PLANS, SCHEMAS AND AFFECT

By

JACALYN D. SNODGRASS

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(Department of Psychology)

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

December 1984

In presenting this thesis in partial fulfilment of the requirements for an advanced degree at the University of British Columbia, I agree that the Library shall make it freely available for reference and study. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by the head of my department or by his or her representatives. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Department of Psychology

The University of British Columbia
1956 Main Mall
Vancouver, Canada
V6T 1Y3

Date Feb. 11, 1985

DE-6 (3/81)

Abstract: It has previously been suggested that a person's behavior in a place is mediated by his or her plans, and by his or her emotional response to the place; but the possible interactive effects of these influences have not been explored. Not only may a particular mood be the goal of a plan, but the process of planning may also produce changes in the planner's mood. It is here argued that a person's emotional response to a place is influenced by the extent of the alterations the place requires be made in his or her plans. It has been generally assumed that a person's liking of a place is decreased if it does not fit his or her plan, but the experiments reported here indicate that some incongruity may actually increase liking of a place if the person is able to modify the plans. Three experiments examined the effects of planning on two dimensions of mood--pleasure and arousal--and for liking of places. In experiment one, subjects who had just completed planning a route for completing a list of errands reported higher arousal than subjects who had judged the time required to complete the same errands. In experiment two, subjects who executed their own plan reported higher pleasure than subjects who executed a

plan they had been given. In experiment three, subjects who had to alter their plans to accommodate the unexpected features of a place reported higher arousal and pleasure, and increased liking of the place over subjects who did not have to re-plan. These results suggest that the process of planning has measureable effects on mood and that these effects influence place-liking.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

In their 1982 Annual Review article, Russell and Ward proposed a framework for environmental psychology that incorporated a person's plans as a mediator in environment-behavior interactions. They made the point that a person's response to a place cannot be understood without consideration of why the person is in the particular place. Simply stated, this means that rather than assuming restaurants cause eating behavior, one might want to consider that people usually go to restaurants when they plan to eat.

The topic to be explored here is the role of plans in a person's emotional response to a place. It is obvious that the plans a person brings to a particular place will influence what the person does there; but it should also be clear that plans may influence the person's emotional response to the place. As an example, consider your reactions to the two versions of the following scenario:

Your friend has offered you the use of his condominium in New York for a month.

A) You accept, thinking it will be a good opportunity to "hibernate" and devote all your

energy to completing some work you haven't been able to finish here.

B) You accept, thinking it will be a great chance to have some fun, and anticipating the night life.

On arriving in New York you discover that the condominium is part of a "singles" complex designed to maximize opportunities for socializing. It is difficult to come and go without being drawn into the various activities.

You would expect to have very different emotional reactions in cases A and B, and would probably like the place more in case B where it facilitates your plan than in case A where it disrupts your plan.

Of course not all situations involve such dramatic interactions between the characteristics of a place and the person's reasons for going there. Often the discrepancy between a person's expectations about a place and its actual characteristics is much smaller. What are the effects of these smaller discrepancies on the person's feelings in or about the place?

A person's affective response to a place is often attributed to violated expectations about that place. For example, the presence of a crowd has been named as both the most and least enjoyable aspect of the same place by people who arrive there with different expectations (Morasch, Groner & Keiting, 1979). It has

been suggested that some effects of crowding, such as impaired task performance, are due not to high density per se, but to violated expectations--that is, high density in a situation where it is not expected (Klein & Harris, 1979). Why should violated expectations result in impaired performance and negative mood? If people are faced with circumstances they were not expecting, it is likely that their current plan will be disrupted. This may affect task performance either because there is no plan to guide it, or because attention is diverted from the task to form a new plan. If a new plan cannot be formed quickly, they may be left without a plan. This state of planlessness may then result in a negative mood state.

Miller, Galanter and Pribram (1960), in first suggesting the importance of plans in structuring behavior, noted the emotional consequences of being without a plan: "If the person becomes planless rather suddenly, marked mood swings are apt to occur: the person is said to become 'emotional.'" (p. 114). It is suggested here that this emotional response to being without a plan is one end of a continuum of mood changes influenced by the ongoing process of adjusting plans to meet environmental demands. At the end of the continuum where plans are completely disrupted, discrepancies between the state of the world and the person's plans for interacting with it are large, arousal is high, and

the experience is negative. At the other end of the continuum are the slight changes in mood that may result from small discrepancies between the person's expectations and the actual environment. The changes in mood along the contimuum defined by degree of discrepancy may range from slight increases in arousal that may be experienced as either pleasant or unpleasant, to the unpleasant, high arousal state accompanying complete plan disruption.

To examine the influence of plans on emotional responses, the concept of emotion must first be specified in more detail. In the following section, the notion of affect is defined. In clarifying what is meant by an emotional response to a place, some questions are raised regarding the possible influences of plans on these responses. Those questions will be addressed in the later sections of the paper.

EMOTION

In reviewing the diverse literature concerned with the affective qualities of places, Russell and Snodgrass (in press) make some useful distinctions among the terms available for discussing emotion in relationship to places. They point out that people often refer to different phenomena when they talk about emotion, and that confusion is best avoided by using distinct terms for separable sets of phenomena. Two of the terms defined by Russell and Snodgrass will be used here: mood and affective appraisal. A brief discription of those terms will help clarify the following discussion.

Mood

At any point in time a person's subjective state has some affective or emotion-tinged quality. The person may be happy, sad, excited, depressed, etc.--or neutral. This subjective feeling is referred to here as mood. In case A of the example of a trip to New York, your mood would probably be frustrated or upset. In case B it might be happy or excited. Although in this example it is easy to attribute a cause to the mood state, this is not always the case. Mood can as easily be feeling good (or bad) for no known reason--probably because mood is multiply determined.

It has been shown that the various moods people experience (happy, sad, excited, depressed, angry, etc.) can be described by values on two underlying dimensions--pleasure and arousal (Russell, 1980, 1983; Russell & Ridgeway, 1983). For example, excitement consists of pleasure and high arousal; relaxation consists of pleasure and low arousal; depression consists of displeasure and low arousal. Although mood is experienced as a unitary phenomenon, stimuli in the environment may influence the underlying dimensions independently, and it is useful to speak of a change in mood as a change in one or both dimensions. But it should be kept in mind that a change in arousal or a change in pleasure or changes in both are all experienced as a single change in mood.

Affective Appraisal

Judgments of a place as pleasant, attractive, likeable, and so on are referred to here as affective appraisals. These are judgments about the ability of the place to alter mood. To appraise a place as exciting means one expects to feel excited there. To appraise it as pleasant means one expects to experience a mood there high in pleasure. Again using the previous example, your affective appraisal of the place in case A would probably be that it is unpleasant or unsatisfying. In case B, you would probably affectively appraise the

place as pleasant or likeable.

Mood experienced in a place and affective appraisal of the place are clearly intertwined, but they need not necessarily co-vary. A person can appraise a variety of places (for example a series of photographs) without experiencing any change in mood. But is the converse true? Are affective appraisals independent of the person's mood at the time the appraisal is made? Probably not. Gifford (1980) has shown that people in a prior pleasant mood appraised places as more pleasant. This finding raises a series of interesting questions. How much influence does mood at the time of appraisal have on place-liking? Does present mood have the same effect on appraisal whether or not the person is in the place? Must the mood be attributable to the place before the affective appraisal will be influenced?

Distinguishing between mood and affective appraisal allows the formulation of specific questions concerning the role of plans in the person's experience with a place. For example, do plans influence mood and appraisal independently, or does mood mediate the effect of plans on appraisal?

SCHEMAS, PLANS AND EMOTION

The following sections will outline some of the ways in which a person's plans might influence mood or affective appraisals of places. A framework utilizing the concept of a "schema" is developed to explore the interrelationships between a person's plans and expectations, the places that do or do not meet those expectations, and the person's mood in and affective appraisals of those places. The ideas are drawn from a variety of sources, most notably Miller, Galanter and Pribram's (1960) discussion of plans, Russell and Ward's (1982, 1983) use of plans in describing person-place interactions, and finally Mandler's work on the role of schemas in affective appraisal (1984). It is argued that resolving the discrepancies between the state of the world and schema-driven expectations can alter mood, and that plans play a key role in determining the resultant mood. First, the concept of a schema is introduced along with Mandler's argument that schemas influence affective appraisal. Secondly, the structure of plans is discussed in terms of schema systems. Thirdly, the role of plans in determining the affective outcome of person-place interactions is discussed. Following these sections, some exploratory research is reported indicating that this is a useful framework for

examining these interrelationships.

SCHEMAS AND EMOTION

Mandler (1984) has presented the argument that an emotional experience can arise out of the discrepancy between a person's expectations and an event in the world. This emotional experience can be either positive or negative, in contrast to the view that discrepancies are always experienced negatively. In Mandler's model, expectations are embodied by schemas--cognitive structures that organize a person's knowledge about the world. A schema represents a set of relationships among the components of an object or event. A brief description of schemas will help clarify their role in Mandler's theory.

Schemas are economically structured so that a single schema can be adapted to fit any in a class of similar situations by changing details in the schema. For example, a "room" schema could be adapted to fit any room by changing the dimensions and furnishings specified by the schema. The "room" schema is an abstraction of the many different rooms that have been experienced, and its features have expected, or prototypical, values that may be replaced by the actual values detected in a room that activates the schema.

A schema specifies the relationship among its component features. These features may be thought of as

tags that specify (or point to) subschemas. For example, the schema "office" contains a tag for "desk." Activation of the "office" schema generates expectations for a desk to be present, but the specific details of desks are represented in the "desk" schema. Any single schema can probably specify the relationships among approximately 7 ± 2 components--the number of pieces of information that can be held in consciousness at one time.

Related schemas may be organized in a schema system. For example, schemas for specific types of rooms such as a living room or office have pointers that link them to the generic room schema.

Schemas are also hooked together in an information-retrieval network. If the incoming sensory stimuli do not fit the schema that is activated, this network will provide a replacement schema. Such network links may either be through generic schema pointers, or pointers to schemas that contain similar features. For example, if sensory stimuli do not match the "office" schema that is activated when you go into a room, it may fit the "library" schema, arrived at through the generic room schema.

According to Mandler, trying to fit sensory information into a schema can give rise to an emotional state. This happens because schemas are abstractions of many previous experiences, and will rarely fit incoming

information exactly. Mandler argues that the failure of incoming stimuli to fit a schema interrupts ongoing cognitive processing and as such causes an increase in autonomic nervous system arousal--one component of his definition of emotional experience. (In Russell and Snodgrass's terms, if the arousal is subjectively perceivable, than a change in mood is experienced.)

Arousal is a function of the degree of discrepancy between the schema and the incoming stimuli. If the discrepancy is slight, and incoming stimuli can be assimilated to the schema, arousal is increased only slightly. If the discrepancy is larger, but the schema can be altered to fit the incoming stimuli, arousal is higher. If the discrepancy can only be resolved by fitting the incoming stimuli to a different schema, then arousal is higher still. There is no easy way to quantify degree of discrepancy, but one way to think of it is as the search time required to find or alter a schema to match sensory input.

Pleasantness--the other component of emotional experience--varies with, among other things, the resolution of the discrepancy. A failure to resolve the discrepancy is experienced as negative. When there is a resolution, the schema that is finally fitted to the incoming stimuli has a value that may be either positive or negative. For example, suppose you've been told by a business associate that a messenger is on the way to

deliver a contract for you to look over. A messenger arrives and hands you an envelope that doesn't look like the contract you are expecting. If the discrepancy from your expectations is resolved by discovering you have just received a check for a large sum of money, the value of the resolution will probably be quite positive. On the other hand, if the envelope contains notification that you are being sued for a large sum of money, the value will be quite negative. As already demonstrated in the previous example of a trip to New York, there is not necessarily an absolute value attached to a schema; it may be positive in one context and negative in another.

Mandler (1984) also assumes that the intensity of pleasure varies with the arousal produced by discrepancy. Thus, the overall mood change resulting from the process of resolving discrepancies is a combined function of the degree of discrepancy and the meaning of the fitted schema. First, arousal varies with degree of discrepancy. The pleasantness of the experience depends upon the value of the fitted schema and on the arousal. If a resolution is not achieved (i.e., evidence in the world does not fit any accessed schema), arousal is very high and the quality of the experience is negative because there is no meaning to evaluate. If there is a resolution, arousal is less high and the quality of the experience depends on the

value of the fitted schema.

An example might help to illustrate the possible outcomes of this process. If you were expecting a telegram from a good friend you haven't seen for a long time, the ringing of your doorbell would activate your schema for receiving telegrams (presuming of course that you have formed such a schema from previous experience). This schema includes expectations for the person at your door to look like your stereotypical telegram delivery person. If, when you answer the door, there is no one there, you will likely experience a mood high in arousal and low in pleasure. This is an example of failure to achieve schema congruity; you are unable to find a schema that fits this situation of a ringing doorbell with no one at the door. If, when you answer your door, you see a vacuum cleaner salesman, you are again likely to experience arousal and low pleasure (unless you're in the market for a vacuum cleaner). This time you've found a schema that fits the situation, but it has negative value in context. If, on the other hand, you open your door and see your friend in person, your experience will be high in arousal and high in pleasure. This is an example of a resolution that has a positive value within the context of your current plan (communicationg with your friend). It should be emphasized that because of the heightened arousal from violated expectations, you should experience a more

intense positive feeling at an unannounced vs. an announced visit of your friend.

PLANS AS SCHEMAS

Ward and Russell (1983) have outlined how plans can be usefully described as a hierarchical organization of schemas. Ward and Russell's concept of schema is based largely on Minsky's (1975) discussion of how to represent knowledge in computer models of problem solving. Building on the foundations established by Ward and Russell, a description of the structure of plans is presented here that will allow some analogies to be drawn between planning and schema-structured perception. These analogies form the theoretical background for some predictions about emotional reactions to places on the basis of how discrepant the places are with a person's plans.

Schemas as used by Ward and Russell are separated into several types, three of which are of present concern: place schemas, action schemas, and state-change schemas. Each of these types of schemas will be described, and then used to present a fairly detailed description of a possible structure for plans.

Place Schemas

A place schema refers to a place or type of place. Any type of place with which a person is familiar will be represented as a generic schema in the person's

memory. For example, the "room" schema discussed earlier is a generic schema representing the prototypical room abstracted through experience with rooms. There are also more specific place schemas such as an "office" schema or even "Mr. Smith's office." The number of specific place schemas a person has depends on his or her experience. The office worker would have more specific office schemas than would a small shopkeeper.

Action Schemas

An action schema specifies the components of an action: a sequence of acts, an actor, and a result. It may also specify prerequisite conditions and required objects or places. As with the objects and features in a place schema, the actor, objects, and subactions in an action schema may be represented as tags identifying (or pointing to) the relevant schemas for each tag. Similarly, the result of the action is specified by a pointer to the schema or schemas that represent the possible changes in state that result from this action. For example, the action schema "hit" has as its possible results the changes in state from "no pain" to "pain" or from "intact" to "broken." These changes are represented as state-change schemas.

State-change Schemas

A change in state may have several possible causes. For example, breakage may result from the object in question being hit, dropped, pulled apart, etc. All of the action frames that have as their result this change in state will have pointers to the "intact/broken" state-change schema. The state-change schema, in turn, points back to causal action schemas. This allows the person to both predict the consequences of his or her actions and to formulate a plan with a particular change of state as its goal.

Plans

A person's plans can be thought of as a hierarchical organization of action schemas linked together through state-change schemas. Each state-change schema represents a goal. A desired change in state--the goal--points to the various action schemas that may be selected to achieve that state. The prerequisite conditions in a selected action schema may generate a subgoal. The possible actions for achieving this subgoal are again available through the pointers from the state-change schema associated with this subgoal. For example, you may be sitting in your office when you suddenly become aware that you are hungry. Your "state-of-hunger" schema points to the action schema "eat" as one resulting in a change from hunger to

satiation. Your "eat" schema has as a required object "food." This generates a subgoal of "acquire food." Your "have food" state-change schema points to the schemas for the possible actions that change the state "have food." You might go to a restaurant, go home, go to the supermarket, etc. Each of these action schemas has its own set of prerequisite conditions and necessary objects that may generate further subgoals.

Obviously plans can have many levels. The part of the overall structure of which the person is aware at one time--the immediate plan--is represented as a single schema. Subplans are represented in this schema as pointers to state change schemas that in turn have pointers to an action schema or several action schemas that may potentially be used to achieve the desired state. Metaplans, or the higher level plans that generated the immediate goal, are linked to the immediate plan through the state-change schema associated with that goal. Until fulfilled, both the higher level metaplans and the lower level subplans can be thought of as intentions, following the usage of Miller, Galanter & Pribram (1960). Intentions constitute part of the overall plan structure, but are beyond the scope of awareness. The action schema representing the current plan specifies the relationships between the goal, the results, the various

subplans, and necessary conditions. These components are all represented as tags which are relatively hazy, and merely point to their respective schemas. To examine the details of a subplan, the person must change levels. Then the details of the subplan become more clear as the higher level plan becomes more hazy.

In this way, plans can be formed and modified as goals and environmental restrictions arise. For example, if your goal is to be a successsful writer, your "successful writer" state-change schema would point to a "sell books" action schema. Among the antecedent conditions for this schema is the "write books" schema which may eventually lead you back to a "sharpen pencil" subplan. If you now find yourself without a pencil sharpener, you can go from the "sharp pencil" state change schema to other action schemas that result in the condition "sharp."

PLANNING AND EMOTIONS

Expectations about a place are represented in plans as prerequisite conditions or required objects specified by the associated action schema. These expectations may be explicit or implicit, that is a person may have developed a plan in such detail that he or she consciously expects certain features to be present in the place, or, the person may arrive at the place with only a general strategy and become aware of his or her expectations only on discovering the place doesn't fit the specifications of any of the available action schemas that have as their result the desired state. In either case, if these expectations are not met the person must replan. For example, what do you do if there isn't a picnic table where you expected one? You alter your plan somehow--by looking elsewhere for a picnic table, by deciding to have your picnic on the ground, or by deciding not to have a picnic.

The expectations inherent in a plan form the basis of the analogy between planning and the process of resolving schema discrepancies. Planning is required any time ongoing behavior is interrupted by expectations that are not met. In identifying an object, expectations are used as the starting point in a search for a schema that matches, or can be adapted to match,

events in the world. Sensory input acts as a constraint on schema selection, and arousal increases as a function of the farther a matching schema is from the starting point. In planning, the current plan (in the form of an action schema with its associated expectations) acts as a starting point in a search for a schema that will integrate actual conditions with the current goal. As with object identification, schema selection is a partially stimulus-driven process, and arousal increases as a function of the difficulty in finding a suitable schema.

As an example relevant to the present purpose, consider what typically happens when you arrive at a particular place. You come to a place with a plan. This plan is in the form of an action schema that specifies characteristics of the place necessary for the action to occur. As you look about the place you've come to, you try to fit the characteristics of that place to your action schema or an attached place schema. If the characteristics don't fit, you have the same alternatives as in object identification. You can adapt your action schema to the actual characteristics of the place and, for example, have your picnic on the ground; or you can use your action schema as a starting point in the search for another action schema that will result in the acquisition of your goal--for example, go to a restaurant. Here the major constraints on schema

selection are that it must lead to the specified state-change schema associated with your goal, and it must either fit the characteristics of the place you're in or some other place you can get to. If you are unable to construct a plan to achieve your current goal, you must then attempt to revise the higher level plan that generated that particular goal, and so on until you have eliminated the discrepancy. The hierarchical organization leads to the type of bottom-up replanning noted by Miller et al. "When in the execution of a Plan it is discovered that an intended subplan is not relevant or is not feasible, the smallest possible substitutions of alternative tactical subplans are to be attempted first, and the change in strategy is to be postponed as long as possible." (p. 114)

As with object identification, arousal increases with the difficulty of finding a schema to fit the constraints. Whether the experience is positive or negative depends on the outcome of the fitting process. In the case of object, person or event identification, this depends upon the context--how the identification fits into current plans. In the case of planning--since plans are hierarchical organizations of subplans--it depends on how well the plan fits into the larger plan hierarchy of which it is a part.

Thus, both planning and identifying events in the world can have an effect on a person's mood. Both

processes can be characterized as a search through stored schemas for one that fits or can be adapted to fit given constraints. This process of searching and adapting requires effort and contributes to the arousal dimension of mood. Once a schema has been found that satisfies the constraints, it can be evaluated in the context of higher level plans. This evaluation contributes to the quality or pleasantness dimension of mood.

With this analogy some predictions can be made about the planning process. As long as the planning process results in a plan consistent with the person's goals, the act of planning will leave the person with a positive feeling. Within these constraints, the more mental effort involved in making a plan (or revising one), the higher the arousal component of mood. That is, provided there are no time constraints or other overriding factors, when you finally find a suitable picnic table you are apt to enjoy your picnic more than if your plan was immediately successful. This is predicted because the effort of thinking of another place to find a picnic table increases your arousal, and finding a suitable table causes us to experience this arousal as positive.

OVERVIEW

The experiments reported here are the first steps in an exploration of the relationships between plan, place and affect. The hypothesized interaction can be broken down into two testable hypotheses: 1) the process of planning or replanning has measurable effects on mood, and 2) the mood induced by planning will influence liking of the place that requires the planning. Specifically, based on the framework developed here, it was predicted that having to plan would increase the arousal component of mood, and the formation of a satisfactory plan would cause this arousal to be experienced as positive. It was also predicted that, as long as a satisfactory plan could be formed, an unexpected place would be liked more than an expected place.

The first two experiments test hypothesis 1, and the third tests one condition of hypothesis 2--the case where a person is able to form a plan. Experiment 1 compared the self-reported mood ratings of subjects who had just completed a planning task with the ratings of subjects who had just completed an evaluation task using the same materials. Experiment 2 compared the mood ratings of subjects who had completed a task by making and following their own plan with the mood ratings of

subjects who had completed the same task by following a plan they were given. These two experiments separate the effects on mood attributable to planning from those attributable to execution of the plan.

Experiment 3 traced the mood of each subject through the stages of planning and executing the plan, and compared subjects who are forced to re-plan with those who were not on measures of mood and place liking.

EXPERIMENT 1

PLANNING WITHOUT EXECUTION

Experiment 1 was designed to test whether planning, in the absence of execution of the plan, causes measureable changes in mood. According to the present framework, the actual planning process itself even without execution of the plan should cause an increase in arousal. Similarly, the pleasure dimension of the resulting mood should vary with how well the person expects the plan to achieve his or her goals. By allowing each subject to work until he or she has developed a satisfactory plan, pleasure should be positive in all cases.

To test the effects of planning on mood, two tasks were required that were as similar as possible in all respects, except that one should be primarily a planning task, while the other should require equivalent effort with a minimal planning component. The planning task chosen was adapted from a task developed by Hayes-Roth for studying human planning (Hayes-Roth & Hayes-Roth, 1978; Hayes-Roth, Hayes-Roth, Rosenschein, & Cammarata, 1979; Goldin & Hayes-Roth, 1980; Hayes-Roth, 1980a, 1980b, 1980c; Hayes-Roth & Thorndyke, 1980). This task involved planning a route for accomplishing a list of

errands.

Subjects in the planning condition were given a map with pictures of various types of shops on it and asked to plan the order of doing a series of everyday-type errands (such as "pick up medicine for the dog at the vets") by drawing a route on the map.

Subjects in the non-planning condition were asked to decide whether the same list of errands could be accomplished in two hours by following a route already drawn on their maps.

METHOD

Subjects

Subjects were 40 students enrolled in undergraduate psychology courses who received course credit for partipating.

Materials

Subjects were each given a map of a ficticious town with various shops marked on it, and a list of ten errands. Both the map and the errand list were taken from Hayes-Roth (1980c).

Rating Scales

Mood ratings were made on a set of 12 9-point

bipolar adjective scales, half comprising the arousal scale and half comprising the pleasure scale (Mehrabian & Russell, 1974).

Procedure

Subjects participated individually, and were told the purpose of the study was to investigate the feasibility of the plans that people make.

Planners

Twenty subjects were given a map and list of errands, and told to plan the most efficient route they could to accomplish all the errands on their list and to draw it on the map.

Raters

Twenty other subjects were given the same list of errands and a map with a route drawn on it by a planner. They were instructed to estimate how long it would take to complete the errands using their own experience as a guideline, and to judge whether or not they could accomplish all the errands on the list in two hours by following the route on the map.

Both groups were allowed to work on the task as long as they wished. Planners and raters spent approximately the same amount of time (30 minutes) completing their respective tasks. After completing the task all subjects were asked to fill out a mood scale.

RESULTS

If planning influences mood by increasing arousal, subjects in the planning group should report moods with a higher score on the arousal dimension than subjects in the non-planning group. Pleasure scores should be above the neutral point (pleasant as opposed to unpleasant) for both groups since both groups should experience success on their respective tasks. Figure 1 shows the mean pleasure and arousal scores for the two groups. Planners had a significantly higher arousal score than raters ($t=3.45$, $p<.01$), but there was no significant difference on the pleasure scale ($t=.13$, n.s.).

DISCUSSION

These results support the prediction that the activity of planning increases the arousal component of mood relative to a similar task that does not involve planning. It is possible that this increase in arousal was due to greater evaluative apprehension among the planners, but every effort was made to make the two conditions equivalent in this respect. Both groups were told that we were interested in the amount of agreement among people about the feasibility of plans.

Although the effects of planning on the pleasure dimension of mood was not specifically tested in this experiment, ratings were consistent with predictions. Since no one could fail on the task, all pleasure ratings would be expected to be positive. Such was found to be the case.

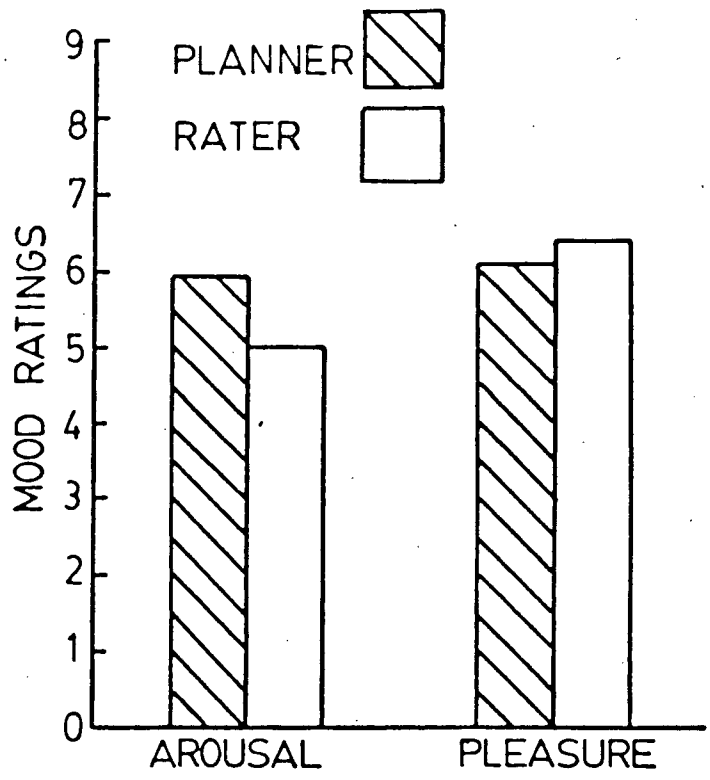


Figure 1. Mean mood ratings for Experiment 1.

EXPERIMENT 2

PLANNING WITH EXECUTION

Experiment 2 was designed to explore the effects on mood of forming and executing a plan. The task for this study involved constructing a "building" out of interlocking building blocks. Subjects in the planning group designed and constructed a building and subjects in the non-planning group constructed a building by following a diagram they were given.

METHOD

Subjects

Subjects were 40 students enrolled in undergraduate psychology courses who received course credit for participating.

Rating Scales

Mood ratings were made on the same set of 12 9-point bipolar adjective scales as used in Experiment 1.

Procedure

Subjects participated individually and were told the purpose of the study was to investigate how people

follow instructions. They were randomly assigned to either the planning or non-planning group and given the following instructions: "Some subjects will be given very loose instructions for doing this task, and some will be given very specific instructions. Then I'll ask some questions about the task after you've finished." Subjects were seated before a set of building blocks and given a demonstration of how the pieces could be fitted together.

Planners

Half the subjects were instructed to make a "building with a tower: You can make it any way you want, but once you've joined two pieces together you can't take them apart again, so you might want to plan it out before you begin."

Followers

The buildings made by the subjects in the planning group were diagramed, and given as instructions to the followers. Each follower was given a plan from his or her counterpart planner in a yoked design. They were instructed to build a building with a tower by following the diagram.

Subjects in both groups were allowed to work as long as they wished, and spent approximately the same amount of time (20 minutes) on their respective tasks. Both groups filled out mood scales after completing the task.

RESULTS

Figure 2 shows the mean pleasure and arousal scores for the two goups. Again, mean pleasure scores were above the neutral point for both groups. Planners scored higher on pleasure than followers, but this difference was only marginally significant ($t=1.79$, $p<.10$, two-tailed). There was no significant difference in arousal ratings.

DISCUSSION

The difference in pleasure ratings suggests that completing one's own plan may increase pleasure relative to completing a plan one has been given. Experiments 1 and 2, taken together, seem to indicate that planning increases arousal whereas completing one's plan increases pleasure. No differences were found in the arousal scores in experiment 2, presumably because sufficient time had elapsed after the planning for arousal levels to return to baseline. In experiment 1, mood ratings were made immediately after planning, while in experiment 2 a plan was formed and executed before any ratings were made. Therefore, it is impossible to determine whether arousal increased and declined again

for the planners, or whether pleasure increased independently of arousal.

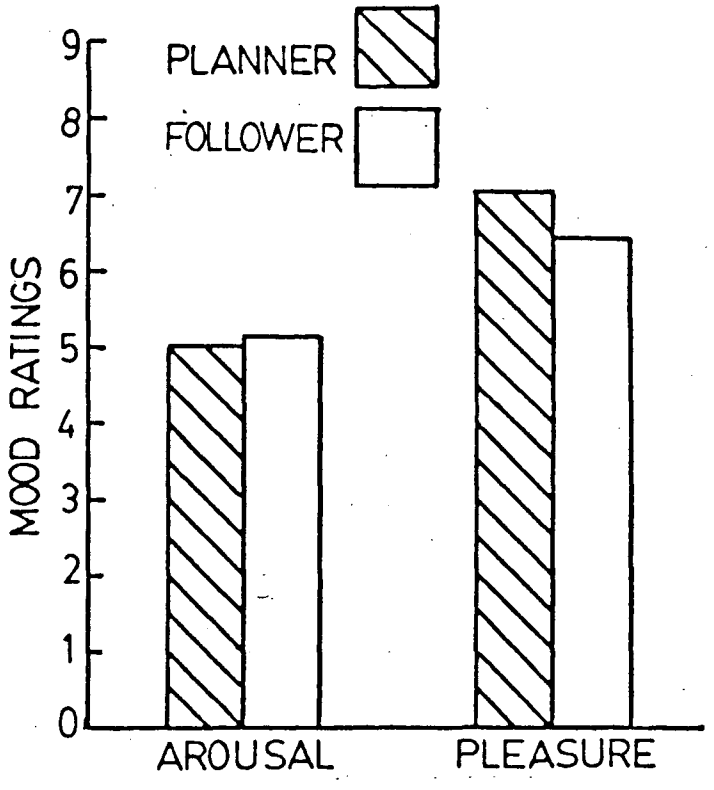


Figure 2. Mean mood ratings for Experiment 2.

EXPERIMENT 3

RE-PLANNING

Experiment 3 was designed to investigate what happens to mood when a person has to change a plan, and what effect this change has on liking of the place. In this experiment, subjects were asked to pretend to be secret agents. Their task was to hide five cassette tapes in a room as quickly as possible. All subjects were given the opportunity to plan, but some were given accurate information about the room where they would hide the tapes, and some were given inaccurate information. It was hypothesized that subjects who had to re-plan because of inaccurate expectations would experience higher arousal than subjects with accurate expectations. Since no one could fail on this task, pleasure should be above the neutral point for both groups (a pleasure score below the neutral point would indicate displeasure), but pleasure should be more intense for the group that experiences higher arousal.

METHOD

Subjects

Subjects were 40 students enrolled in introductory

psycholgy courses who recieved course credit for participating.

Rooms

Subjects hid the tapes in one of two rooms. The rooms were identical in size and shape, but one was set up as an office and the other as a store room. The contents of the two rooms were adjusted to provide approximately the same number of hiding places in each room. Pretest ratings of task difficulty showed the rooms to be approximately equal.

Rating Scales

Mood ratings were made on Russell's Affect Grid (1983), a 9 by 9 grid defined by two orthogonal dimensions--pleasure and arousal. Russell's work has shown mood ratings made on this grid to be reliably correlated with mood ratings obtained on the 12 bipolar adjective scales used in experiments 1 and 2. The grid was used for this experiment because it is faster for making multiple ratings.

Procedure

Subjects again participated individually, and were told the purpose of the study was to investigate how working under time pressure affects people's mood. On arriving for the experiment, subjects were given the

instruction booklet for the Affect Grid, and asked to rate their mood. They were then asked to imagine that they were applying for a job as a secret agent. They were given a code name (Agent 1), and told they would receive further instructions from a hidden agent. They were then left alone in the room and were read the following instructions over an intercom from the adjoining observation room:

> "All right Agent 1. To test your aptitude for this job, we're going to see how you handle a hypothetical situation. Please imagine that you've been successfully carrying out an assignment to collect certain information in a foreign country when you suddenly find out your cover's been blown. You have to get out of the country quickly, but before you go you want to pass along the information you have gathered to another agent--in case you don't make it. The information you have gathered is on the five tapes you'll find before you on the desk. It's been arranged that you'll hide these tapes in a certain room, and another agent will come later and find them. In the envelope under the tapes is some information about the room where you will hide the tapes. Please open it now."

In the envelope were two pictures of one of the two rooms used for hiding the tapes, and the following instructions:

> "Here are some pictures of the room in which you'll be hiding the tapes. It is a storeroom (office) that is not used very much, but people do come in unexpectedly, so you'll need to work as fast as you can. There are sufficient hiding places for all five tapes. Please hide them in five different places.
>
> "Take a few minutes to study the pictures and plan your strategy. When you are ready to proceed, replace the pictures in the envelope and wait for further instructions."

After the subjects had looked at the pictures, they were asked to make a rating of how well they expected to do (confidence rating), and another mood rating. They were then instructed to go to the appropriate room and hide the tapes.

Subjects were randomly assigned to one of two groups. Half the subjects (the planners) carried out their plan in the expected room. The other half of the subjects (the replanners) were told there was a change in plans, and they would have to hide the tapes in a

room they had no information about. Within each of the two groups of subjects, half hid the tapes in the "office" and half in the "storeroom." After hiding the tapes, they again rated their mood, and also rated how well they thought they had hidden the tapes and how much they liked the room in which they hid them.

In sum, the experiment was a two-factor repeated measures design with three levels of "Time" (time 1=baseline ratings, time 2=after initial planning, time 3=after task completion), and two levels of "Group" (planners and replanners). The room used for hiding the tapes was counterbalanced. Half the subjects in each group hid the tapes in the "storeroom" and half in the "office." Within the replanning group half the subjects saw pictures of the "storeroom" and actually went to the "office", and half saw pictures of the "office" and went to the "storeroom."

RESULTS

A repeated-measures analysis of variance was performed on the mood ratings at times 1 and 2 to examine the effects of initial planning on mood. There was a main effect of Time on arousal ($F=61.15$, $df=1/38$, $p<.001$), but not on pleasure. As expected, there was no significant interaction between Time and Group for

either mood dimension--the two groups were treated identically up to this point.

A second repeated-measures analysis of variance was performed on the mood ratings at times 2 and 3 to examine the effects of re-planning on mood. There was a marginal effect of Group on pleasure ($F=3.201$, $df=1/38$, $p=.08$), but no significant effect on arousal, and no significant interaction between Time and Group for either mood dimension--although a weak pattern is discernable.

Figure 3 summarizes the changes in mood. Initial ratings of pleasure and arousal were similar for the two groups (replanners mean arousal=4.8, planners mean arousal=4.95, mean pleasure=6.2 for both groups). After the initial planning, arousal increased for both groups (replicating the pattern of experiment 1), and pleasure remained approximately the same (as also happened in experiment 1). After performing the task, arousal increased again for the replanners, but decreased slightly for the planners. Pleasure increased for both groups, but more so for the replanners.

After the initial planning, confidence ratings of how well the subject expected to do were similar for the two groups (replanners mean confidence=4.33, planners mean confidence=4.37), indicating there were no differences between the groups in the expected success of plans before the treatment was applied. These

confidence ratings were correlated with pleasure at time 2 ($r=.28$, $p=.04$, one-tailed)--as expected--and with arousal at time 2 ($r=.32$, $p=.02$, one-tailed).

Success ratings taken at time 3 were significantly higher for the planners than for the replanners (replanner mean success=3.45, planner mean success=4.15, $t=2.43$, $p<.05$, two-tailed). Success ratings for the combined groups were not correlated with pleasure or arousal at time 3, or with changes in arousal and pleasure. However, tests for within group correlations between success ratings and pleasure and arousal changes showed a correlation between success rating and increase in arousal from time 1 to time 3 for the replanners ($r=.39$, $p=.04$, one-tailed), and a marginally significant correlation between success rating and increase in pleasure from time 2 to time 3 for the replanners ($r=.31$, $p=.09$, one-tailed). There were no significant correlations between success rating and changes in arousal or pleasure for the planners.

As predicted, liking of the room was significantly greater for those subjects who went to a room they were not expecting ($t=2.59$, $p=.01$).

DISCUSSION

The results from the third experiment support

several of the predictions made here. Subjects who were forced to alter their plans to accommodate the unexpected features of a place reported increased arousal, increased pleasure, and increased liking of the place over subjects who were able to carry out their plans unaltered.

The pattern of mood changes in experiment 3 was similar to the pattern found in experiments 1 and 2. Arousal increased after planning the first time--as in experiment 1--although it should be kept in mind that part of the increase in arousal in experiment may have been due to time pressure. More important, arousal sincreased again between time 2 and time 3 for the group who had to replan during execution. Pleasure increased after execution as in experiment 2, especially for the replanners.

The larger increase in arousal for the replanners is consistent with the hypothesis that changing plans increases arousal, and the corresponding increase in pleasure supports the hypothesis that this arousal intensifies pleasure. It is somewhat surprising that pleasure did not increase at time 2 with the first increase in arousal, but an increase in pleasure only after execution is consistent with the findings of experiments 1 and 2. In experiment 1--planning <u>without</u> execution--no change in pleasure was found. In experiment 2--planning <u>with</u> execution--pleasure

increased after exectution for those who executed their own plan.

Although the mean pleasure scores did not increase at time 2, pleasure was correlated with the confidence ratings made at time 2. This suggests that pleasure may have increased for those subjects who thought they had a good plan. The mean pleasure scores probably reflect the fact that many subjects were not satisfied with their plans at time 2. This is not surprising since the task was beyond the realm of most people's everyday experience, and plans would be expected to be correspondingly difficult to evaluate.

In further support of the hypothesis that plan evaluation influences pleasure, increase in pleasure was found to be correlated with success ratings only for those subjects who had to re-plan as they executed their plan. For those subjects the success ratings probably were the evaluations of their plans. It seems that when planning and execution of the plan are separated in time, the expected success of a plan influences pleasure. However, when planning occurs during execution, expected success and actual outcome may not be separable.

Most important, experiment 3 showed that violated expectations about a place do not necessarily result in decreased liking of the place. Liking of the experimental rooms actually increased for those subjects

who went to a room they weren't expecting.

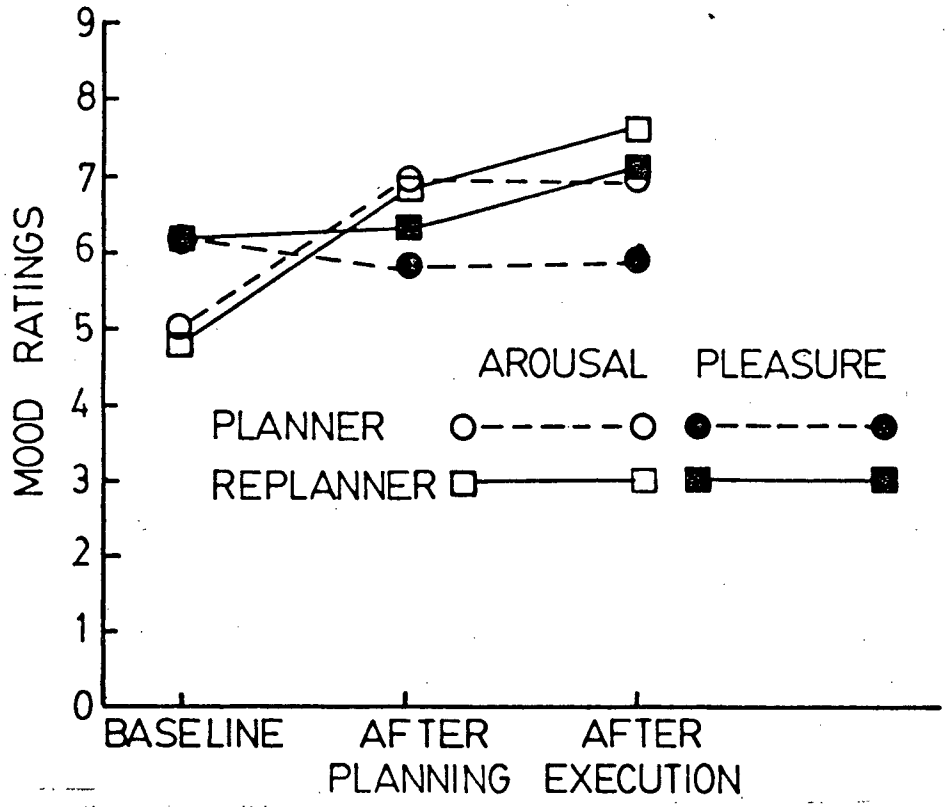


Figure 3. Mean mood ratings for Experiment 3.

GENERAL DISCUSSION

The results of these three experiments showed a consistent pattern of effects of planning on mood over a variety of tasks. These effects thus demonstrate the feasibility of pursuing the framework presented here. Three different planning tasks were all found to have measurable effects on mood and, in the case tested, on affective appraisal of a place. The planning tasks used were found to increase the arousal dimension of mood, while executing the plan showed a tendency to increase the pleasure dimension.

Table 1 summarizes the results of the three experiments. In experiments 1 and 3, mood ratings were taken immediately after planning. Both show an increase in arousal immediately after planning, with experiment 3 suggesting an additional increment in arousal as a result of re-planning. No increase in arousal was found for the planners in experiment 2, perhaps because of the duration of the task (approximately 20 minutes). No mood ratings were obtained in this experiment until after completion of the task--sufficient time for the arousal caused by planning to dissipate. Comparison of arousal ratings in experiment 2 with the baseline measures in experiment 3 shows the arousal ratings for both planners and followers are quite close to the

arousal ratings of subjects on entering the experiment. The difference in pleasure between planners and followers in experiment 2 is suggestive. Completing one's own plan seems to increase pleasure, whereas completing a plan one has been given does not. This trend is supported by a comparison with the baseline measures of pleasure obtained in experiment 3--the mean pleasure rating for planners is significantly higher than this baseline measure ($t=2.35$, $p<.05$), but the difference for followers is nonsignificant ($t=.65$), indicating that pleasure increased for the planners rather than decreased for the followers. Pleasure also increased after plan execution in experiment 3, but only for the replanners.

An intriguing explanation of the differential increase in pleasure between planners and replanners in experiment 3 is suggested by the tendency of planners in experiment 2 to plan as they built, even though they were instructed to plan their buildings before they began. Most subjects immediately started putting the pieces together, and paused occassionally as they completed a segment. The increase in pleasure under these conditions, and in experiment 3 where subjects had to re-plan as they were executing the plan, may reflect something especially pleasurable about adjusting plans during execution. For some tasks, planning while executing the plan may have the advantage that the

constraints on subplan selection are more obvious and hence it is easier to choose plan segments that are likely to be positively evaluated. Future studies should examine the differences in mood between subjects who must first plan and then execute the plan, and subjects who must plan the same task as they do it.

According to experiment 2, pleasure increases only for those subjects who execute their own plan; those subjects who completed the same plans without forming the plan themselves gave pleasure ratings similar to baseline conditions. This finding sheds some light on Miller, Galanter, and Pribram's (1960) observation regarding people's objections to motion-study engineering: "Unfortunately, workers may not acquire the strategies possessed by the engineers--they frequently object to being so tightly regimented and seem to feel that the boss is trying to exploit them unfairly." (p. 85) Giving workers explicit plans for doing their job may well remove their major source of enjoyment of the work.

The present experiments only tested a subset of the possibilities of plan-affect relationships, but the results suggest this as a fruitful line of inquiry. The planning tasks were found to have strong effects on the arousal component of mood, and somewhat more complex effects on the pleasure dimension of mood.

It is not surprising that the pleasure dimension is

more complex, since it is dependent, in the present framework, on the individual's ability to form a satisfactory plan and on how the plan fits into larger plans. Subjects do not completely give up their own ongoing plans for the duration of the psychology experiment. It is relatively easy to manipulate expectations, and thus force subjects to change their plan; but it is less easy to predict their evaluation of the resultant plan since the evaluation depends on how the revised plan fits into each person's own ongoing plans. In this set of experiments, subjects were allowed to work at each task as long as they wished (although in experiment 3 they were encouraged to work as quickly as possible). Presumably, this allowed all subjects to form a satisfactory plan, and hence to experience the planning induced arousal positively. However, a subject who comes into the experiment with the plan to get it over with as quickly as possible may evaluate his or her plan for hiding tapes differently than a subject who comes in with the plan to do whatever is asked as well as possible.

The obvious test of the effect of planning on pleasure is to present subjects with a task for which they will be unable to form a satisfactory plan. A success-failure comparison in a planning task would obviously show differences in the evaluative dimension of mood, difficult to find in the more subtle

manipulation used here where mean pleasure ratings were all positive. Asking subjects to perform a task for which they are unlikely to formulate a satisfactory plan should produce pleasure ratings below the neutral point on the scale. The present framework would predict that this unpleasant mood would result in decreased liking of the place about which the planning failure occurs.

An alternate explanation of the present results that cannot be ruled out at this point is that the mood changes in these experiments were due to the particular tasks chosen rather than to the common planning component. More work is needed with still different planning tasks before this possibility can be eliminated. However, it must be emphasized that a similar pattern of results was found with three quite different types of planning tasks. This similarity suggests that it _is_ the common planning component that is responsible for the findings. Although concern with being evaluated on task performance probably contributed to arousal increases, some such motivation is integrally related to any plan. The goal of being favorably evaluated would have been equally likely to be part of the plans of subjects in any condition of the three experiments reported here, and so should not be responsible for differential increases in arousal.

Perhaps the most interesting finding in this set of studies is that unexpectedness may increase liking of a

place--a finding inconsistent with the general implications of Klein and Harris's (1979) interpretation of violated expectations as producing uniformly negative results. The assumption that negative effects are produced by incongruity between people's plans or expectations and the situation in which they find themselves seems to be fairly widespread. Stokols and Novaco (1981) define well-being as "the degree of fit (or congruence) between human goals and activities, and the environmental context in which they are pursued." (p. 97) Although this may certainly sometimes be the case, and may always be the case at some high level of the person's plan, a certain amount of incongruity may actually enhance well-being.

Strong conclusions must await further research, but the results of the present research are promising. Increased liking of the slightly unexpected is consistent with Berlyne's two-factor theory of aesthetic judgment (1974), but that theory lacks an explanation of why only intermediate degrees of unexpectedness are valued. The present view predicts that a person will positively evaluate the unexpected place as long as he or she is able to adapt the current plan to fit the place, or adjust the place to fit the plan. Thus plans may supply the missing definition of "intermdiate" unexpectedness. Unexpectedness is beyond the intermediate range when the person can no longer adjust

his or her plans to accommodate it.

TABLE 1

MEAN PLEASURE AND AROUSAL SCORES

	AROUSAL	PLEASURE
EXPERIMENT 1		
Planner	5.9	6.1
Rater	5.0	6.4
EXPERIMENT 2		
Planner	5.0	7.0
Follower	5.1	6.4
EXPERIMENT 3		
Replanner		
Baseline	4.8	6.2
After Planning	6.8	6.3
After Execution	7.6	7.1
Planner		
Baseline	5.0	6.2
After Planning	6.9	5.8
After Execution	6.9	5.9

REFERENCES

Bartlett, F.C. Remembering. Cambridge: Cambridge University Press, 1932.

Berlyne, D.E. Studies in the New Experimental Aesthetics: Steps Toward an Objective Psychology of Aesthetic Appreciation. New York: Halsted Press, 1974.

Gifford, R. Environmental dispositions and the Evaluation of architectural interiors. Journal of Research in Personality, 1980, 14, 386-399.

Goldin, S. & Hayes-Roth, B. Individual Differences in Planning Processes, N-1488-ONR, The Rand Corporation, June, 1980.

Hayes-Roth, B. Flexibility in Executive Strategies, N-1170-ONR, The Rand Corppration, September, 1980.

Hayes-Roth, B. Estimation of Time Requirements During Planning: Interaction Between Motivation and Cognition, N-1581-ONR, The Rand Corporation, November, 1980.

Hayes-Roth, B. Human Planning Processes, R-2670-ONR, The Rand Corporation, December, 1980.

Hayes-Roth, B. & Hayes-Roth, F. Cognitive Processes in Planning, R-2366, The Rand Corporation, December, 1978.

Hayes-Roth, B. & Thorndyke, P.W. Decisionmaking During the Planning Process, N-1213-ONR, The Rand Corporation, October, 1980.

Hayes-Roth, B., Hayes-Roth, F. Rosenschein, S.J., & Cammarata, S. Modeling Planning as an Incremental, Opportunistic Process, N-1178-ONR, The Rand Corporation, June, 1979.

Klein, K. & Harris, B. Disruptive effects of disconfirmed expectancies about crowding. Journal of Personality and Social Psychology, 1979, 37, 769-777.

Mandler, G. Mind and Body: Psychology of Emotion and Stress, New York: W.W. Norton & Company, 1984.

Mehrabian, A. & Russell, J.A. An Approach to Environmental Psychology, Cambridge, Mass.: MIT Press, 1974.

Miller, G.A., Galanter, E., & Pribrim, K.H. Plans and the Structure of Behavior, Holt, Rinehart and Winston, Inc., 1960.

Minsky, M.A. A framework for representing knowledge. In P.H. Winston, The Psychology of Computer Vision, New York: McGraw Hill, 1975.

Morasch, B., Groner, N., & Keating, J.P. Type of activity and failure as mediators of perceived crowding. Personality and Social Psychology Bulletin, 1979, 5, 223-226.

Russell, J.A. A circumplex model of affect. Journal of Personality and Social Psychology, 1980, 39, 1161-1178.

Russell, J.A. The affect grid: A single item mood scale. Unpublished manuscript, 1983.

Russell, J.A. & Ridgeway, D. Dimensions underlying children's emotion concepts. Developmental Psychology, 1983, 19, 795-804.

Russell, J.A. & Ward, L.M. Environmental psychology. Annual Review of Psychology, 1982, 33, 651-688.

Stokols, D. & Novaco, R.W. Transportation and Well-being: An ecological perspective. In I. Altman, J. Wohlwill, & P. Everett (Eds.), Human Behavior and Environment: Advances in Theory and Research, Volume 5: Transportaion Environments. New York: Plenum Press, 1981.

Ward, L.M. & Russell, J.A. Frames, plans and scripts in environmental psychology. Unpublished manuscript, 1983.

APPENDIX

PLANNER'S INSTRUCTIONS

You have just finished working out at the health club. You have to pick up your car at the Maple Street garage, but first you have several errands to do. Plan the most efficient route you can for accomplishing all these errands on the way to pick up your car. Here's your errand list. Draw your route on the map.

RATER'S INSTRUCTIONS

You have just finished working out at the health club. It's 11:00 a.m., and you have several errands to do before you pick up your car at the Maple Street garage at 2:00 p.m. Assuming it takes about 15 minutes to walk across town in either direction, decide whether or not you can complete the following list of errands in the allotted time by following the route marked on the map. Here's your errand list.

ERRAND LIST

pick up medicine for dog at the veterinary office 45

buy fan belt for refrigerator at appliance store 12

buy fresh vegetables at grocery 9, 87

check out two of the three luxury apartments 73, 91, 89

stop at one of the restaurants for coffee 31, 39

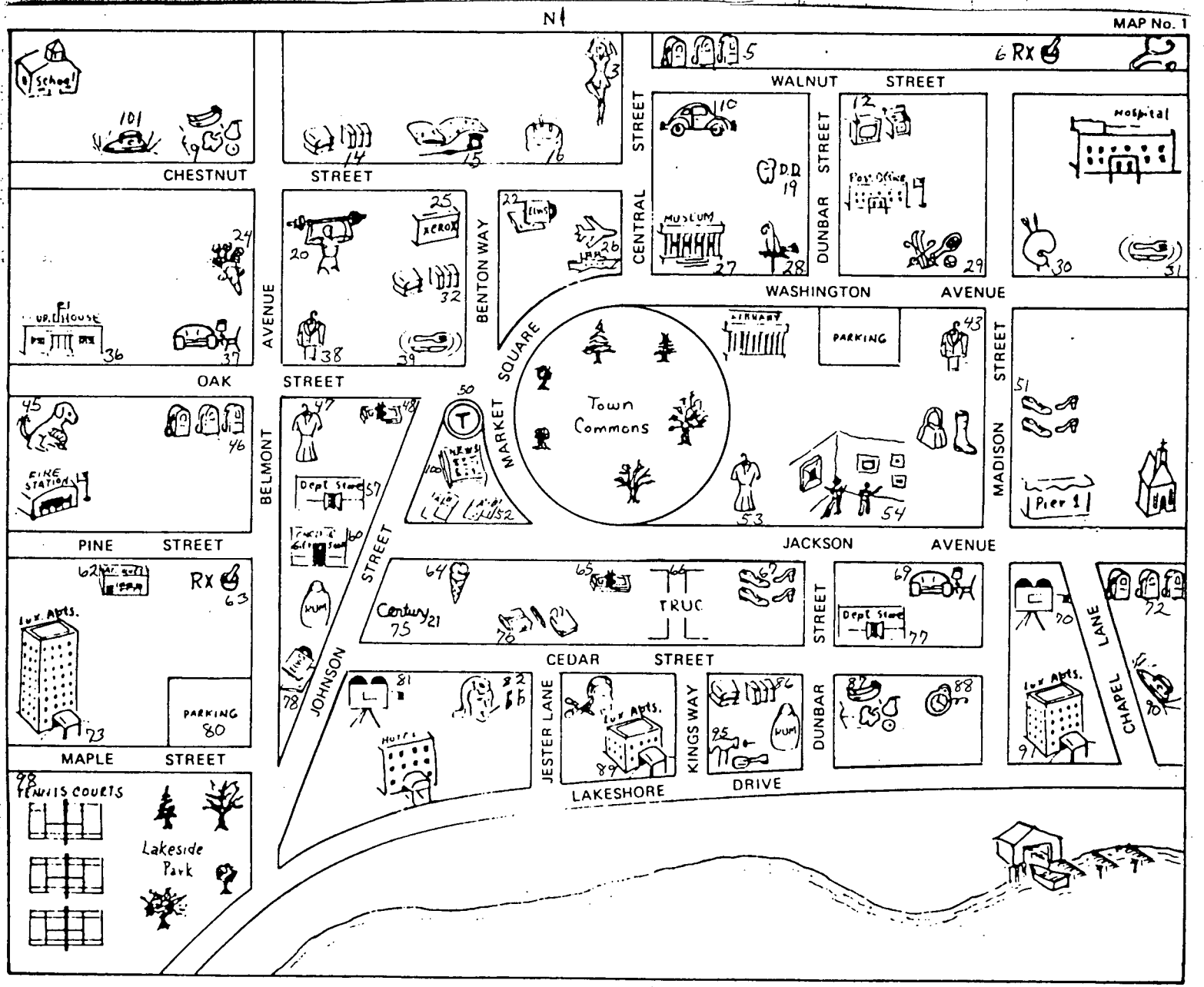
buy toy for dog at pet store 28

pick up watch at watch repair 88

special order book at bookstore 86, 32, 14

buy gardening magazine at newsstand 100

send flowers to friend in hospital at flower shop 24


N
MAP No. 1
School
CHESTNUT
STREET
WALNUT
STREET
Rx
CENTRAL
STREET
MUSEUM
D.D.
DUNBAR
STREET
Post Office
Hospital
WASHINGTON
AVENUE
AVENUE
BENTON WAY
XEROX
UP. LIGHHOUSE
OAK
STREET
SQUARE
MARKET
Town
Commons
AIRWAY
PARKING
MADISON
STREET
Pier 1
BELMONT
FIRE STATION
PINE
STREET
Dept Store
STREET
JOHNSON
JACKSON
AVENUE
Rx
Lux. Apts.
PARKING
80
MAPLE
STREET
Century 21
TRUC
CEDAR
STREET
STREET
Dept Store
HOTEL
JESTER LANE
Lux. Apts.
KINGS WAY
DRIVE
DUNBAR
Lux. Apts.
CHAPEL
LANE
TENNIS COURTS
Lakeside
Park
LAKESHORE