meaningful

units. Markus theorized that in the process of person perception, the self-schema would provide an interpretive framework in which bits of schema-relevant information were organized into larger chunks. Thus the activation of a masculine self-schema by the film protraying masculine behaviors would result in larger chunking of the behaviors of the actor. The masculine schematics were indeed found to divide the schema-relevant film into larger units than the aschematics, but the two groups showed no difference in unitizing the control film. Following the unitizing task, subjects judged the stimulus actor on a collection of masculine, feminine and neutral trait adjectives. For each adjective, they push a button to indicate whether or not it described the stimulus actor. Subjects then attempted to recall the actor's behaviors in the film. Following the recall task, subjects judged themselves similarly on the same collection of trait adjectives. The data indicated that the schematic ascribed more masculine traits to the actor than the aschematics while there was no difference in their endorsement of feminine and neutral words. With respect to judgment latencies, the schematics took longer to decide whether or not a masculine word described the actor than a feminine word, suggesting that more time was needed to search a relatively large network of information before arriving at a decision. No such differences were observed for the aschematics. On the other hand, both schematics and aschematics were faster in self-attribution than other-attribution. This was consistent

with the notion that the self-structure facilitated self-referent information processing. Analyses of the adjectives endorsed in self and other attribution revealed that schematics appeared to have a rather unique, distinctive view about themselves. Although the schematics ascribed more masculine adjectives to the actor, they did not see these same adjectives as self-descriptive. This differentiation between self and other was further supported by the judgment-confidence results. Schematics displayed higher judgment-confidence of a self-descriptive adjective only when this adjective had not been ascribed to the actor. No such differentiation was shown by the aschematics. Finally, for the recall task, the performances of schematics and aschematics were essentially the same. However, due to the operation of the masculine self-schema, the schematics appeared to be overconfident of their recall accuracy than the aschematics.

Based on these findings, Markus and Smith (1981) concluded that an individual would attend to information about others that was meaningful to him. The self-schema which was activated would then evaluated and elaborated the inputs with information from the existing knowledge structure. This was especially true when there was only minimal information about the other or when the behaviors of the other were similar to that of the observer. In this case, the perceived other would likely be evaluated along the same dimensions the observer used to judge himself. However, with increased familarity, detailed stimulus information, or an

explicit request for comparison, the self-schema would focus more sharply on the differentiation between the self and other. Although the self-schema still served as the point of reference upon which one evaluated others, it was now the differences rather than similarities between the self and other were stressed.

Self-schema can also influence the type of information that a person tends to seek in finding out more about others. Fong and Markus (1982) asked subjects to select questions from a list of questions eliciting information about extraversion, introversion, and other unrelated dimensions. The subjects were told the selection task was intended to examine how people used questions to get to know one another. The results showed that extravert schematics selected more extravert questions, and introvert schematics selected more introvert questions. After selecting questions, subjects listened to two tape-recorded interviews, and rated the interviewed persons on a number of scales relating to extravertion, introveration, and other dimensions. No differences in rating were found among extravert schematics, introvert schematics, and aschematics. However, extravert schematics and introvert schematics showed significantly more confidence in their ratings on schema-relevant dimensions compared with aschematics.

Rogers and Kuiper (1980) contended that since trait dimensions of the self structure were highly acccessible for information processing, social judgments about others would be

greatly facilitated along these dimensions. In an experiment to test this proposition, they asked subjects to make a dichotomous judgment about themselves and an unknown person on a list of trait adjectives. It was found that for both self-referent and other referent judgments, there was an inverted-U effect with faster judgment latencies associated with high as well as low self-descriptive adjectives. The results suggested that similarly to self-judgment, individuals were faster in making personality judgments about a stranger along traits that were either high or low in self-descriptiveness.

The observer facilitation effect in judgment about a stranger is probably due to the use of schematic information such as stereotyped information and implicit personality theories contained in the self-structure by the perceiver to supplement and embellish the extremely limited inputs. However, with increased familarity with a person, more information becomes available for the development of an abstract representation of that particular person. Once formed, this structure then assists in the processing of information about that person. In a series of studies, Kuiper and Rogers(1979) put this notion to an empirical test. In these studies, students were asked to rate themselves and a new instructor on a number of personal adjectives. In a subsequent recall task, subjects showed better recall in the self-referent condition than the other-referent condition. In addition, the recalled adjectives were associated with a faster judgment decision in the former

condition but longer decision time in the latter. However, when the students knew the instructor better, the same rating tasks were repeated. This time the results showed little difference in the recall performances between the self-referent and other-referent conditions. Similar findings were reported by Rogers and Kuiper (1980) in a further series of studies involving various types of others ranging from best friend to complete strangers. There was an interaction between the level of familarity and degree of self-reference (self-descriptiveness). Subjects were fast in rating both self-descriptive and non-self-descriptive adjectives with respect to themselves, best friends, close relatives and strangers but not to the casual acquaintances. For persons at a moderate level of familarity, recalled adjectives, which were rated as both descrptive and nondescriptive, had longer judgment time. It appeared that although an individual might have already acquired some information relating to a casual acquaintance, there was no saving in decision time because this information had not been abstracted and consolidated, thus the longer response time could be attributed to an extensive search in memory for specific information, this was then abstracted into a general form for decision making.

An important question is concerned with the nature of the self-reference process, and whether it differs from processes involved in other judgments. Kuiper and Rogers (1979) argued that the self was a unique cognitive structure which differed

from other structures in the degree of organization and integration. In fact, they found self-referent decision time was faster than the other-referent judgment, and suggested it was the increased organization of the self structure that faciliates self-referent decision. Another difference was reflected in the types of cognitive processes involved in the self-referent and other-referent judgment. The former appeared to involve a rather efficient process whereas the latter employed an effortful rehearsal process (Kuiper and Rogers, 1979). Further evidence of the uniqueness of the self comes from studies involving both self-reference and imagery in a memory task. Although imagery was a powerful device, no memory enhancement effect was observed when self-reference procedure and imagery were employed together. It appeared that the self-reference process was so unique that combining it with another encoding task like imagery actually reduced its effectiveness (Lord, 1980; Rogers, 1977).

Keenar and Baillet (1980) proposed that there were two kinds of processes in self-reference decisions: computational and availability processes (Tversky and Kahneman, 1973). The time to process self-referent items should be fast because the processing involved some readily available dimensions of the self structure. On the other hand, there were no such readily available dimensions to help process other-referent items. In this case, a series of guesses and computational processes were performed, thereby increasing the time to reach a decision. According to this two-process model, people would be expected to

take less time to make judgment about a familiar than an unfamiliar person because detailed schematic information that could facilitate decision was more readily available in the self-structure. This expectation was confirmed by Kuiper and Rogers (1979) and Keenar and Baillet (1980).

There was a related prediction that concerned the memory for words differing in judgment time. Based on the computation hypothesis, words with fast judgment time should be better remembered as they were encoded with reference to a well differentiated structure. However, a reanalysis of data from Rogers et al (1977) failed to confirm this prediction. Rogers concluded that more research was needed before a thorough evaluation of the computation hypothesis was possible.

Self-schema and affect

Rogers (1981) observed that most cognitive views of the self failed to incoporate affect as an important element in their formulations. As a result, these models tended to ignore the affective effects in information processing despite the fact that personal and social information were typically affect-laden.

Rogers advanced an affect-in-self-reference model as a preliminary step toward an integration of affect and cognition. According to this model, highly self-descriptive terms such as traits are indicative of which aspects of the environment are

personally significant.

> The self becomes involved in encoding personal information by directing attention to certain aspects of the current environment. This attention direction is toward information that is personally relevant and also toward information that the person is already an expert at analyzing (Rogers,1981, p.208).

Personal information would then be encoded with an affective tag or signal, which varies with the degree of self-relevance and acts as a kind of amplifier. Thus there are two factors operating in the encoding process: a cognitive factor involving availability/ computational processes, and an affective signal. The self-referent memory effect, therefore, is a result of a strong memory trace produced by these two factors. Rogers cited the result of a study by Kirker as inital support for the hypothesized amplifying effect of emotion.

In view of the importance of affective motivational factors in social behaviors, Taylor (1981) argued that an exclusively cognitive orientation was unjustifiable, and one should include motivational factors in social cognitive analysis. A similar view was expressed by Fiske (1981) in her analysis of the relationship between social cognition and affect. After a detailed examination of various definitions of affect, Fiske proposed to use evaluation as the first approximation to affect with valence as the most important dimension. According to Fiske, a schema has both cognitive and affective consequences.

In processing social information, affect-laden information together with other inputs was encoded into the existing knowledge structure. Affect was said to be cued when new information could be fitted to the old affectively laden knowledge. This implied that interpretation, which was set in motion by attention, was necessary for affect to occur. While interpretation provided the valence of affective responses, attention determined their intensity. In this sense, affect is schema-driven. According to Higgins, Kuiper, & Olson (1981), affect influences information processing by narrowing one's focus on affect-ladden stimuli, producing more rehearsal and rumination, and making affectively significant schemata more accessible. There is evidence that affect influences the learning and retrieval processes (Dutta & Kanungo, 1975), word recall (Bower, Monterio & Gillian, 1978), and helping behaviors (Isen, Shalker, Clark, & Karp, 1978).

Self schema and depression

Taylor and Crocker (1980) have observed that distortion and biases in social cognitions often stem from the application of erroneous schemata. A parallel conceptualization can be found in the cognitive approach to depression, which focuses on the irrational and negative beliefs held by depressives about the world and themselves (Beck, 1979). In schematic terms, depressives appear to employ predominently inappropriate and

highly negative self-schemata to encode, organize and interpret social information. This extension of the cognitive self to depression was undertaken by Kuiper and Derry (1980). They formulated a content-specificity hypothesis which predicted that with a self-prototype organised around pathological features, a depressive would show superior recall in a self-referent condition only for depressive content adjectives. In an experimental test of this hypothesis, depressed and normal subjects were asked to make structural, phonemic, semantic, and self-referent ratings on a set of depressed and nondepressed adjectives. The recall data only confirmed the prediction for the non-depressed subjects, thus supporting a less robust version of the content-specificity hypothesis. Based on these data and related research, Kuiper and Derry proposed a self-schema model of depression. The basic proposition of this model is that the ratio of depressed to nondepressed content of a depressive's self-schema increases with severity. The relative proportion of these two kinds of content will determine what types of personal information are more likely to be processed by the self-schema. For moderately depressed individuals, the self-schema will involve processing both nondepressed and depressed information (Kuiper and Derry, 1980). For the severely depressived, self-schema processing may only occur with information consisting of pathological content. Kuiper and Derry (1981) reported a study which found that normal and nondepressed clinical controls indeed showed better recall for

self-referenced, nondepressed content words while clinical depressives displayed enhanced memory only for the depressed content adjectives. With regard to the mildly depressed individual, the onset of depressive symtoms led to a state of confusion and uncertainty surrounding the self with attendant decreased efficiency. This state of disorganization in the mild depressives reflects in their failure to show self-referent enhanced recall for both depressed and nondepressed adjectives (Kuiper and Derry, 1980). At a more severe level of depression, however, the efficiency of the self-schema is restored through a reconsolidation process which integrates the depressed contents into the existing structure. This time, however, the efficiency of the self-schema is specific to pathological contents. In a study concerned with the knowledge about depression, Kuiper and Cole (1983) asked depressed and nondepressed to rate themselves and the average others on a number of parameters of depression. The results indicated that in self-referent condition, depressed made higher estimates on frequency and intensity paramaters of depression than nondepressed. However, the depressed did not provide higher estimates for the average others. This was thought to be related to the poor self-perception of the depressed.

Taken together, the empirical findings and theoretical arguments strongly support the view that self-schemata are powerful and active agents in processing information related to the self, and have significant behavioral consequences.

Self-schema and intrinsic motivations

There has been growing interest in the effects of extrinsic rewards on intrinsically motivated behaviors. Numerous studies have demonstrated that performance-contingent rewards tend to undermine intrinsic motivation for the rewarded task (see Condry, 1977; Deci and Ryan, 1980, for reviews).

From a cognitive perspective, Porac and Meindl (1982) argued that intrinsic and extrinsic motives might best be viewed as situationally-induced cognitive interpretations of the task context. Such task interpretations are influenced by cognitive schemata, which are memory structures based on abstract information from daily experiences. There is evidence indicating that schemata can affect the interpretation of stimulus inputs (Anderson and Pichert, 1978), and facilitate comprehension of social events (Schank and Abelson, 1977).

Once schemata are activated by a certain stimulus configuration in a social situation, they will determine the interpretation of the event by structuring the inputs and recalling information that is consistent with the schemata. Thus whether a task is interpreted as intrinsic or extrinsic depends very much on the information surrounding the task. According to Porac and Meindl, a task with minimal constraint and high novelty is likely to elicit an intrinsic interpretation of the task context by inducing the individual to recall information

relevant to the concept of the task as an end in itself. By contrast, a task with extrinsic reward and constraint is likely to elicit an extrinsic interpretation of the task context by inducing the individual to recall information relevant to the concept of the task as a means to an end. Thus the detrimental effect of extrinsic reward on intrinsic motivation is mainly a result of extrinsic task interpretation induced by the reward.

However, most task situations consist of both intrinsically and extrinsically relevant information. The relative salience of these two kinds of information will determine which task interpretation is formed. Porac and Meindl (1982) conducted an experiment to see if by altering the salience of intrinsic and extrinsic task information, it could be possible to change the effects of an extrinsic reward on intrinsic motivation. In this study, both paid and unpaid subjects were invited to engage in puzzle solving. Immediately after the puzzle solving session, some subjects completed a cognitive priming questionnaire designed to induce the individual to recall either intrinsic or extrinsic information from memory; others completed a neutrual questionnaire about career preference. It was assumed that by making intrinsic or extrinsic task information more accessible, such information would influence the resulting task interpretation. During a subsequent free-choice period, the amount of time which a subject spent on additional puzzles without apparent reward was recorded as a measure of intrinsic motivation.

As a whole the results provided some initial support for the contention that motivation for a task is largely a result of task interpretation. Such a view shifts the focus from the reward to the whole task context. It emphasizes the general cognitive representation elicited by the total task situation of which the reward is only one attribute. However, the data failed to support the hypothesis that salient extrinsic task information in the absence of extrinsic reward would be sufficient to undermine intrinsic motivation, although finding were in the predicted direction. Porac and Meindl offered two explanations for this failure. First it was possible that extrinsic task information required the presence of some salient external constraint in the task situation before it could induce an extrinsic task interpretation. On the other hand, the task itself might contain such highly intrinsic stimuli that the extrinsic information induced by the priming questionnaire was not powerful enough to override them. In other words, it was greater recall of extrinsic information rather than some external constraints that were needed.

There is another possibility which has to do with individual differences. Deci (1975) has argued that it is not the reward per se, but the perception of the reward that is crucial in determining intrinsic motivation, and characteristics of the recipient are proposed as a factor that may affect how the reward is perceived.

Earn (1982) performed a study on the effect of pay on the intrinsic motivation of internals or externals. He pointed out that if locus of control is a predisposition to view the reward as internally or externally mediated, the reward would be differentially perceived by people varying in locus of control. He found that when both controlling and competence aspects of the reward were kept vague, internals showed increase in intrinsic motivation by placing more weight on the competency information of the reward, whereas externals showed decrease in intrinsic motivation by focusing more on the controlling aspects of the reward. However, when the controlling aspects of the reward were very salient, both externals and internals exhibited diminished intrinsic motivation.

Much evidence indicates that internals are more competent and personally more effective than externals (Lefcourt, 1976). Internals with a feeling of personal control and competency generally enjoy intrinsically rewarding activities; externals with a feeling of powerlessness and insecurity generally avoid challenges, thereby depriving themselves of a major source of intrinsic satisfaction. From a social schema perspective, internal people with abundant stored information based on intrinsically rewarding activities are likely to develop a self-schema for personal control, whereas external people with accumulated information derived from extrinsically motivated activities are likely to develop a self-schema for external control. It is argued that individual differences in

internal-external self-schema have important affective and behavioral consequences. As an important component of the self, a self-schema about ability to control social rewards would have significant impact on the processing of intrinsic and extrinsic stimulus information in a social situation such as a behavioral experiment. As a result of differential processing of intrinsic and extrinsic information, internal schematics are likely to form intrinsic representations of the experiment whereas external schematics are likely to form extrinsic representations. These resultant representations would, in turn, differentially influence their subsequent evaluation and behavior in the experiment.

The present study

From a social cognitive perspective, the present study was designed to examine the effects of self-schema and cognitive priming on the intrinsic motivation of people in the presence or absence of extrinsic reward. It attempted to demonstrate the viability of applying the self-schema construct to the study of intrinsic motivation by examining its cognitive and motivational consequences. Second, it examined the various ways in which cognitive priming through exposure to different task information influenced intrinsically motivated behaviors. Attention was to be directed to the mixed priming in which both intrinsic and extrinsic task information were presented. Third,

it also tried to determine whether there were any interactions among reward, self-schema, and priming.

In general, it was expected that subjects who were paid for solving puzzles would exhibit diminished intrinsic motivation as compared to subjects who were not paid. Intrinsic motivation was expected to be enhanced when the intrinsic aspects of the experiment were made more salient and accessible through an intrinsic priming questionnaire. Conversely, it was expected to be reduced when the extrinsic aspects of the experiment were made more salient and accessible through an extrinsic priming questionnaire. Under the mixed priming condition in which both intrinsic and extrinsic task information was made more salient and accessible, the level of intrinsic motivation would be expected to be higher than under the extrinsic condition but lower than under the intrinsic priming condition. Internal schematic subjects who were highly sensitive to intrinsic information were expected to show enhanced intrinsic motivation; external schematic subjects who were more sensitive to extrinsic information were expected to show diminished intrinsic motivation.

A basic assumption of the study is that subjects' schematicity influences their cognitive representations through the differential processing function. To assess the nature of the cognitive representations developed by internal and external schematic subjects under the mixed priming conditionn, a short recognition test was given. The test contained items that

subjects had or had not seen before. Since there was evidence that false recognition was associated with schema-consistent distractor items (Hartwick, 1979; Rogers et al, 1977), it was predicted that there would be a significant difference in recognition memory between intrinsic and extrinsic items only for the new distractor items but not for the old items.

B. Method

Subjects and design

Prior to the experiment, 600 psychology students completed Rotter's (1966) I-E Control Scale. 60 students scoring in the first quartile of the distribution (a score of 7 or less) and 60 students scoring in the fourth quartile of the distribution (a score of 15 or more) were randomly selected to participate in the study. The design of the study is a 2x2x3 factorial with two levels of self-schema (internal and external), two levels of reward (no pay and $2.50), and three levels of priming (intrinsic, extrinsic, and both). There were 10 subjects in each of the 12 groups listed as follows:

1. internal-no pay-intrinsic priming
2. internal-no pay-extrinsic priming
3. internal-no pay-mixed priming
4. internal-pay-intrinsic priming
5. internal-pay-extrinsic priming
6. internal-pay-mixed priming
7. external-no pay-intrinsic priming
8. external-no pay-extrinsic priming
9. external-no pay-mixed priming
10. external-pay-intrinsic priming

11. external-pay-extrinsic priming

12. external-pay-mixed priming

Procedure

The experimental procedure was adapted from Deci (1972). Upon being greeted by the experimenter, each subject was given a vague explanation of the experiment as a study of the relationship between information processing and personality. The subject was then seated at a large table on which there were 30 anagram puzzles comprosed of Scrabble tiles. Solving a puzzle required the rearrangement of individual tiles until an English word was found. Pretesting showed that university students found the puzzle task to be moderately interesting. The subject was instructed to solve as many puzzles as possible in twenty minutes, and to proceed according to the ordinal number of the puzzles. Half of the subjects were told that they would be paid $2.50 for their participation; no payment was mentioned to the other half. After the introduction, the experimenter set the timer and retired to a corner away from the subject. At the end of the puzzle solving period, the experimenter recorded the number of puzzles solved and showed the subject the solutions to any unsolved puzzles. After that, the subject was paid and signed a receipt. The experimenter then noted that he had to go to the department computer terminal to do a preliminary analysis of the subject's data (i.e. number of puzzle solved, personality

score, etc). Based on the analysis result, a particular posttask questionnaire would be selected to give the subject. The experimenter indicated that he would be away for a few minutes and suggested that the subject could either relax, read a magazine, or attempt to solve some more puzzles. When the experimenter was about to leave, in a somewhat casual manner he told the subject that he almost forgot about a Psychology Department survey on students' opinon concerning behavioral experiments, and would like the subject to complete it. After giving this 'priming' questionnaire to the subject, the experimenter left and immediately went into the adjacent room. As soon as the subject finished the questionnaire, the experimenter started monitoring the subject's behaviors for five minutes. The amount of time the subject spent on the puzzles was recorded. At the end of five minutes, the experimenter returned and gave the posttask questionnaire to the subject. Full debriefing would be given by mail at the end of the research.

For the subjects in the mixed priming condition, an unexpected short recognition test was given after they had completed the posttask questionnaire. This test consisted of 3 intrinsic and 3 extrinsic items from the mixed priming questionnaire. In addition, there were two new distractor items. One was conceptually similar to the intrinsic items; the other to the extrinsic items. For each item, subjects were asked to encircle a 'yes' if they had seen it before in the survey; a 'no' if not.

Cognitive priming questionnaire

The original cognitive priming questionnaire was developed by Porac and Meindl. They asked individuals to imagine that they were engaging in either an enjoyable task or an extremely boring task. They were then asked to list the characteristics of the two task situations, the thoughts, and feelings during the tasks. From these responses, items for the intrinsic and extrinsic priming questionnaire were constructed.

In the present study, a modified version of the cognitive priming questionnaire was developed. It contained the original 8 task characteristics and 7 thought items with the addition of 5 reason items. On the extrinsic questionnaire, the subject was asked to rank the task characteristic items on a dimension from 'most unpleasant' to 'least unpleasant'; on the intrinsic questionnaire, the ranking of task characteristics was on a dimension from 'most pleasant' to 'least pleasant'. On both questionnaires, the thoughts about experiments were ranked on a dimension from 'most applies to you right now' to 'least applies to you right now'. In addition, subjects were asked to rank a number of reasons for working on the experimental task according to how much each applied to them. The extrinsic questionnaire contained 5 extrinsic reasons while the intrinsic questionnaire contained equal number of intrinsic reasons. The mixed priming questionnaire consisted of both intrinsic and extrinsic items.

The priming questionnaires were presented to the subjects as a survey by the Psychology Department concerning opinions about behavioral experiments. The survey was described as confidential, and subjects were asked to put the completed questionnaire in a sealed envelope.

Measures

1. Internal-external self-schema: Subjects' self-schemata for personal effectiveness were determined by their scores on the Rotter I-E Control Scale (Rotter, 1966). Subjects who had a score of 7 or less were classified as internal schematics; those with a score of 15 or more were classified as external schematics.
2. Behavioral measure of intrinsic motivation: The behavioral measure is the amount of time which a subject spent on additional puzzles during the five-minute free-choice period when alternative activities were available. The time was recorded in seconds.
3. Self-report measures of intrinsic motivation: Subjects were asked to rate on a 7-point scale their task enjoyment, effort spent on puzzle solving, perceived competency in puzzle solving, and willingness to participate in a similar experiment in future. These scales were mainly based on previous work on intrinsic motivation (e.g. Earn, 1982; Farr, 1976). In addition, subjects rated their feelings

about the experiment on Mehrabian's semantic differential scales (Mehrabian & Russell, 1974); these measured individuals' affective reactions in various situations. The scales were summed to yield 3 scores: pleasure, arousal, and dominance.

C. Results

Separate 2x2x3 analyses of variance were conducted on task enjoyment, perceived effort, perceived competency, the amount of time that a subject would like to spend in future experiments of a similar nature, and Mehrabian's semantic differential measures of pleasure, arousal, and dominance. Furthermore, to check whether differential performances across priming conditions could account for intrinsic motivation differences, correlations between the number of puzzles solved and various intrinsic motivation measures were computed. Table 1, 2 and 3 contain the means and standard derivations of all self-report and behavioral measures of intrinsic motivation. Correlations among various measures of intrinsic motivation and number of puzzle solved can be found in Appendix G. Individual summary tables of ANOVA are presented in Appendix F. The means of various intrinsic motivation measures by group are reported in Appendix H.

Table 1

Means and standard deviations of self-report and behavioral measures of intrinsic motivation by pay and no pay condition

	No pay		Pay	
	Mean	S.D.	Mean	S.D.
Enjoy	7.00	1.24	6.85	1.23
Effort	6.66	1.44	6.95	0.90
Competence	5.83	1.32	5.58	1.22
Time 1	45.25	21.47	45.98	20.27
Pleasure	15.60	5.42	16.66	5.58
Arousal	19.65	6.32	21.13	6.19
Dominance	22.53	5.67	23.60	5.94
Time 2	95.45	79.97	67.11	60.89

Time 1: the amount of time which a subject is willing to spend in a similar experiment in future.

Time 2: the amount of time which a subject spends on additional puzzles during the free-choice period.

Table 2

Means and standard deviations of self-report and behavioral measures of intrinsic motivation by internal and external schematics

	Internal Schematics		External Schematics	
	Mean	S.D.	Mean	S.D.
Enjoy	7.26	1.13	6.58	1.25
Effort	6.85	1.19	6.79	1.24
Competence	6.00	1.17	5.41	1.31
Time 1	45.98	20.45	45.25	21.30
Pleasure	14.98	4.88	17.28	5.88
Arousal	19.06	6.67	21.71	5.59
Dominance	22.31	5.76	23.81	5.80
Time 2	95.03	77.21	67.53	64.54

Table 3

Means and standard deviations of self-report and behavioral measures of intrinsic motivation by intrinsic, extrinsic, and mixed priming conditions

	Intrinsic		Extrinsic		Mixed	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Enjoy	7.32	1.02	6.40	1.35	7.05	1.15
Effort	7.00	1.32	6.32	1.40	7.10	0.92
Competence	5.70	1.13	5.55	1.37	5.87	1.32
Time 1	47.62	20.34	42.97	21.32	46.25	20.96
Pleasure	14.47	5.11	17.62	5.53	16.30	5.53
Arousal	18.47	5.90	22.05	6.83	20.65	5.65
Dominance	22.1	6.19	24.32	6.81	22.77	3.93
Time 2	99.77	80.71	55.95	55.36	88.12	72.57

Behavioral measure

There were significant main effects of pay ($F=5.07, d.f.=1,108, P<.05$), self-schema ($F=4.77, d.f.=1,108, P<.05$) and cognitive priming ($F=4.33, d.f.=2,108, P<.05$) on intrinsic motivation as measured by the amount of time in seconds subjects spent on the puzzles during the free-time period. No interaction effects were observed. The data showed that in general internal schematic subjects spent more of their free time on puzzles as opposed to external schematic subjects. When subjects of both types were paid, they spent less time than when they received no pay. Also decreased time was associated with the condition in which they received extrinsic information while increased time was associated with the receipt of intrinsic information. The amount of time spent on puzzles in the mixed information condition was higher than the time in the extrinsic condition but less than that in the intrinsic condition. It appears that an internal schematic subject who was given the intrinsic information and received no pay was highest in the behavioral measure of intrinsic motivation, while an external schematic subject who was given the extrinsic information and received pay was lowest in intrinsic motivation.

Self-report measures

Rated enjoyment of puzzle task was significantly higher for internal schematic subjects than external schematic subjects ($F=10.69, d.f.=1,108, P<.01$); a significant main effect for cognitive priming on enjoyment ratings was also found ($F=6.88, d.f.=1,108, P<.01$). The data indicated that subjects generally enjoyed the puzzles more when presented with intrinsic information about behavioral experiments than when presented with extrinsic information. The rated enjoyment in the mixed information condition was generally lower than that in the intrinsic condition but higher than that in the extrinsic condition.

There were significant self-schema effects on subjects' ratings of competence ($F=6.42, d.f.=1,108, P<.05$). These indicated that internal schematic subjects felt more competent in puzzle solving after the puzzle task as compared with external schematics.

A significant main effect for cognitive priming ($F=5.04, d.f.=2,108, P<.01$) on rated effort was found. It suggested that subjects spent greater effort in puzzle solving in the intrinsic priming condition than in the extrinsic priming condition with the mixed priming condition in the intermediate.

With respect to Mehrabians's semantic differential scale, a significant main effect for self-schema as well as cognitive priming on pleasure and arousal dimensions were obtained. It

appears that internal schematic subjects felt happier ($F=5.64, d.f.=1,108, P<.05$) about and less aroused ($F=5.74, d.f.=2,108, P<.05$) by the experiment as opposed to external schematic subjects. Furthermore, when subjects were given intrinsic information about the experiment, they were happier ($F=3.55, d.f.=2,108, P<.05$) and relaxed ($F=3.54, d.f.=2,108, P<.05$) than given extrinsic information. Under the mixed information condition, ratings of pleasantness and arousal fell between those observed in the intrinsic and extrinsic conditions.

Together the self-report results showed that internal schematics displayed greater enjoyment, perceived competence, pleasant feelings and relaxation as compared with external schematic subjects, and these differences became more pronounced as the former was primed with intrinsic information while the latter with extrinsic information. In addition, intrinsic information about the experiment appears to induce subjects to work harder on the puzzles. Inspection of the data revealed that there were no significant main or interaction effects for pay on all self-report measures of intrinsic motivation. Neither were there any main or interaction effect for all independent variables on the amount of time subjects were willing to spend in a future experiment and the dominance ratings of the semantic differential scales.

Effect of differential performance

Pearson correlations between the number of puzzles solved and various intrinsic motivation measures were computed. No significant correlation was found, suggesting that differential performances on puzzles were not related to subjects' intrinsic motivation.

Recognition task performances

The mean correct responses to both old and distractor items for internal and external schematic subjects are presented in Table 4. T- and z-tests for differences between means of correct recognition of both old and distractor items for internal and external schematic subjects were performed; no significant differences were found. This indicates that internal and external schematics did not differ much in their recognition memory of old items taken from the priming questionnaire as well as new distractor items which were inconsistent with their self-schemata. The data on schema-consistent distractor items, though not significant, showed that internal schematics made fewer correct recognitions (more false alarms) of the intrinsic distractor item as a new item, relative to the extrinsic distractor item. By contrast, external schematics made fewer correct recognitions of the extrinsic distractor item than the intrinsic distractor item.

Table 4

Mean correct recognition of new distractor items

	Item		
	Intrinsic	Extrinsic	Z-value
Internal schematics	$\bar{X}$= .55	$\bar{X}$= .8	1.29
External schematics	$\bar{X}$= .65	$\bar{X}$= .45	1.1892

Mean correct recognition of old items

	Item		
	Intrinsic	Extrinsic	t-value
Internal schematics	$\bar{X}$=2.6	$\bar{X}$=2.45	0.616
External schematics	$\bar{X}$=2.4	$\bar{X}$=2.35	0.252

D. Discussion

Payment significantly affected the behavioral measure of intrinsic motivation but had no significant effect on the self-report measures of intrinsic motivation. As expected, non-paid subjects generally spent more of their free time on the puzzles than paid subjects. The self-report data indicated that non-paid subjects as a whole appeared to enjoy the task more, to feel more competent about puzzle solving, to rate the experiment more positively, and to feel more in control and less aroused. Although the differences were too small to be significant, the pattern was consistent with the results of the behavioral measure during the free-choice period. A plausible explanation for the differential payment effects on self-report and behavioral measures is that subjects are usually poor in reporting their internal states of which they have limited awareness (Wilson, Hull, & Johnson, 1981). This seems unlikely, however, given that subjects in the present study were asked to rank order the reasons for their behavior. Wilson et al showed that by inducing subjects to focus on the causes of their behavior, the probability of finding self-report effects was increased. Besides, self-report effects for self-schema and priming were found. It appears that these scales simply fail to reflect the impact of the payment.

One of the major concerns of the present study was the effect of cognitive priming on intrinsic motivation. It was assumed that by inducing subjects to think and recall either intrinsic or extrinsic aspects of an experiment, their intrinsic motivation could be augmented or reduced. The results showed that intrinsic motivation across subjects was highest under the intrinsic priming condition, intermediate under the mixed priming condition, and lowest under the extrinsic priming condition. This confirmed the prediction of the study.

In the process of ranking statements and making causal attributions, the information contained in the priming questionnaire is actively processed and integrated with the existing knowledge structure. The cognitive representation of the ranking judgments as well as causal attributions, in turn, influences the evaluation of the entire experimental situation in which the subject was interacting.

According to Hastie (1980), different items of information are said to be linked together when they are compared in the short-term memory or the working memory. The short-term memory, which is associated with conscious processes, classifies, organizes and structures information flowing from the environment as well as the long-term memory; more elaborate processing such as inferences and judgments are conducted in the working memory which maintains a mental model of the immediate physical and social environment. The inferential process is largely automatic and mainly involves the formation of extensive

linkages to other cognitive structures in a manner similar to Craik and Lockhart's processing at a deep level (1972). In the context of the present study, the ranking process would be assumed to take place in the working memory and result in the formation of numerous links between the information contained in the statements and relevant information stored in the cognitive structure. Thus an intrinsic task representation would likely be formed when the priming questionnaire contained mainly intrinsic information, whereas an extrinsic task representation would be created when only extrinsic information was presented. The resulting representation then becomes the basis of subsequent judgments and behaviors.

Extrinsic priming is thought to induce subjects not only to attend to the extrinsic aspects of the experiment but to search for related information in memory. With extrinsic information highly accessible, a subject would be more likely to process and encode extrinsic stimuli array in the experimental situation rather than other types of stimuli, resulting in a representation largely extrinsic in content. Since subjects' behaviors are determined by their cognitive representations of the situation, such an extrinsic representation, therefore, would lead to a decrease in intrinsic motivation. Parallel processes are thought to occur under the intrinsic priming condition which results in enchanced intrinsic motivation. The effect of mixed priming will be discussed later.

There are two social cognitive models which could be adapted to explain the priming process and effects. These two models are not incompatible with each other as both use the concept of construct acccessibility.

Cognitive priming could be viewed as a way to increase the accessibility of certain conceptual materials in the long-term store. According to Wyer and Srull's model of social information processing (1980), the long term memory consists of a vast number of storage bins which are identified by tags referring to their specific contents. A piece of information could be stored in and retrieved from more than one bin. The implication is that the larger the number of bins in which a unit of information is deposited, the greater the availability of the information. The unit of information stored in a bin can vary in generality and complexity. For example, the information about extrinsic reward could be stored simply as $2.50 in a bin with a money tag. Alternatively it can be stored in the form of an organized set of features or attributes including expectancy about reinforcement, the context in which the reward is given, the affective responses and so forth. These organized sets of features are called schemata. It is postulated that when information is retrieved from a bin, it will be returned to the top of the pile rather than the original position it occupies. It means the more recently the information is used, the more accessible the information becomes. By giving the priming questionnaire to subjects, the information activated and

generated would be deposited 'on top', thereby rendering it more accessible for subsequent processing purposes. It has been shown that people do not make an exhaustive search in memory for information to make a decision. Instead they tend to base their decisions on a relatively small set of information which is most accessible (Tversky & Kahneman, 1974).

The other model is Higgin and King's construct accessibility model (1981). According to this model, categorization of social information involves an assessment of the similarity between the attributes of a stimulus and the content of a schema or a construct. The readiness with which a schema or construct could be used would significantly affect the processing of social information. There are several determinants of construct accessibility: expectation, motivation, recency of activation, frequency of activation, and construct salience. Through control and manipulation of these determinants, construct accessibility could be either increased or reduced. From a construct accessibility perspective, the priming effect on intrinsic motivation could be viewed as a consequence of recency of activation. The priming questionnaire could be seen to activate a number of related schemata, resulting in an increase of their subsequent accessibility. There is evidence that increased construct accessibility from recent activation can have significant information processing effects. For example, subjects who were unobtrusively exposed to personality trait terms, were more likely to employ the primed constructs

later to characterize a stimulus target (Higgin et al, 1977). Cognitive priming not only influences recall and judgment but also social behaviors. In a study by Wilson and Capitman (1982), male subjects who read a 'boy-meet-girl' script subsequently behaved in a much friendlier manner than those who read a control story. Higgin likened the influence of recency on construct accessibility to an energy cell whose energy was increased whenever the cell was activated and whose energy gradually dissipated over time. By constrast, Wyer and Srull's model postulated that recent activation would result in the construct being placed on top of a bin. Therefore, as long as it remained on top, the recency effect would persist.

It should be noted that Wyer and Srull's model embodies both associationist and constructionist principles. According to Landman and Manis (1983), many social cognition theorists combine the essential features of associative network and schematic approaches in their formulations. The former is characterised by elementaristic structures, and passive, bottom-up processing; the latter by higher-oder structures, and active, top-down processing. For example, Hamilton (1981) viewed a personality impression as 'a network of associations among the individual items of information' (p. 141), and asserted that 'one actively organizes the available informatiom according to certain personality relevant schemas' (p. 145). Despite their constructionist orientation, Markus and Smith (1981) described the self as a single node that was linked to numerous conceptual

nodes in memory. Gilovich (1981) employed both associationist and schema constructs to explain the results of a series of studies on the effects of associations on social and political judgment. Perhaps this blending of schema and associationist tenets in social cognition models reflects a more mature stage of theoretical development.

Another focus of the present study concerned the impact of self-schema on intrinsic motivation. It was contended that subjects with different self-schema about social reinforcement would differ in their representations of the experimental situation. Such variation in cognitive representation then differentially affects their intrinsic motivation.

The results of the study indicated that subjects with an internal self-schema across different priming conditions displayed higher intrinsic motivation relative to subjects with an external self-schema. They tend to enjoy the puzzle more, feel more competent about puzzle solving, make more effort in solving the puzzles, see the experiment in a more positive way, and spend more of their free time working on the puzzles.

To understand the relationship between self-schema and behavior, it is deemed necessary to discuss in more detail the development as well as the organization of self-schemata. According to Markus and Smith (1981), the self can be viewed as represented in memory as a single node with numerous links to other conceptual nodes such as family, school and friends. All representations of self-knowledge from general self esteem to

specific behaviors, are stored and integrated together into an elaborated network. Repeated experiences in an area that concerns us would result in a continuous strengthening of association between the self and the cognitive representation of that area. Eventually the two structures become partially integrated. When this happens, a self-schema for a particular area is said to be formed; it becomes activated whenever the self is involved.

From a schema perspective, an internal is basically a person with a self-schema for personal control of social reinforcement. For many people social reinforcement is a highly self-relevant area that receives extensive personal investment, and there is likely to be substantial integration between the self and the social reward structure. This then becomes central in the organizing of information about the self and the social world. Depending on their social reinforcement histories, some individuals may have acquired an internal self-schema or an external self-schema. Once established, such social reinforcement schemata would influence what aspects of the incoming stimulus information would be attended to, how they are interpreted, and what responses would be initiated. Thus the self-schema could be thought to provide for

> a point of view, an anchor, or a frame of reference. As mechanisms of selectivity, they guide the individual in choosing those aspects of social behavior to be regarded as self-relevant, and they function as interpretive frameworks for understanding this behavior (Markus, 1983, p.548).

In this regard, an internal or external schematic subject would be highly sensitive to an information array that confirms his or her internal or external expectancy. Upon encountering schema-relevant information, the self-schema is activated to organize and encode the information. Specifically, in the present study, an internal schematic would be more attentive and attuned to the intrinsic aspects of the puzzle task, likely to interpret the experiment as potentially rewarding, and to regulate his or her behavior toward the desired goal--to meet the challenge. On the other hand, an external schematic would be more sensitive to the extrinsic aspects of the puzzle task, likely to see the experiment as confining, and to regulate his behaviors toward the desired goal--to fulfil an obligation.

The lack of interaction between self-schema and priming suggests that their effects on intrinsic motivation are likely to be additive. As indicated by the group means, in general unpaid internal schematics given intrinsic priming showed the highest mean intrinsic motivation whereas paid external schematics were lowest in mean intrinsic motivation. Within the same payment condition, the mean intrinsic motivation of internal schematics given extrinsic priming and external schematics given intrinsic priming was generally at an intermediate level. It would be interesting to speculate on the processes that may occur when a subject was given a schema-inconsistent priming. It is generally assumed that information consistent with a self-schema would be extensively

integrated into the existing cognitive structure while inconsistent information would be less integrated. Extensive elaboration and integration of self-consistent stimuli information mainly involves forming linkages to the vast knowledge network of the self-schema. Without a self-schema, such deep encoding and integration of the information is unlikely. When the intrinsic task information is presented to an internal schematic subject, a highly differentiated intrinsic representation is formed. Likewise, an extrinsic representation is created by an external schematic subject presented with extrinsic task information. However, when extrinsic task information is presented to an internal schematic (or vice versa), loose and fragmented encoding would occur. Without a framework within which the information could be easily integrated, the information could not be encoded as a whole (Sentis & Burnstein, 1979), rather, individual items of information would be linked to different cognitive structures which may be unrelated to each other or only peripherally related to the self. Low in salience and valence, the fragmented representation is likely to exert a much weaker influence on behavior than a highly elaborated representation.

In the mixed priming condition, both intrinsic and extrinsic information about experiments was presented. In this case, the ranking and attribution task involve both intrinsic and extrinsic information provided externally by the experimenter, and derived internally from the subjects'

knowledge structure. Since the externally provided information is the same for every subject, any difference in the cognitive representation of the experimental situation should largely reflect individual differences in self-schema. Since subjects with either an internal or external self-schema are assumed to be more sensitive and biased toward the schema-consistent component of the mixed questionnaire, the resultant representation is likely to be a composite structure incorporating both types of information with the schema-consistent elements predominant. As a result, the overall effect on intrinsic motivation would be less than that of the other two types of priming. The findings indeed showed that in general the mixed priming produced higher intrinsic motivation than the extrinsic priming but lower than the intrinsic priming condition.

The prediction about subjects' immediate recognition memory was only partially supported by the recognition test results. As predicted, both internal and external schematics generally were quite accurate in and equally good at identifying old items as being seen before in the mixed priming questionnaire. However, the results concerning the recognition of distractor items showed a somewhat different picture. Although not significant, the trends were in the predicted direction, in that internal schematics made slightly more false recognitions of the intrinsic distractor item as an old item, relative to the extrinsic distractor item. By contrast, external schematics were

somewhat more likely to identify the newly added extrinsic distractor item as being seen before than the intrinsic distractor item. This false recognition tendency can be considered to reflect the influence of a recently activated cognitive structure. When presented with both types of task information, internal schematics were thought to encode intrinsic task information into an available elaborated structure, while similar deep encoding of extrinsic task information occurred in external schematics. These recently constructed structures were highly accessible for processing information in the subsequent recognition task. It is plausible that the higher recognition accuracy of intrinsic items by extrinsic schematic subjects and extrinsic items by intrinsic schematic subjects is partly due to the clear thematic incongruences between the items and the cognitive representations, and the tendency to falsely recognize a schema-consistent distractor item may be attributed to the confusion caused by the conceptual similarity between the distractor item and the cognitive representation (Cohen, 1983). As a whole, the recognition test results are consistent with the notion that individual differences in self-schema influenced the cognitive representation of the experiment through differential processing of intrinsic or extrinsic information.

In a recent paper, Markus (1983) has outlined an expanded view of self-knowledge which is particularly relevant to the present discussion of the link between self-schema and motivated

behavior. The major theme of the paper is that self-knowledge is a critical component of personality, and its content and organization have significant behavioral implications. Markus points out that human social behaviors are mainly products of the interaction between the self and social environment forces. When a person perceives a situation as self-relevant or personally meaningful, he attempts to direct and regulate his behaviors in an attempt to promote or protect the self.

Markus feels that recent research on the cognitive self has been too narrowly focused on how an individual describes himself in terms of personality traits, and needs to be expanded to the study of other dynamic contents such as goal, value, motives and behavioral strategies. These dynamic aspects of self-knowledge are primarily concerned with the possible or the potential self.

Markus introduces the concept of possible selves to embody these dynamic elements, and to serve as a link between present and future. The importance of possible selves lies in their mediating role for future actions. When a person is schematic with respect to a behavioral domain, he is likely to develop possible selves in that particular domain. As these possible selves not only represent the motives and goals but also behavioral strategies, they guide and direct the person's actions towards his desired goal.

In this expanded view of self-knowledge, the constructive and dynamic aspects of self-schema are stressed. With the addition of the concept of possible selves as an integral part

of a self-schema, there is a shift in emphasis from the information processing function to the implications for behavioral regulation. In this expanded view, a self-schema is regarded as more than a representation of physical characteristics and traits. It includes cognitive representations of various ways to fulfil the self in important areas as well as to protect the self from potential harm and threat. As such, a self-schema implies increased awareness of the antecedents and consequences of one's behavior in areas of concern.

A behavioral experiment is basically a social encounter. Like many social situations, it contains both rewarding and constraining features. Which features would be focused on, and the kinds of behavioral responses manifested depend very much on a subject's self-schema. In the present study, the behaviors shown in the free time period could be viewed as a direct function of the possible selves activated by the priming questionnaire and other information of the experiment. It was predicted that engaging in the puzzle task would be seen as a way to promote the self by internal schematic subjects, and that they would be more likely to work on the puzzles while waiting for the experimenter. On the other hand, the challenge and novelty of the experiment was assumed to be seen as a threat to the self by external schematic subjects, and they were considered to be unlikely to spend more time on the puzzles during the waiting period. These predictions were largely borne

out by the results.

In conclusion, the results of the present study generally demonstrate the important influences of self-schema and cognitive priming on intrinsic motivation. These motivational effects are assumed to be mediated by cognitive processes and structures. Self-schema influences intrinsic motivation through its selective processing function; cognitive priming achieves its effects by rendering cognitive schemata more accesible for processing. The basic assumption of this cognitive analysis of intrinsic motivation is that motivational behavior can be viewed as mainly a product of cognitive activities. The study shows that the application of the social cognitive approach to dynamic areas is a fruitful one as Taylor (1981) and Fiske (1981) have cogently argued that 'hot cognition' such as affect and motives should be synthesised into a social cognitive program.

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APPENDIX A

To all students:

I am looking for subjects for an experiment on information processing. The experiment will take about 40 minutes, and mainly involve solving a number of interesting puzzles. I would appreciate very much your filling out the attached short questionnaire. Depending on your scores, some of you will be asked to take part in the information-processing experiment. Participation, of course, is entirely voluntary. Please put down your name and phone number so that I can contact you later. When you agree to participate, the experimental procedure will be explained to you in more detail, and your consent to the experimental task will be sought. Strict confidentiality of your name and results is promised.

Name (Please print) _____

Phone _____.

Thank you,

Wai Yuen

Graduate student,

Psychology.

Rotter I-E Control Scale

PLEASE PRINT CLEARLY-Name: Last:_____ First:_____

Date:_____ Age:_____ Sex: M/F

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered a or b. Please select the one statement of each pair (and only one) which you most strongly believe to the case as far as you're concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief: obviously there are no right or wrong answers.

Please answer these items carefully but do not spend too much time on any one item. Be sure to find an answer for every choice. Black-in the space provided beside a or b -- the one you choose as the statement more true.

In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to the case as far as you're concerned. Also try to respond to each item independently when making your choice; do not be influenced by our previous choices.

1. ( ) a. Childen get into trouble because their parents punish them too much.
   ( ) b. The trouble with most children nowadays is that their parents are too easy with them.
2. ( ) a. Many of the unhappy things in people's lives are partly due to bad luck.
   ( ) b. People's misfortunes result from the mistakes they make.
3. ( ) a. One of the major reasons why we have wars is because people don't take enough interest in politics.
   ( ) b. There will always be wars, no matter how hard people try to prevent them.
4. ( ) a. In the long run people get the respect they deserve in this world.
   ( ) b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
5. ( ) a. The idea that teachers are unfair to students is nonsense.
   ( ) b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
6. ( ) a. Without the right breaks one cannot be an effective leader.
   ( ) b. Capable people who fail to become leaders have not taken advantage of their opportunities.
7. ( ) a. No matter how hard you try some people just don't

like you.

( ) b. People who can't get others to like them don't understand how to get along with others.

8. ( ) a. Heredity plays the major role in determining one's personality.

( ) b. It is one's experiences in life which determine what they're like.

9. ( ) a. I have often found that what is going to happen will happen.

( ) b. Trusting to fate has never turned out as well for as making a decision to take a definite course of action.

10. ( ) a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.

( ) b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. ( ) a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.

( ) b. Getting a good job depends mainly on being in the right place at the right time.

12. ( ) a. The average citizen can have an influence in government decisions.

( ) b. This world is run by the few people in power, and there is not much the little guy can do about it.

13. ( ) a. When I make plans, I am almost certain that I can make them work.

( ) b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14.( ) a. There are certain people who are just no good.

( ) b. There is some good in everybody.

15.( ) a. In my case getting what I want has little or nothing to do with luck.

16.( ) a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.

( ) b. Getting people to the right thing depends upon ability, luck has little or nothing to do with it.

17.( ) a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.

( )b. By taking an active part in political and social affairs the people can control world events.

18.( ) a. Most people don't realize the extent to which their lives are controlled by accidental happenings.

( ) b. There really is no such thing as "luck."

19.( ) a. One should always be willing to admit mistakes.

( ) b. It is usually best to cover up one's mistakes.

20.( ) a. It is hard to know whether or not a person really likes you.

( ) b. How many friends you have depends upon how nice a person you are.

21.( ) a. In the long run the bad things that happen to us

are balanced by the good one's.

( ) b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22.( ) a. With enough effort we can wipe out political corruption.

( ) b. It is difficult for people to have much control over the things politicians do in office.

23.( ) a. Sometimes I can't understand how teachers arrive at the grades they give.

( ) b. There is a direct connection between how hard I study and the grades I get.

24.( ) a. A good leader expects people to decide for themselves what they should do.

( ) b. A good leader makes it clear to everybody what their jobs are.

25.( ) a. Many times I feel that I have little influence over the things that happen to me.

( ) b. It is impossible for me to believe that chance or luck plays an important role in my life.

26.( ) a. People are lonely because they don't try to be friendly.

( ) b. There's not much use in trying hard to please people, if they like you, they like you.

27.( ) a. There is too much emphasis on athletics in high school.

( ) b. Team sports are an excellent way to build character.

28.( ) a. What happens to me is my own doing.

( ) b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29.( ) a. Most of the time I can't understand why politicians behave the way they do.

( ) b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX B

Survey On Student Involvement In Behavioral Experiments

This survey is conducted by the Psychology Department as an ongoing project to study students' opinion and feelings about behavioral experiments. The results of the survey will provide preliminary data for the Department to formulate guidelines for future experimental designs. After you finish, please put the survey into the envelope provided, and seal it.

A. Characteristics of experimental tasks

Rank the task characteristics by putting a number beside each item according to this scale:

Least pleasant 1 2 3 4 5 6 7 8 Most pleasant.

Please note that each number can only be used once to indicate the rank oder of a particular item.

_ Experimental tasks involve a great deal of creative input on the part of participants. Students must use their problem-solving skills to do well.

_ Experiments are fast-paced and time goes by very quickly because one is usually very absorbed in the situation and forgets about other things.

_ Students can really learn new things about themselves in experiments because most experimental tasks are novel

and interesting.

_ Experimental activities are fun and enjoyable.

_ Experimental activities are intellectually challenging because they involve moderate risk and are difficult.

_ Participants in experiments get a great deal of feedback about their problem-solving competence because they can compare their performance with a performance standard.

_ Experimental tasks are structured to give students flexiblity in solving the problem (or making decisions). It's up to the student's own initiative.

_ Experimental tasks seem more like games than work.

B. Possible thoughts while engaged in the task

Rank the set of thoughts below by numbering each item according to this scale:

Least applies to you right now 1 2 3 4 5 6 7 Most applies to you right now

Again, each number can only be used once to indicate the rank order of a particular item.

_ I am thinking how this is a nice break from my schoolwork.

_ I am looking forward to being challenged (or was challenged) by the game.

_ I am comparing this game to other intellectually stimulating games I have done in the past.

_ I am planning (or did plan) a strategy to approach the

game so that I can (would) do well and win.

_ I am having (or had) fun.

_ I am viewing (or did view) the game as an end in itself rather than a means to some further end. It is (or was) inherently interesting.

_ I am going to try (or did try) to beat the clock and win.

C. Rank order the following reasons for working at the puzzle task in terms of how much they apply to you

Least applies to you right now 1 2 3 4 5 Most applies to you right now

_ Curiosity

_ Interest in the puzzles

_ Sense of achievement

_ Feeling of competence

_ Self-esteem

APPENDIX C

Survey On Student Involvement In Behavioral Experiments

This survey is conducted by the Psychology Department as an ongoing project to study student's opinions and feelings about behavioral experiments. The result of the survey will provide preliminary data for the Department to formulate guidelines for future experimental designs. After you finish, please put the survey into the envelope provided, and seal it.

A. Characteristics of experimental tasks

Rank the task characteristics by putting a number beside each item according to this scale:

Least pleasant 1 2 3 4 5 6 7 8 Most pleasant

Please note that each number can only be used once to indicate the rank order of a particular item.

-- Experiments are physically confining; you are required to stay in the same place for a relatively extended period of time.

-- Students have no control over what they will be doing in the experiment; they are required to follow the exact orders of the research supervisor.

-- Experimental tasks are scheduled precisely, with no

deviation from a well-defined time-table, it makes a person feel like a little robot.

-- Students have almost no choice concerning whether to participate in experiments. They have to do it to fulfill course requirements.

-- Participants are always being watched and evaluated in terms of how well they do on the experimental task. You can never relax and enjoy what's going on.

-- Experimental tasks are repetitious and tend to get monotonous by the end of the session.

-- Experimental tasks are pretty simple and require a little creative input. Anyone with normal intelligence will do okay.

-- Experiments are slow-paced and eventually it seems as though they will never end. It's a relief when they are finished.

B. Possible thoughts while engaged in the task

Rank the set of thoughts below by numbering each item to this scale:

Least applies to you right now 1 2 3 4 5 6 7 Most applies to you right now

Again, each number can only be used once to indicate the rank order of a particular item.

-- I am thinking about more important things that I could be doing right now instead of being here doing this.

-- I am wondering why I am here in the first place. There is

really little that is inherently interesting.

-- I am day dreaming about other things to get my mind off this confining situation.

-- I am thinking about the real reason I am here -- the money or the credit I am going to get in exchange for my participation and my efforts.

-- I am thinking about whether I am doing correctly what I have been told to do because I want to get what I've earned and leave.

-- I am trying to figure out a way to get the task over with as quickly as possible so that I can get out here.

-- I am thinking about earning as much as I can so that I can make my time here worthwhile.

C. Rank order the following reasons for working at the puzzle task in terms of how much they apply to you.

Least applies to you right now 1 2 3 4 5 Most applies to you right now

-- Reward

-- Experimenter's acceptance

-- To help the experimenter

-- To fulfill an obligation

-- To comply with experimental instruction

APPENDIX D

Posttask Questionnare

1. Would you rate on the 9-point scale, how much you enjoy the puzzles:

   1---2---3---4---5---6---7---8---9---

   very little — very much

2. How much effort you made in solving the puzzles:

   1---2---3---4---5---6---7---8---9---

   little — tremendous

3. How competent you think you are in puzzle solving:

   1---2---3---4---5---6---7---8---9---

   not competent — highly competent

4. How much time you would like to spend in a future experiment of similar nature:

   0---15---30---45---60---75---90---105---

   minutes

5. Please use the adjective pairs below to describe your feeling about the whole experiment (including the puzzle task). Put a check mark somewhere along each line (Example:---:-x-:---:) to indicate what you think is an appropriate description. The more appropriate that adjective seems, the closer you put your check mark to it.

Good	---:---:---:---:---:---:---:---:---	Bad
Nice	---:---:---:---:---:---:---:---:---	Bad
Pleasant	---:---:---:---:---:---:---:---:---	Unpleasant
Strong	---:---:---:---:---:---:---:---:---	Weak
Large	---:---:---:---:---:---:---:---:---	Small
Heavy	---:---:---:---:---:---:---:---:---	Light
Fast	---:---:---:---:---:---:---:---:---	Slow
Active	---:---:---:---:---:---:---:---:---	Passive
Sharp	---:---:---:---:---:---:---:---:---	Dull
Happy	---:---:---:---:---:---:---:---:---	Unhappy
Pleased	---:---:---:---:---:---:---:---:---	Annoyed
Satisfied	---:---:---:---:---:---:---:---:---	Unsatisfied
Contented	---:---:---:---:---:---:---:---:---	Melancholic
Relaxed	---:---:---:---:---:---:---:---:---	Bored
Stimulated	---:---:---:---:---:---:---:---:---	Relaxed
Excited	---:---:---:---:---:---:---:---:---	Calm
Jittery	---:---:---:---:---:---:---:---:---	Dull
Wide-wake	---:---:---:---:---:---:---:---:---	Sleepy
Aroused	---:---:---:---:---:---:---:---:---	Unaroused
Controlling	---:---:---:---:---:---:---:---:---	Controlled
Influential	---:---:---:---:---:---:---:---:---	Influenced
In control	---:---:---:---:---:---:---:---:---	Cared for
Dominant	---:---:---:---:---:---:---:---:---	Submissive
Autonomous	---:---:---:---:---:---:---:---:---	Guided

APPENDIX E

Recgonition Test

Some of the sentences below are taken from the opinion survey you have just completed; but some are new sentences that you have not seen before. For each sentence, encircle 'yes' if you believe you have seen it before in the survey, and encircle 'no' if not.

1. Experiments are fast-paced and time goes by very quickly because one is usually very absorbed in the situation and forgets about other things.
   a. Yes b. No
2. Students have almost no choice concerning whether to participate in experiments. They have to do it to fulfill course requirements.
   a. Yes b. No
3. Experimental tasks are structured to give students flexibility in solving the problem (or making decisions). student's own initative.
   a. Yes b. No
4. Experimental tasks are scheduled precisely, with no deviation from a well-defined time-table. It makes a person feel like little like a robot.

a. Yes b. No

5. Experimental tasks are just interesting games in which participants can enjoy and learn new things about their problem-solving competence.

   a. Yes b. No

6. Experiments are physically confining; you are required to stay in the same place for a relatively extended period of time.

   a, Yes b. No

7. Most experimental tasks are pretty boring and monotonous. Participants have a difficult time trying to concentrate and keep their minds off other things.

   a. Yes b. No

8. Experimental activities are intellectually challenging because they involve moderate risk and are difficult.

   a. Yes b. No

APPENDIX F

Task enjoyment

Source by variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	32.733	4	8.183	6.246	0.000
Pay	0.675	1	0.675	0.515	0.474
I E	14.008	1	14.008	10.692	0.001
Prime	18.050	2	9.025	6.888	0.002
2-way interactions	5.375	5	1.075	0.820	0.538
Pay I E	1.408	1	1.408	1.075	0.302
Pay prime	3.150	2	1.575	1.202	0.305
I E prime	0.817	2	0.408	0.312	0.733
3-way interactions	2.717	2	1.358	1.037	0.358
Pay I E Prime	2.717	2	1.358	1.037	0.358
Explained	40.825	11	3.711	2.833	0.003
Residual	141.499	108	1.310		
Total	182.324	119	1.532		

Effort spent on puzzle solving

Source of variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	16.833	4	4.208	2.984	0.022
Pay	2.408	1	2.408	1.708	0.194
I-E	0.208	1	0.208	0.148	0.701
Prime	14.217	2	7.108	5.041	0.008
2-way interactions	4.642	5	0.928	0.658	0.656
Pay I-E	0.408	1	0.408	0.290	0.749
Pay Prime	1.517	2	0.758	0.538	0.586
I-E Prime	2.717	2	1.358	0.963	0.385
3-way interactions	0.817	2	0.408	0.290	0.749
Pay I-E Prime	0.817	2	0.408	0.290	0.749
Explained	22.292	11	2.027	1.437	0.167
Residual	152.299	108	1.410		
Total	174.591	119	1.467		

Perceived competence in puzzle solving

Source of variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	14.200	4	3.550	2.233	0.070
Pay	1.875	1	1.875	1.179	0.280
I-E	10.208	1	10.208	6.421	0.013
Prime	2.117	2	1.058	0.666	0.516
2-way interactions	7.042	5	1.408	0.886	0.493
Pay I-E	0.075	1	0.075	0.047	0.828
Pay Prime	3.350	2	1.675	1.054	0.352
I-E Prime	3.617	2	1.808	1.137	0.324
3-way interactions	1.850	2	0.925	0.582	0.561
Pay I-E Prime	1.850	2	0.925	0.582	0.561
Explained	23.092	11	2.099	1.320	0.223
Residual	171.699	108	1.590		
Total	194.791	119	1.637		

The amount of time that a subject was willing to spend on a similar future experiment

Source of variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	488.783	4	122.196	0.273	0.895
Pay	16.133	1	16.133	0.036	0.850
I E	16.133	1	16.133	0.036	0.850
Prime	456.517	2	228.258	0.509	0.602
2-way interactions	1601.169	5	320.234	0.715	0.614
Pay I E	537.633	1	537.633	1.200	0.276
Pay Prime	433.517	2	216.758	0.484	0.618
I E Prime	630.018	2	315.009	0.703	0.497
3-way interactions	986.028	2	493.014	1.100	0.337
Pay I E Prime	986.028	2	493.014	1.100	0.337
Explained	3075.980	11	279.635	0.624	0.805
Residual	48404.160	108	448.187		
Total	51480.141	119	432.606		

Pleasure dimension

Source of variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	392.950	4	98.237	3.493	0.010
Pay	34.133	1	34.133	1.214	0.273
I E	158.700	1	158.700	5.643	0.019
Prime	200.117	2	100.058	3.588	0.032
2-way interactions	109.200	5	21.840	0.777	0.569
Pay I E	40.833	1	40.833	1.452	0.231
Pay Prime	36.517	2	18.258	0.649	0.524
I E Prime	31.850	2	15.925	0.566	0.569
3-way interactions	72.317	2	36.158	1.286	0.281
Pay I E Prime	72.317	2	36.158	1.286	0.281
Explained	574.467	11	52.224	1.857	0.053
Residual	3037.386	108	28.124		
Total	3611.854	119	30.352		

Arousal dimension

Source of variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	536.300	4	134.075	3.659	0.008
Pay	66.008	1	66.008	1.801	0.182
I E	210.675	1	210.675	5.749	0.018
Prime	259.617	2	129.808	3.534	0.032
2-way interactions	112.675	5	22.535	0.615	0.689
Pay I E	37.408	1	37.408	1.021	0.315
Pay Prime	34.717	2	17.358	0.474	0.624
Pay Prime	40.550	2	20.275	0.553	0.577
3-way interactions	84.118	2	42.059	1.148	0.321
Pay I E Prime	84.118	2	42.059	1.148	0.321
Explained	733.094	11	66.645	1.819	0.059
Residual	3957.457	108	36.643		
Total	4690.551	119	39.416		

Dominance dimension

Source of variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	205.750	4	51.438	1.507	0.205
Pay	34.133	1	34.133	1.000	0.320
I E	67.500	1	67.500	1.978	0.163
Prime	104.117	2	52.058	1.525	0.222
2-way interactions	42.500	5	8.500	0.249	0.939
Pay IE	4.033	1	4.033	0.118	0.732
Pay Prime	37.517	2	18.758	0.550	0.579
I E Prime	0.950	2	0.475	0.014	0.986
3-way interactions	81.017	2	40.508	1.187	0.309
Pay I E Prime	81.017	2	40.508	1.187	0.309
Explained	329.267	11	29.933	0.877	0.565
Residual	3686.387	108	34.131		
Total	4015.454	119	33.743		

The amount of time a subject spent on additional puzzles during the free choice period

Source of variation	Sum of Squares	DF	Mean Square	F	Signif Of F
Main effects	87991.938	4	21997.984	4.631	0.002
Pay	24083.332	1	24083.332	5.070	0.026
I E	22687.496	1	22687.496	4.776	0.031
Prime	41221.137	2	20610.566	4.339	0.015
2-way interactions	17467.313	5	3493.462	0.735	0.598
Pay I E	3763.200	1	3763.200	0.792	0.375
Pay Prime	7257.262	2	3628.631	0.764	0.468
Pay Prime	6446.871	2	3223.436	0.679	0.509
3-way interactions	1737.438	2	868.719	0.183	0.833
Pay I E Prime	1737.390	2	868.695	0.183	0.833
Explained	107196.688	11	9745.152	2.051	0.030
Residual	513042.250	108	4750.391		
Total	620238.938	119	5212.090		

APPENDIX G

Pearson correlation coefficients among intrinsic motivation measures and number of puzzles solved

	Puzzles solved
Enjoy	0.0831
Competence	0.0568
Effort	-0.0135
Time 1	-0.0011
pleasure	-0.0406
Arousal	-0.0922
Dominance	-0.1057
Time 2	0.1084

Time 1: the amount of time that a subject is willing to spend in a similar experiment in future.

Time 2: the amount of time that a subject spends on additional puzzles during the free-choice period.

APPENDIX H

Means Of Intrinsic Motivation Measures By Group

Group	Enjoy	Effort	Pleasure	Time 1 (min.)
1	7.3	6.7	12.9	145.9
2	6.9	6.1	16.6	64.0
3	7.5	7.5	15.6	134.5
4	7.2	7.0	16.0	98.9
5	5.9	6.0	18.1	55.6
6	7.2	6.7	14.4	73.8
7	7.8	7.1	12.4	85.1
8	6.7	6.5	17.5	85.8
9	7.4	7.2	14.9	84.9
10	7.0	7.2	16.6	69.2
11	6.1	6.7	18.3	48.4
12	6.1	7.0	20.3	59.3

Means Of Intrinsic Motivation

Measures By Group

Group	Time 2 (sec.)	Compet-ence	Arousal	Dominance
1	49.5	6.1	15.1	20.7
2	37.5	6.0	19.6	25.1
3	43.5	6.2	19.6	20.1
4	40.5	5.9	19.9	22.7
5	52.5	4.9	23.4	23.7
6	48.0	5.9	21.3	22.9
7	51.0	5.9	20.5	21.9
8	42.9	6.1	20.3	22.3
9	51.5	5.7	20.3	23.8
10	49.5	4.9	19.4	23.1
11	39.0	5.2	24.9	26.2
12	42.0	5.7	21.4	24.3