METHODS & DESIGNS

Normative studies of six characteristics of our knowledge of common activities

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Six dimensions that are relevant to our knowledge of common activities are introduced and quantified. Twelve component actions in each of 30 activities were chosen. Two of the dimensions examined were the familiarity and frequency of performance of the activities themselves. The other four dimensions—sequence, centrality, distinctiveness, and standardness—are characteristics of the actions within the activities. There was high agreement among subjects on the norms for each dimension. Correlational analyses demonstrate the possibility of choosing actions in such a way as to compare different levels of the dimensions as factors in controlled experiments. The importance of considering these dimensions in interpretations of script or schema experiments is stressed.

In the past few years there has been increasing interest in the memory for, and processing of, stories about common events, situations, and activities. Various theoretical constructs have been examined in research of this kind: for example, scripts (Schank & Abelson, 1977), schemata (Rumelhart & Ortony, 1977), frames (Minsky, 1975), and mental organization packets, or MOPs (Schank, 1982). These constructs provide an idealized representation of the structure and content of routine situations and activities that occur with some frequency. They are idealized because they organize aspects of a situation that either must be, or frequently are, part of that situation without necessarily making reference to specific instances of the situation. In theories of text or story comprehension, the function of these representations is to provide a model into which incoming information may be fitted, in order to provide more rapid and reliable comprehension, analysis, and integration of that information. Furthermore, this type of memory structure might be employed in making predictions and inferences concerning features of the situation that are not explicitly presented in the input of a specific instance. Finally, and more generally, this organized knowledge may be invoked when the activities in question are actually carried out.

This type of memory structure has played an important role in recent theories within artificial intelli-

gence (Schank, 1982; Schank & Abelson, 1977), text comprehension (Den Uyl & Oostendorp, 1980; Graesser, 1981; Haberlandt & Bingham, 1982; Kintsch & Van Dijk, 1978), story retention (Bower, Black, & Turner, 1979; Mandler & Johnson, 1977; Rumelhart, 1975; Thorndyke, 1977), semantic memory (Galambos, 1981; Galambos & Rips, 1982; Nottenburg & Shoben, 1980), autobiographical memory (Reiser, Black, & Abelson, 1982), developmental psychology (Nelson & Gruendel, 1979; Stein, 1979; Stein & Glenn, 1978), and social psychology (Abelson, 1981; Wyer & Carlston, 1979). Given the theoretical importance of these kinds of memory structures, it is necessary to attempt to specify some of the features of their representations.

The goal of this paper is to address this question by introducing and describing some aspects of our knowledge of common activities that may be reflected in their mental representation. The data to be reported are the results of a series of norming studies on a number of potentially important representational dimensions. It is hoped that this information can be used by researchers in the construction of stimuli for investigations of these representations. The use of these norms permits control of extraneous factors and better manipulation of experimental factors. Furthermore, it may be possible to reexamine data from earlier experiments with these dimensions in mind in the attempt to generate new hypotheses. For instance, the grocery and restaurant scripts examined in Bower et al. (1979) have a number of actions in common with those in the following norming studies. It was possible to examine the differences between the action production procedure used by Bower et al. (1979) to estimate the frequency of the actions in the script and the centrality dimension discussed below. There is a difference between the fre-

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quency with which the subjects in the Bower et al. mentioned actions in the scripts and the importance of those actions as rated by subjects in the norming studies reported here. This difference points to an empirical question concerning whether the action components of activities might be retrieved in the order of their importance to the script or the frequency with which they occur in instances of the activity.

In the following series of studies, I obtained norms for 30 common activities on six dimensions that are important to consider in investigations of this domain. Each of these dimensions has been examined in reaction time studies in a fashion similar to those involving natural categories in semantic memory. Some of these results are reported in Galambos and Black (1982), and Galambos and Rips (1982) and others are in a paper by Galambos (Note 1).

Although a number of different experimental tasks have been used in these reaction time studies, the most frequent is the membership decision task. In this paradigm, subjects are timed as they decide whether or not an action is involved in performing a given activity. Subjects are presented with two phrases—an action phrase and an activity phrase—and are instructed to press one of two buttons (“yes” or “no”) to indicate whether or not the action is a component of the activity. The stimulus actions are chosen using the norms described below. These norms allow an experimenter to design studies of common activities that either manipulate levels of these dimensions or control for their effects. For example, Galambos and Rips (1982) examined the centrality dimension (see definition of “centrality” later in this paper) in the membership decision paradigm. We selected two sets of actions. One contained actions that were highly central to their activities, and the other, actions that were not central. The stimuli were constructed from these two sets in a manipulation of the centrality factor. We then compared membership decision latencies for central actions with latencies for actions that were not central. The latencies to respond “yes” to highly central actions were significantly shorter than those to make the same response to less central actions. Thus, retrieval of the action given the activity was facilitated by the centrality of the action to the activity. In this same study, the sequence dimension was examined in an analogous fashion. Galambos and Black (1982) examined the distinctiveness and centrality dimensions, and Galambos (Note 1) studied distinctiveness, standardness, and centrality. These studies showed that the dimensions are relevant to retrieval of information about common activities.

METHOD

Activities and Their Component Actions

In this section, the activities and the actions that were used in the subsequent experiments are described. Thirty common activities and 12 component actions of each are examined. The activities covered a fairly wide range of situations varying in length, complexity, and number of participants involved. These

activities were originally chosen to be scripts according to the definition and examples given in Schank and Abelson (1977). Since then, Schank (1982) has redefined the script concept, and it appears that the activities studied here are more akin to the MOP concept than to the present script notion. Rather than engage in semantic debate, I have attempted to provide a descriptive (nontechnical) name for the type of structure studied (i.e., activities). I will specify what I mean by activities, and await further investigation to establish a better taxonomy.

A three-word name beginning with a nominalized verb was selected to refer to each activity. Examples are: “starting a car,” “going to restaurants,” and “shopping for groceries.” The complete list of activities is in Table 1. For each activity, 12 component actions were chosen in consultation among members of a research group at the University of Chicago. These components were also three-word descriptions of the action they represented. Typically, they had the linguistic form of subjectless imperatives. For example, in the “changing a flat” activity, some of the actions were “position the jack,” “take off hubcap,” and “raise the car.” The 12 actions in each activity are given in Table 2. The choice of 12 actions in each activity was not meant to be a claim that the representations of all the activities contain exactly 12 components. The attempt was to have a reasonably large sample size for the actions in each activity to allow for straightforward comparisons between activities.

The criteria for the selection of the action phrases were that they referred to actions at approximately the same level of generality and that the actions were unambiguous and non-overlapping. The resultant action sets may be thought of as composite representations of their activities and not necessarily as precise characterizations of any one individual's memory. These sets were intended to be free, to some extent, from idiosyncrasies in the way in which people perform these activities and yet to constitute a representation of the activities that would not differ markedly from person to person. In the remainder of the paper, I described each of the measures made on the 30 activities and how the norms were collected.

Subjects

There were five norming studies, and five different groups of subjects provided the data. In each of these groups, there were approximately equal numbers of males and females, since some of the activities might have been considered (from a traditional point of view) to be more closely associated with one sex or the other. Finally, all studies were performed while the author was at the University of Chicago, and all subjects were recruited there via an advertisement in the campus newspaper.

Dimensions Examined

Familiarity and Frequency. One issue that may affect the representation of common activities is commonality. Experience with activities can come from actually performing them a number of times, or subjects may experience the activities in a more vicarious fashion, such as by reading about the activities, by seeing them done by others, or by being told about them. Experience with an activity (or lack thereof) may be reflected in the representation of that activity. In order to examine this issue, two measures of experience were obtained: familiarity with the activity and frequency of performance. Eighteen subjects rated their familiarity with, and how frequently they performed, each of 28 activities (2 of the original set of 30 were inadvertently left out of this study of familiarity and frequency).

The subjects rated each activity by assigning a number from 1 to 10, with 1 indicating low familiarity and 10, high. The same subjects were asked to report how frequently they performed each activity. The subjects again assigned each activity a number from 1 to 10, with 1 indicating low frequency and 10, high. Although these two sets of ratings are highly correlated, there are some instances of familiar but infrequent activities. For instance, many people go to movies more often than they barbecue a steak, even though they might be quite familiar with

the components of the latter activity and with the relationships of these components. The mean ratings of these two dimensions for each of the activities are listed next to the activity names in Table 1.

Sequence. Familiarity and frequency are dimensions of the activities themselves. The next four studies measured attributes of the component actions within each activity. The first of these was the sequential order of the components in the performance of the activity. One of the major features of common activities is that they have a temporal structure: Certain actions occur before others. This temporal information is relevant to predictions and inferences made by a comprehension system. If one knows that John ate a meal at a restaurant, it can be inferred that at some earlier time he ordered the meal. Clearly, causal and plan relationships may be involved in this inference. Thus, one may rely on the knowledge that ordering a meal is causally related to getting and eating it. This causal relationship may be more relevant to the inference than mere temporal precedence. To make this distinction, it is necessary to have a metric for sequential order in order to contrast with a causal interpretation.

Sixteen subjects ranked the actions of each activity in the order in which these actions would normally be performed. Each subject was given a computer-printed packet of 30 pages. Each page had one of the activity names at the top of the page, and the 12 actions in that activity followed below. To the right of each of the actions were the numbers 1 through 12. The stimuli were randomized twice for each subject; each subject saw the 30 activities in a different order and also saw the 12 actions for any one activity in a different order. The subjects were told to rank the action within the activity by circling the number 1

next to the action they felt would be the first performed, and so forth, finally circling the number 12 next to the action they felt would be the last of the 12 items to be performed when doing the activity named at the top of the page. The mean sequential position ranks and the standard deviations of those means are given in the first two columns of Table 2.

Centrality. The next dimension considered is the importance of an action to the performance of an activity. Some actions are relatively unimportant to the performance of an activity, whereas others are crucial to it. For instance, when one cashes a check, it is more important to endorse the check than to record the amount of the check in the checkbook. I call this difference between the importance of the actions in the performance of the activity a difference in their centrality. The centrality of an action may influence its retrievability when the activity context is present. It may be that central actions are more readily available to serve as expectations to guide a top-down comprehension process.

This centrality dimension was operationalized by having subjects rank the actions in terms of their relative importance to the activity. The stimuli were presented in the same way as in the previous study. Fifteen subjects were told to circle the number 1 next to the item that was least central to the performance of the activity, and so forth, finally circling the number 12 next to the item that they felt was most central. The means and standard deviations of the centrality rankings are in the third and fourth columns of Table 2.

Distinctiveness. The distinctiveness of an action is a measure of the extent to which knowing the action allows one to distinguish the activity (or activities) in which it occurs. Some actions occur in one, and only one, particular activity. Such actions are "high in distinctiveness." For example, the action "see head waiter" is very distinctive to the activity of eating at restaurants. If one is presented with a distinctive action, it is easy to infer the activity in which it is likely to have occurred.

On the other hand, some actions may occur in a number of different activities. This sort of action is low in distinctiveness and does not distinguish among various activities. For instance, "stand in line" is not distinctive to any of the large number of activities of which it is a component ("shopping for groceries," "cashing a check," "going to movies," etc.). The distinctiveness of an action reflects the probability of accessing the activity when presented with the action. This characteristic is important in studies of reading, since it measures the a priori association of the action with the activity that contextualizes it.

The norms in this and the next study were obtained by having the subjects rate action-activity pairs. Note that in the studies of sequence and centrality, the subjects ranked the actions in each activity. This change may affect the interpretation of the norms and will be discussed in the Results section.

The stimuli were presented on a 20-page computer-printed packet. On each page there were 18 pairs of three-word phrases; one member of the pair was an activity name, and the other member was one of its component actions. The 18 subjects who made the distinctiveness ratings saw the actions at the left of the activities (e.g., POSITION THE JACK-CHANGING A FLAT), and at the top of every page was the question frame: "When you _____, how frequently are you in the process of _____?" To the right of a pair was a line with 10 marks at equal intervals. Only 2 of these marks were labeled; the leftmost end point was labeled "never" and the rightmost end point "always." Each subject circled 1 of the 10 marks to record a rating. Each subject saw a different random permutation of the 360 pairs. Table 2 contains the mean distinctiveness ratings and their standard deviations in columns 5 and 6.

Standardness. The final dimension concerned the frequency of performing a given action during an activity. Some of the component actions in an activity are almost always performed when the activity is performed (e.g., "get a towel" in the "washing your hair" activity). Others (such as "get a tripod" in the

Table 1
Frequency and Familiarity of the Thirty Activities

Activity	Frequency		Familiarity	
	Mean	SD	Mean	SD
Cashing a Check	8.28	1.96	9.11	1.49
Making New Clothes	2.83	3.29	4.50	3.42
Going on Vacation	4.28	2.54	6.22	2.32
Serving Good Wine				
Sending a Gift	3.73	2.05	6.33	1.88
Changing the Linens	6.28	2.95	7.83	2.50
Taking a Photograph	5.44	2.41	6.50	2.55
Checking out Books	7.61	2.28	8.72	2.02
Playing Some Tennis	2.61	2.03	4.72	3.46
Making a Campfire	2.61	1.88	5.83	2.12
Throwing a Party	4.00	2.35	6.50	2.36
Xeroxing a Page	7.00	2.72	8.72	1.93
Cleaning Your Clothes	8.17	2.28	8.61	1.85
Starting a Car	7.67	2.72	9.00	1.19
Getting a Suntan	4.83	2.53	7.67	2.14
Going to Movies	6.67	2.00	9.06	1.43
Changing a Flat	2.72	2.49	5.17	2.71
Writing a Letter	7.17	3.13	9.06	1.21
Pitching a Tent	2.39	1.69	4.67	2.06
Catching a Plane	4.28	2.49	6.89	2.22
Buying a Car	1.56	.78	4.56	2.48
Doing the Dishes	8.11	2.45	9.00	1.68
Going to Restaurants	6.11	2.14	8.39	1.65
Smoking a Pipe	2.50	3.19	5.39	3.11
Taking the Subway	5.22	2.76	6.67	2.61
Painting a Room	2.83	1.47	6.83	2.15
Brewing Some Tea	6.22	3.37	8.28	2.02
Shopping for Groceries	7.89	2.19	8.94	1.92
Washing Your Hair				
Barbecuing a Steak	2.83	2.09	7.22	1.99

Note— $n = 18$ for each mean.

Table 2
The Thirty Activities and the Norms

	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Cashing a Check								
Go to Bank	1.38	1.09	7.53	3.91	5.63	2.22	5.44	2.48
Write Down Date	3.31	2.50	4.53	3.02	3.44	2.22	7.94	2.27
Write Down Amount	3.56	2.31	7.20	3.05	3.75	1.84	7.63	2.45
Write Your Signature	4.62	1.15	7.47	2.59	3.69	2.30	9.00	0.00
Record the Amount	5.75	2.62	4.80	3.51	4.13	2.19	6.88	2.66
Stand in Line	5.88	2.13	4.53	3.48	2.56	1.26	6.75	2.46
Go to Window	6.25	1.65	6.07	3.58	2.50	1.93	7.31	2.75
Endorse the Back	6.88	1.26	8.00	1.77	8.00	1.37	7.69	2.55
Give to Teller	8.94	.57	8.00	3.05	5.50	1.97	7.50	1.97
Show Your Identification	9.31	1.58	6.07	2.52	4.38	2.73	6.88	2.55
Receive the Money	10.31	2.50	9.00	3.93	5.00	2.10	8.63	.81
Count the Money	11.81	.54	4.80	3.51	3.38	2.13	8.13	1.15
Making New Clothes								
Select a Pattern	1.19	.75	8.13	3.85	4.75	3.02	8.25	1.34
Buy the Material	1.94	.25	8.20	3.51	4.38	2.83	8.00	.97
Buy the Thread	2.94	.25	4.13	3.44	2.56	2.10	7.06	1.61
Lay out Fabric	4.00	.37	7.93	2.31	4.62	2.96	8.56	.89
Pin on Fabric	5.50	.63	7.47	2.72	4.38	2.96	7.75	1.84
Cut the Material	5.50	.63	9.47	1.51	3.81	2.83	8.69	.70
Thread the Needle	7.06	.57	5.13	2.26	2.56	2.16	8.38	1.41
Sew Pieces Together	8.13	.50	9.73	2.71	4.06	2.65	7.94	2.49
Try on Garment	9.69	1.08	5.40	2.69	1.88	1.71	8.69	.79
Put Buttons on	9.88	1.03	4.13	2.70	2.38	1.78	5.94	1.73
Adjust the Hems	10.37	.96	5.47	2.20	3.81	2.43	6.31	2.52
Iron the Garment	11.81	.54	2.80	2.54	1.44	1.37	7.25	2.44
Going on Vacation								
See Travel Agent	1.81	.54	4.40	3.60	6.44	2.42	4.31	3.40
Decide on Place	1.50	.89	11.00	1.41	3.06	2.02	8.31	1.30
Check the Availability	3.19	.54	6.93	3.33	3.81	2.51	6.38	2.92
Note the Dates	4.31	1.58	8.80	2.40	2.44	1.55	8.00	1.90
Make the Reservations	4.50	.73	8.07	2.79	3.88	2.45	6.44	2.31
Pay for Tickets	6.62	1.41	8.53	2.23	3.00	2.25	5.50	3.54
Shop for Clothes	8.19	1.83	3.87	2.53	2.38	2.28	3.69	2.75
Pick up Tickets	8.38	2.42	7.20	2.31	3.31	2.33	6.62	2.36
Arrange for Pets	8.50	1.03	4.47	2.20	5.81	2.40	6.56	3.71
Stop the Newspaper	9.31	1.62	2.73	1.53	4.94	3.17	3.19	3.17
Get the Suitcases	10.31	1.08	4.60	1.88	4.87	2.45	8.25	1.34
Pack Your Bags	11.37	.72	7.40	3.81	5.06	2.49	8.00	2.31
Serving Good Wine								
Select a Bottle	1.19	.40	10.97	1.41	3.38	1.93	7.31	2.30
Take off Foil	3.81	.98	4.00	2.80	2.56	2.37	6.44	2.90
Find a Corkscrew	3.44	.81	5.27	3.10	5.44	3.05	7.50	2.85
Select the Glasses	3.94	3.25	3.93	3.65	3.06	2.46	6.88	2.13
Insert the Corkscrew	5.37	.72	5.73	2.31	5.44	2.58	7.31	2.65
Remove the Cork	6.38	.72	8.07	2.58	5.88	2.42	8.13	1.86
Look for Sediment	6.50	3.56	7.33	2.22	4.25	2.54	3.88	3.30
Examine the Cork	6.75	1.44	5.80	2.78	5.88	2.53	4.62	2.83
Wipe the Rim	9.31	2.12	4.60	2.97	2.63	2.06	3.88	2.87
Pour a Sample	9.63	1.03	8.33	3.18	4.69	2.50	5.75	3.19
Decant the Contents	10.06	1.34	5.40	3.13	4.50	2.90	5.06	3.44
Fill the Glasses	11.62	.62	8.67	3.58	2.31	2.33	7.25	2.38
Sending a Gift								
Get a Box	1.00	0.00	7.93	3.63	2.69	1.54	7.00	2.28
Fill the Box	2.38	.50	9.47	2.77	2.81	1.52	7.13	2.36
Put in Filler	2.63	.50	5.93	3.49	4.31	2.68	5.31	2.58
Close the Top	4.00	0.00	5.40	3.00	1.88	1.20	8.44	1.03
Tape the Sides	5.06	.25	4.87	2.72	3.81	2.26	7.94	1.61
Tie With String	6.25	.58	5.07	2.05	3.19	2.43	5.13	2.50
Put on Address	6.69	.48	9.40	1.68	2.75	2.02	8.44	1.09
Weigh the Package	8.06	.25	3.80	2.76	4.62	3.30	5.37	3.40
Pay for Postage	9.56	.63	6.73	3.28	3.75	2.11	8.44	1.31
Get it Insured	10.00	1.09	3.73	2.15	3.69	2.50	2.19	2.64

Table 2 (Continued)

	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Put on Stamps	10.37	.62	6.07	3.03	2.63	2.00	7.63	1.54
Mail the Box	12.00	0.00	9.60	3.25	4.44	2.68	7.75	1.48
Changing the Linens								
Take off Blankets	1.69	2.75	6.86	3.63	5.06	1.84	7.94	1.57
Strip the Bed	1.94	.25	10.50	2.31	8.56	.51	8.50	.89
Spread Bottom Sheet	2.94	.25	10.07	2.65	6.81	2.01	6.69	3.59
Spread Top Sheet	4.87	.89	8.71	2.09	5.88	2.25	7.63	2.28
Tuck in Corners	5.69	1.49	4.93	3.17	5.25	1.84	7.56	2.22
Tuck in Sides	5.63	1.31	5.57	3.13	4.87	2.36	7.06	2.89
Straighten Top Sheet	6.06	.93	5.57	2.77	4.00	1.79	8.25	1.29
Put on Blankets	7.63	1.45	6.93	2.97	4.31	2.15	7.63	1.15
Put Pillowcases on	9.94	.68	4.71	2.64	7.56	2.03	8.69	.79
Tuck in Blankets	9.19	.75	4.07	2.24	4.56	1.71	5.44	3.65
Put Pillows on	10.94	.68	4.71	2.40	5.63	1.96	7.69	2.58
Put Bedspread on	11.50	1.16	5.36	3.78	4.50	2.66	6.00	3.22
Taking a Photograph								
Get the Camera	1.56	.51	6.20	4.14	6.94	2.21	8.75	.78
Decide on Subject	2.88	2.36	9.47	3.27	3.19	2.64	7.69	2.09
Get a Tripod	3.06	1.18	2.13	2.67	7.37	2.22	2.00	2.19
Take off Case	4.13	1.36	3.67	1.95	3.88	1.93	6.06	3.71
Check the Film	4.94	1.91	5.33	2.16	6.62	1.54	4.75	2.65
Take off Lens Cap	6.19	1.80	5.93	2.58	7.31	1.54	6.56	3.60
Look Through Viewfinder	7.25	1.77	9.07	2.09	7.06	2.38	8.75	.58
Compose the Picture	8.38	1.67	8.07	3.58	4.87	2.53	6.62	2.39
Focus the Image	9.25	1.13	8.00	2.48	6.62	1.82	5.50	3.78
Set the Exposure	9.31	1.25	7.27	1.94	8.19	.75	4.44	3.69
Advance the Film	9.50	2.90	4.93	2.46	7.87	1.45	7.06	3.00
Press the Button	11.56	.51	7.93	3.52	2.56	1.67	9.00	0.00
Checking out Books								
			(n = 13)					
Enter the Library	1.13	.34	5.54	4.41	4.19	1.97	8.81	.75
Find the Catalog	2.25	.58	6.38	4.25	3.88	1.59	5.25	1.81
Find the Card	3.75	1.81	5.00	2.55	3.75	2.21	7.94	2.05
Get Call Numbers	4.13	.62	8.31	2.10	5.25	1.65	6.44	1.93
Check Shelf Locations	5.56	.96	8.23	1.59	5.50	2.03	7.63	2.39
Go to Stacks	5.69	.60	7.85	1.77	4.94	1.57	8.25	.78
Get the Volumes	7.13	.62	10.23	2.35	4.13	1.93	8.25	2.32
Show Library Card	7.37	3.22	6.00	2.74	6.50	2.25	8.88	.34
Go to Circulation	8.13	.62	6.85	2.34	6.12	2.06	8.31	1.58
Get Volumes Stamped	10.00	.37	8.31	3.45	7.06	2.72	7.81	2.43
Show to Inspector	10.94	.57	3.15	1.82	4.44	2.22	7.56	2.48
Leave the Library	11.94	.25	2.15	1.82	4.69	1.82	7.81	1.83
Playing Some Tennis								
Reserve a Court	1.38	.62	5.67	4.42	6.19	2.51	3.44	2.61
Get the Equipment	1.69	.48	7.53	3.94	1.88	1.41	8.44	.96
Go to Courts	2.94	.25	6.60	3.33	5.81	2.69	8.25	.93
Choose a Side	4.06	.25	4.87	2.33	2.56	2.03	6.94	2.38
Warm up Volley	5.19	1.05	6.40	2.90	5.69	2.06	7.44	2.50
Start a Game	6.00	.37	8.13	2.97	2.38	1.67	5.63	2.53
Serve the Ball	7.13	.34	9.47	2.13	4.87	2.96	7.56	1.79
Run for Shot	8.56	.89	7.40	2.69	5.25	2.08	7.37	1.45
Make the Return	8.81	.54	9.00	2.59	4.94	2.67	6.25	2.11
Keep the Score	9.94	1.44	6.07	2.60	2.94	2.35	5.50	2.63
Retrieve the Balls	10.50	1.41	5.40	2.20	3.88	2.13	6.62	2.73
Shake Opponent's Hand	11.81	.40	1.47	.99	3.00	2.16	3.94	3.21
Making a Campfire								
Find a Location	1.00	0.00	7.13	3.70	2.19	2.01	8.50	.97
Clear the Surroundings	2.31	.87	7.53	3.74	3.25	2.75	7.06	2.08
Get the Tinder	3.69	.87	6.33	2.29	5.25	2.49	7.25	2.46
Get Some Logs	4.00	2.10	7.73	2.28	4.94	2.46	7.56	2.16
Get the Matches	5.69	1.35	5.33	3.22	1.94	1.84	8.31	1.40
Lay Down Tinder	5.75	.78	8.07	1.44	5.50	2.37	7.75	1.95
Pile the Logs	6.75	2.57	8.87	2.23	4.81	3.04	7.19	1.76

Table 2 (Continued)

	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Light the Tinder	7.69	.60	9.00	3.21	6.31	2.50	7.75	2.41
Blow on Flame	8.88	.89	5.60	3.50	3.19	2.32	6.69	2.27
Feed More Wood	10.31	1.01	6.80	3.53	4.75	2.35	6.75	2.30
Avoid the Smoke	10.75	1.13	1.93	1.53	2.06	1.39	7.00	1.55
Poke the Coals	11.19	.98	3.67	2.90	2.94	1.69	7.37	2.28
Throwing a Party								
Pick a Theme	2.38	2.45	3.53	4.12	2.19	2.07	2.75	2.32
Select a Day	2.44	2.90	8.47	2.85	2.56	2.10	8.81	.54
Invite Some People	2.81	.83	11.60	.74	5.19	2.40	8.13	1.96
Notify the Neighbors	3.56	.89	2.80	2.18	3.13	2.31	4.19	2.86
Buy the Food	5.81	.83	7.47	2.42	2.13	2.00	7.31	1.14
Buy Some Drinks	6.50	1.16	8.73	1.79	3.25	2.18	7.44	1.71
Rearrange the Furniture	7.13	1.82	3.33	1.88	2.56	2.28	4.06	2.82
Clean up Apartment	7.56	3.05	5.73	3.26	3.06	2.72	7.44	1.90
Get Some Ice	8.56	1.15	5.00	1.56	3.13	2.03	6.38	3.16
Prepare the Food	9.06	1.00	7.47	2.00	2.13	1.36	6.88	1.96
Set out Food	10.50	.73	6.53	2.50	2.63	2.16	8.00	.97
Greet the Guests	11.69	.48	7.33	2.99	6.00	2.37	8.31	1.78
Xeroxing a Page								
(n = 15)								
Find the Article	1.40	1.30	8.53	4.12	2.94	1.65	7.56	2.13
Get Some Change	2.60	1.88	5.33	3.75	2.31	1.70	5.06	2.62
Find a Machine	2.67	.62	8.27	3.15	3.38	2.00	8.88	.34
Read the Instructions	4.00	.93	5.33	3.46	1.25	1.24	3.13	2.47
Pick up Flap	6.40	2.47	4.13	2.80	4.50	2.56	7.87	1.75
Align the Original	6.13	.83	8.67	1.88	6.88	2.25	8.75	.45
Select the Size	6.13	1.36	5.87	2.17	2.56	2.39	7.44	1.93
Put Flap Down	7.40	.83	4.87	2.53	4.94	2.84	7.56	1.79
Put in Coin	8.73	.59	7.53	2.97	2.75	1.53	7.19	2.71
Push the Button	9.73	.59	8.47	3.80	2.38	1.54	8.94	.25
Wait for Copy	10.93	.59	6.73	2.79	6.81	2.34	8.81	.54
Retrieve the Original	11.87	.35	4.27	3.33	5.63	2.83	8.63	.50
Cleaning Your Clothes								
Go to Hamper	1.75	2.75	4.87	4.12	4.69	2.41	5.88	3.18
Separate the Whites	2.38	.62	7.60	2.75	7.13	2.99	4.94	3.44
Get the Soap	3.19	1.17	6.00	2.73	3.75	1.81	7.69	2.41
Go to Washer	3.38	.89	7.07	2.69	7.56	1.50	7.87	1.36
Load the Washer	5.31	1.08	10.80	1.61	8.13	1.20	7.63	1.93
Select Water Temperature	6.50	1.09	6.80	2.68	5.19	2.51	8.25	1.24
Put in Soap	6.56	.73	8.60	2.50	5.94	1.57	8.50	.89
Turn Washer on	7.81	1.05	8.67	2.53	7.81	1.38	8.19	1.05
Clean Out Filter	8.63	1.63	3.40	2.47	4.44	2.87	5.19	2.69
Load the Dryer	9.69	.48	6.53	3.60	7.81	2.40	7.25	2.30
Turn Dryer on	10.88	.50	4.93	2.22	5.81	2.86	7.00	2.48
Iron the Garments	11.94	.25	2.73	2.25	5.69	2.12	3.00	3.03
Starting a Car								
Unlock the Door	1.06	.25	4.33	3.75	3.00	2.37	7.13	3.03
Open the Door	1.94	.25	5.27	3.63	2.00	1.16	6.75	3.89
Get Into Auto	3.00	0.00	7.40	2.61	5.19	2.54	8.25	1.65
Adjust the Seat	4.13	.50	5.00	2.48	4.56	2.85	4.38	2.80
Lock Seat Belts	5.37	.62	4.13	2.10	4.62	3.14	4.25	2.67
Key in Ignition	6.44	1.03	9.53	2.53	7.94	1.12	8.75	.78
Check the Mirrors	7.19	1.97	5.07	1.98	5.13	1.67	6.38	2.50
Shift Into Neutral	8.06	1.61	7.27	3.19	4.75	3.34	4.69	3.74
Turn the Key	8.63	.81	10.93	1.75	3.44	2.16	8.75	.78
Check the Traffic	10.81	.75	4.80	2.78	3.31	2.47	6.62	2.85
Depress the Accelerator	10.37	1.63	8.93	2.09	5.63	2.78	7.69	2.58
Shift Into Drive	11.00	.89	5.33	3.50	5.88	2.96	6.00	3.98
Getting a Suntan								
Check the Weather	1.13	.50	8.73	3.69	2.38	2.22	7.13	2.58
Get Bathing Suit	2.19	.54	6.80	2.78	4.81	2.14	5.25	2.05
Get the Lotion	3.50	1.32	4.60	2.32	3.69	2.30	5.00	2.71
Change Your Clothes	4.38	1.63	6.73	3.59	1.56	1.15	5.50	1.83

Table 2 (Continued)

	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Find a Place	4.38	1.15	9.00	2.51	2.00	1.37	7.19	2.04
Spread Out Towel	6.00	.73	5.67	2.44	4.94	2.41	5.37	2.09
Rub Lotion on	7.19	.66	7.13	2.17	3.94	2.18	5.44	2.66
Lie on Towel	7.81	.75	7.80	3.82	6.81	1.76	6.06	1.88
Watch the Time	9.25	.58	8.00	2.20	1.50	1.27	6.38	2.19
Turn Yourself Over	9.88	.62	8.13	3.02	2.13	1.50	6.38	2.13
Pick up Towel	10.88	2.16	2.27	2.37	2.00	.89	6.56	1.71
Cover Yourself Up	11.44	.51	3.13	2.59	1.75	1.61	3.31	2.36
Going to Movies								
Check the Newspaper	1.31	.70	7.53	3.62	3.13	2.06	6.69	1.62
Pick a Show	2.13	.34	10.00	1.85	6.56	1.31	8.31	1.35
Find Out Time	3.25	.45	7.40	2.95	2.69	2.18	8.44	.81
Go to Theater	4.38	.62	7.47	2.45	5.75	2.15	8.13	2.31
Stand in Line	5.37	.72	4.53	2.50	3.13	1.50	5.37	2.39
Buy the Tickets	6.38	.72	8.27	2.60	4.19	2.01	8.06	1.34
Enter the Theater	7.31	1.25	7.07	2.46	5.88	1.54	8.44	1.21
Give Usher Tickets	8.00	.73	5.87	2.62	5.19	2.74	8.00	2.25
Watch the Previews	8.50	4.34	5.87	4.31	5.37	2.09	6.56	2.39
Buy Some Popcorn	9.38	.96	3.07	3.03	4.81	2.26	4.38	2.83
Find a Seat	10.00	.63	7.60	3.60	3.38	1.89	8.94	.25
Leave the Theater	12.00	0.00	3.33	2.41	3.63	2.47	8.19	1.94
Changing a Flat								
Set the Brake	1.50	1.16	6.53	4.31	2.69	2.12	7.75	2.46
Take Out Jack	2.19	.75	4.60	3.18	6.75	2.02	8.44	1.21
Take Out Spare	2.56	.63	5.93	2.37	6.88	1.93	8.63	1.03
Position the Jack	4.50	.82	7.33	3.42	7.44	1.67	8.25	1.84
Take Off Hubcap	5.44	1.21	4.93	1.87	7.00	1.71	8.19	2.26
Raise the Car	5.63	.96	8.87	1.51	6.19	2.01	8.44	1.75
Unscrew the Lugs	6.19	1.33	7.07	1.91	6.81	1.33	8.31	2.27
Remove Bad Tire	8.00	0.00	9.60	2.50	8.19	.66	8.56	1.21
Put on Spare	9.00	0.00	9.93	3.08	7.19	2.40	8.50	1.21
Screw on Lugs	10.06	.25	6.53	2.95	7.00	1.55	8.50	1.51
Let Car Down	10.94	.25	4.80	2.83	6.62	2.09	8.06	2.29
Put Away Jack	12.00	0.00	1.87	1.55	7.25	1.39	7.87	2.36
Writing a Letter								
Get Some Paper	1.13	.34	6.33	3.98	2.75	1.29	8.56	1.31
Put on Date	2.63	1.09	6.33	3.02	4.38	1.75	7.31	1.92
Put on Salutation	3.31	.70	8.33	2.77	7.63	1.86	8.56	.63
Compose the Message	3.69	1.01	11.53	1.06	5.37	2.55	7.50	2.28
Sign Your Name	5.31	.60	9.13	1.55	3.94	1.81	8.31	1.62
Put on Postscript	6.25	1.65	7.07	3.17	7.06	2.32	4.69	2.39
Get an Envelope	6.25	2.32	3.67	2.74	6.31	1.35	7.44	2.76
Fold the Paper	8.13	.89	4.20	2.37	2.88	1.41	8.50	.82
Address the Envelope	9.31	1.40	7.67	3.31	6.31	2.15	8.38	.96
Put Into Envelope	9.63	.72	4.40	1.77	5.44	1.93	8.50	1.09
Seal the Envelope	10.81	.75	4.53	1.89	6.38	1.59	8.31	1.08
Put on Stamp	11.56	.89	4.80	3.17	6.50	2.03	8.19	1.38
Pitching a Tent								
	(n = 15)							
Find Good Location	1.00	0.00	8.53	4.45	2.00	1.71	7.75	2.08
Prepare the Site	2.00	0.00	7.80	3.38	4.13	2.71	7.06	2.08
Unpack the Canvas	3.33	.72	5.80	2.93	5.63	2.75	8.31	1.08
Get the Stakes	4.93	1.16	5.13	2.88	5.81	2.88	7.75	2.30
Unfold the Canvas	5.67	1.54	6.93	2.99	6.12	2.00	8.38	1.26
Get Out Ropes	5.67	1.59	4.07	2.37	3.13	2.06	7.19	2.74
Pound Stakes in	7.07	1.83	8.33	2.55	6.75	1.34	7.75	2.46
Put up Poles	7.07	1.71	8.73	1.87	4.69	3.00	8.25	1.24
Raise the Top	8.93	1.03	8.07	3.17	3.81	3.02	7.31	2.36
Tighten the Ropes	9.67	.98	7.20	3.07	3.44	2.42	8.50	.82
Check for Stability	11.07	.70	5.33	2.90	2.56	2.50	7.87	1.15
Tie Back Flap	11.60	.83	2.07	1.62	4.94	2.62	6.38	2.03
Catching a Plane								
Pack Your Bags	1.56	.81	4.67	4.01	5.94	1.98	7.69	2.24
Go to Airport	2.63	.81	8.27	3.35	6.44	1.37	8.94	.25

Table 2 (Continued)

	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buy a Ticket	3.19	1.47	9.07	2.76	2.44	2.03	7.81	2.29
Find the Airline	3.69	1.35	8.20	1.57	6.56	1.79	8.69	1.01
Get Boarding Time	4.87	2.03	7.80	2.86	6.38	1.93	8.81	.54
Weigh the Bags	6.06	1.65	3.53	2.00	6.31	2.44	4.19	3.31
Get Gate Number	6.44	.73	7.40	2.82	5.56	2.13	8.88	.34
Go to Gate	8.31	.79	8.67	2.16	5.00	2.42	8.69	.87
Get Boarding Call	8.31	.70	6.27	2.84	6.12	2.22	7.56	1.86
Show Your Pass	9.94	.25	5.60	3.68	3.19	1.97	8.31	2.02
Find Your Seat	11.00	0.00	5.73	3.43	3.06	1.95	8.38	1.54
Fasten Seat Belt	12.00	0.00	2.80	2.68	4.19	2.48	8.13	1.75
Buying a Car								
Look at Advertisements	1.06	.25	4.20	3.78	1.94	2.41	7.56	1.26
Select the Model	2.44	1.03	8.07	3.22	3.94	3.13	8.88	.34
Look at Engine	3.25	.45	6.33	3.18	3.13	2.68	6.88	2.96
Take Test Drive	4.13	.72	8.20	3.30	6.56	2.66	8.13	1.78
Bargain About Price	5.31	.60	8.80	2.04	3.25	2.70	5.31	3.28
Arrange the Financing	6.56	1.67	6.60	3.02	3.94	2.65	6.31	3.52
Sign Sales Contract	7.75	1.48	7.00	3.25	3.56	1.75	8.69	.70
Get Temporary License	8.63	3.12	3.93	1.94	3.56	3.31	4.62	3.42
Pay the Money	9.06	1.39	9.60	2.82	1.56	1.67	7.00	2.85
Get Title Transferred	9.13	1.45	6.73	2.58	5.06	3.19	7.56	2.94
Get the Keys	9.13	2.71	4.67	2.92	1.31	1.25	8.44	2.25
Drive it Home	11.56	.89	3.87	3.31	1.69	1.49	7.19	1.60
Doing the Dishes								
Put on Apron	1.19	.75	2.67	3.56	3.56	2.50	1.19	2.23
Clean off Scraps	3.38	1.75	7.87	2.17	6.25	1.57	8.50	.73
Get the Detergent	3.38	1.31	6.00	2.88	5.13	2.09	8.50	.89
Run Hot Water	4.25	1.13	7.47	2.90	4.31	1.99	8.50	.73
Get a Sponge	4.31	1.70	4.80	2.62	4.87	2.03	4.94	2.74
Get Drying Rack	5.75	2.46	3.40	1.92	6.56	1.75	2.75	2.91
Let Them Soak	7.69	2.47	7.13	3.04	4.81	2.29	3.75	2.35
Wash the Glasses	7.69	.95	9.40	2.50	7.31	2.02	8.00	1.09
Wash the Plates	8.19	.75	10.13	2.56	7.87	1.67	8.50	.89
Wash the Pans	9.81	.75	8.20	3.26	7.37	1.50	7.50	1.67
Rinse off Soap	10.50	.97	7.13	2.26	4.19	1.72	8.56	1.03
Let Them Dry	11.88	.50	3.80	1.86	3.88	1.86	6.38	2.45
Going to Restaurants								
Make the Reservations	1.00	0.00	5.73	4.30	4.87	2.00	3.31	2.15
See Head Waiter	2.80	1.94	2.87	3.40	7.75	1.48	3.31	2.65
Ask for Table	2.80	.41	5.73	2.92	6.88	1.86	5.75	2.67
Ask for Menu	5.20	.68	7.20	2.18	7.94	1.00	5.81	2.64
Sit at Table	5.67	.62	7.20	2.98	2.19	1.42	8.56	.63
Order Some Drinks	5.67	.62	6.07	3.17	5.37	2.45	3.75	2.79
Order a Meal	6.87	.35	9.87	1.64	7.25	1.98	7.56	1.31
Eat the Meal	7.93	.26	10.60	2.50	2.06	1.24	8.19	.83
Order the Dessert	8.93	.26	5.27	2.96	7.50	1.79	5.63	2.16
Ask for Check	10.07	.26	5.40	1.72	6.44	1.90	6.31	2.09
Pay the Bill	11.27	.46	6.80	3.51	4.25	2.44	6.88	2.09
Tip the Waiter	11.67	.62	5.27	2.55	7.69	1.74	8.44	.63
Smoking a Pipe								
Pick One Out	1.44	.81	5.07	4.33	1.19	1.76	6.75	2.44
Get the Tobacco	2.25	1.29	6.47	3.74	4.00	2.73	7.81	2.37
Fill the Bowl	4.13	1.26	8.20	1.74	3.44	3.25	8.19	1.42
Pack Tobacco Down	5.13	1.26	7.47	2.23	6.94	2.54	7.44	2.10
Clean the Bowl	6.56	4.19	5.07	3.47	3.31	2.96	6.19	2.61
Stem Into Mouth	6.81	1.17	8.07	2.55	5.63	3.10	8.44	2.25
Light a Match	6.81	1.42	6.33	1.50	2.31	2.39	7.87	1.36
Clean the Stem	7.56	4.50	4.13	2.83	4.56	3.31	6.06	2.44
Light the Tobacco	7.94	1.39	8.87	2.64	3.75	2.98	8.75	.78
Draw in Smoke	9.19	1.17	8.07	4.08	3.75	3.34	7.00	2.76
Dispose of Ashes	10.00	2.76	2.80	1.57	3.00	2.50	8.06	1.29
Puff Out Smoke	10.19	1.17	7.47	4.01	3.44	2.80	7.87	2.45

Table 2 (Continued)

	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Taking the Subway								
Go Down Stairs	2.13	.62	5.47	2.70	2.06	1.34	7.94	1.53
Find Street Entrance	2.38	3.76	6.67	3.31	4.75	2.98	8.31	1.58
Buy a Ticket	2.81	.66	9.33	2.66	1.63	1.54	7.31	2.55
Go Through Turnstile	4.31	1.66	6.20	3.41	4.19	2.29	8.50	1.21
Wait on Platform	5.19	.83	7.93	2.81	4.94	2.82	7.81	1.42
Check the Number	5.88	1.36	8.00	3.70	2.94	2.44	6.88	2.55
Find a Seat	7.63	1.20	6.27	3.15	2.88	1.75	7.56	1.55
Watch for Stop	8.00	1.37	8.67	3.37	3.63	2.36	8.69	.87
Signal the Driver	8.25	1.65	4.00	3.00	1.69	1.66	1.56	2.19
Get to Door	9.13	1.26	6.87	3.64	1.94	2.08	8.50	1.21
Exit Onto Platform	10.44	1.55	5.13	2.95	4.75	2.91	8.50	1.21
Climb Exit Stairs	11.88	.34	3.47	2.03	3.38	2.42	7.63	1.82
Painting a Room								
Decide on Color	1.00	0.00	8.93	3.92	3.06	2.59	8.06	2.02
Move Out Furniture	2.44	.73	7.80	2.04	4.06	2.59	6.38	2.39
Cover the Floor	3.94	1.06	7.07	1.62	6.06	2.72	7.00	1.79
Mask the Woodwork	4.00	.73	7.67	2.47	7.31	2.33	5.81	2.88
Get Some Brushes	4.19	1.68	7.40	3.27	3.13	2.03	8.06	1.61
Get a Ladder	5.44	.89	5.07	3.17	3.19	2.54	6.62	2.03
Open the Bucket	7.13	.34	6.07	2.31	3.38	2.63	7.81	1.97
Dip the Brush	8.13	.34	8.47	3.42	3.56	2.42	8.13	1.93
Brush the Wall	8.94	.57	9.47	3.27	5.81	2.66	7.63	2.28
Close the Bucket	10.31	.48	2.60	1.64	4.13	2.78	6.56	3.31
Clean the Brush	10.75	1.13	3.47	1.60	3.25	2.59	6.62	3.05
Let it Dry	11.75	.68	4.00	3.40	2.00	1.90	8.88	.50
Brewing Some Tea								
Select a Pot	2.06	.85	4.40	2.64	3.38	1.96	5.63	3.72
Determine How Much	3.31	2.65	6.73	3.62	2.31	1.78	7.25	2.44
Boil Some Water	3.31	1.70	10.47	1.51	4.62	2.78	8.44	1.15
Get Some Bags	3.31	1.45	6.27	3.17	4.19	2.74	7.56	1.79
Warm the Pot	4.80	2.66	3.00	2.53	4.56	2.99	5.44	2.97
Bags Into Pot	6.38	1.69	8.53	2.70	7.44	2.03	5.44	2.73
Add Boiling Water	7.19	.66	8.87	1.64	4.44	2.53	6.50	3.08
Cover the Pot	8.25	1.06	4.13	2.64	3.63	2.09	6.62	2.50
Get the Cups	8.81	2.83	4.20	2.46	3.50	2.22	8.13	2.06
Let it Steep	9.13	.81	9.27	3.24	7.00	2.34	8.00	1.46
Take Out Bags	9.94	2.49	5.80	2.48	4.44	2.00	7.50	2.28
Pour Into Cups	11.50	.89	6.33	3.02	2.50	1.67	7.94	1.98
Shopping for Groceries								
Make a List	1.00	0.00	8.40	4.12	3.63	2.39	5.00	2.90
Enter the Store	2.00	0.00	6.07	3.63	4.62	1.86	8.56	1.21
Get a Cart	3.00	0.00	5.53	2.50	6.38	2.13	6.12	2.09
Go to Shelves	4.00	0.00	8.20	2.15	4.19	1.52	8.00	2.39
Reach for Items	5.31	.48	7.60	3.83	4.50	1.75	8.63	.89
Check the Price	5.94	1.18	8.60	2.75	5.75	2.24	7.13	2.28
Load the Cart	6.94	.25	8.33	3.13	6.12	2.22	6.38	2.80
Go to Checkout	8.06	.44	5.20	2.01	5.81	1.64	8.63	.89
Pick Shortest Line	8.81	.40	4.87	2.80	5.25	2.02	7.69	1.99
Unload the Cart	9.94	.25	3.80	2.68	6.25	2.21	7.25	3.04
Pay for Items	11.06	.25	8.13	3.64	4.75	1.98	8.38	1.15
Pick up Bag	11.94	.25	3.27	1.87	4.06	1.39	8.00	2.16
Washing Your Hair								
Get the Shampoo	1.19	.54	6.20	3.32	7.63	1.54	8.69	.79
Turn on Water	2.94	.77	8.00	1.93	2.13	1.15	8.31	2.02
Wet Your Head	3.94	.77	9.93	1.03	6.44	1.59	9.00	0.00
Get a Towel	4.06	3.47	5.87	3.14	4.81	2.20	8.25	1.34
Apply the Shampoo	5.00	.89	10.47	1.60	8.38	.62	8.94	.25
Work up Lather	6.00	.89	9.87	2.36	6.00	2.03	8.38	1.78
Rinse With Water	7.19	.83	8.40	1.96	4.00	2.13	9.00	0.00
Apply Creme Rinse	8.06	.93	5.20	2.73	8.06	1.44	4.50	3.50

Table 2 (Continued)

	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Get a Dryer	8.88	3.67	2.40	.99	5.06	2.74	3.44	3.08
Turn off Water	9.19	1.42	3.40	1.96	2.38	.96	7.94	2.41
Blot up Water	9.63	1.36	4.47	2.75	3.38	1.54	7.13	2.73
Turn on Dryer	11.94	.25	3.80	2.24	4.31	2.96	3.50	3.16
Barbecuing a Steak								
Get A Grill	1.69	1.20	6.73	3.31	4.31	2.12	6.31	2.87
Get the Charcoal	2.56	.63	5.80	2.91	4.19	2.17	7.13	2.53
Get the Meat	3.69	2.68	7.80	3.76	2.38	1.50	7.81	2.17
Get the Starting Fluid	3.94	1.34	3.47	2.45	3.25	2.27	6.31	2.92
Get the Matches	4.62	.72	4.73	2.12	2.00	1.46	6.88	2.55
Put in Charcoal	5.19	1.38	6.53	2.26	3.75	2.30	8.00	1.71
Light the Charcoal	6.75	.68	8.33	2.26	3.88	2.13	7.44	2.34
Grill the Meat	8.63	.50	10.40	2.72	4.19	2.51	8.44	1.26
Cut the Meat	8.75	2.32	5.53	3.81	2.00	1.37	5.37	2.96
Turn Meat Over	9.63	.50	8.20	2.43	3.19	1.97	8.50	1.03
Check if Done	10.63	.50	6.73	3.39	1.94	1.24	8.50	1.03
Serve the Meat	11.94	.25	3.73	3.43	2.44	1.50	7.94	1.95

Note—Unless otherwise indicated, $n = 16$ for all sequence rankings, $n = 15$ for all centrality rankings, and $n = 18$ for all distinctiveness and standardness rankings.

"taking a photograph" activity) may be less standardly included in the activity. The difference between these two kinds of actions is measured by the standardness dimension. In Galambos and Rips (1982), this dimension was mentioned briefly under the name "indispensability." However, the term "indispensability" carries theoretical implications that are unwarranted and confusing. The term "standardness" was selected because it captured the notion of frequency of performance of the actions during performance of the activity but did not imply the necessity of their being performed. Thus, an action may be standardly done in some activity but not be necessary to the successful performance of that activity.

As will be discussed in the Results section, this measure differs somewhat from the centrality dimension, although there is some overlap. Standardness is also similar to the notion of typicality developed by Graesser, Woll, Kowalski, and Smith (1980), although their subjects made ratings of script actions on a scale labeled with varying degrees of typicality rather than of frequency. The standardness norms make it possible to distinguish between two models of the retrievability of action concepts from the representations of activities. The first of these models maintains that action concepts are retrievable according to their frequency of occurrence in the activity. The second specifies that retrievability is a function of the role the action plays in accomplishing the main goals of the activity. Thus, an action that is crucial to the accomplishment of the main goals of the activity might be more readily accessible than would an action that is not as relevant to the main goals but that occurs with equal frequency. Although clearly there will be a certain degree of overlap (since goal-related actions will occur with high frequency), the standardness dimension provides information that makes it possible to disconfound these two models.

The stimulus packets were constructed in the same fashion as in the study of distinctiveness. However, for the subjects who were to make standardness ratings, the pairs were arranged so that the activity was to the left of the action (e.g., CHANGING A FLAT-POSITION THE JACK). At the top of each page was the following question frame: "When you are in the process of _____, how frequently do you _____?"

The 18 subjects rated how frequently they did a particular action when engaged in the activity. As in the preceding study, the subjects made their ratings by circling a number next to the activity-action pair on a 10-point scale marked "never" on one

end and "always" on the other. The mean standardness ratings and their standard deviations are shown in Table 2 in the last two columns.

RESULTS

The main results of these studies are the norms and their standard deviations, listed in Tables 1 and 2. Whereas the sequence and centrality norms can vary between 1 and 12, the distinctiveness and standardness norms vary only between 0 and 9. Thus, for example, a mean of 7 on either of the first two dimensions is at the middle level of those dimensions, whereas a 7 is a fairly high value on the distinctiveness and standardness dimensions. Recall that the numbers for the sequence dimension order the actions in temporal sequence and that low numbers are for actions early in the activity and high numbers indicate actions occurring later in the activity. The centrality dimension is ordered from low centrality (small numbers) to high centrality (large numbers). For the distinctiveness and standardness dimensions, the higher the mean rating, the higher is the value of the action on that dimension. For example, the action "endorse the back" when "cashing a check" has a mean distinctiveness rating of 8, which indicates that the action is very distinctive to that activity, and the action "count the money" has a mean standardness rating of 8.125, which indicates that that action is done very often in the "cashing a check" activity.

There was a high degree of intersubject agreement on the norms of the actions. Galambos and Rips (1982) reported the statistics for agreement for the centrality and sequence norms. Galambos (Note 1) reported high agreement for the distinctiveness and standardness measures. These statistics were computed by rank ordering the actions on each dimension according to the mean

for that action on that dimension. Agreement among subjects as to this ordering was computed using Kendall's coefficient of concordance (W) statistic for each activity for each dimension. These results are given in Table 3. These Ws can be tested by a chi-square (with 11 degrees of freedom), where the critical W value for $p < .05$ is .101. To summarize, the intersubject agreement on the 120 activity x norm conditions (30 activities, four dimensions each) was (in all but two cases) highly significant ($p < .001$). Thus, for instance, the subjects agreed that the actions in the restaurant activity occurred in a certain order; they agreed as to which actions were central and which were not; and they agreed on their ratings of the distinctiveness and standardness of the actions to that activity. Such agreement was clearly present for each of the activities on each dimension. These findings replicate and expand the norming studies of Bower et al. (1979) on frequency of mention and sequential order of actions in scripts and of Graesser et al. (1980) on typicality. All of these results indicate that subjects have the information available to make the various norming decisions. Furthermore, the agreement indicates a regularity across subjects in their knowledge about these activities.

The standard deviations in Table 2 provide more specific information about the agreement among subjects on a given action. For instance, some of the sequence norms have very low variability, whereas others seem less stable. In the latter case, the action may not be well ordered with respect to the others in the temporal sequence of the activity. The standard deviations for the actions on the centrality dimension are somewhat higher overall than those for the sequence norms. This indicates that, when designing stimulus materials, it is prudent to sample fewer levels of the centrality dimension than of the sequence dimension.

The ranks of centrality and sequence may not be as comparable across activities as are the ratings of distinctiveness and standardness. The selection of the 12 actions in an activity has a greater influence on the former two norms, since the actions in an activity are ranked with respect to one another. Particularly, a difference of, say, four sequence units between two actions in the "going on vacation" activity may not be equal (in amount of elapsed real time) to the same difference in number of sequence units in the "brewing some tea" activity. Although the order between the two actions is preserved, their distance in real time units is not. Thus,

Table 3
Intersubject Agreement on the Norms of the Four Dimensions for Each Activity

Activity	Kendall's Coefficients of Concordance (W)*			
	Sequence	Centrality	Distinctiveness	Standardness
Cashing a Check	.74	.19	.45	.26
Making New Clothes	.96	.40	.32	.34
Going on Vacation	.86	.47	.36	.47
Serving Good Wine	.77	.35	.33	.32
Sending a Gift	.98	.35	.21	.33
Changing the Linens	.88	.35	.39	.21
Taking a Photograph	.78	.38	.46	.46
Checking Out Books	.89	.41	.25	.33
Playing Some Tennis	.95	.35	.53	.37
Making a Campfire	.87	.34	.47	.18
Throwing a Party	.78	.51	.22	.52
Xeroxing a Page	.89	.23	.52	.52
Cleaning Your Clothes	.89	.41	.43	.34
Starting a Car	.92	.40	.31	.39
Getting a Suntan	.91	.36	.49	.25
Going to Movies	.84	.32	.31	.47
Changing a Flat	.95	.41	.29	.06**
Writing a Letter	.90	.43	.61	.33
Pitching a Tent	.89	.33	.39	.21
Catching a Plane	.91	.33	.38	.31
Buying a Car	.81	.30	.32	.30
Doing the Dishes	.84	.44	.48	.65
Going to Restaurants	.96	.34	.60	.57
Smoking a Pipe	.61	.27	.28	.23
Taking the Subway	.80	.25	.36	.43
Painting a Room	.95	.39	.37	.25
Brewing Some Tea	.74	.43	.37	.17***
Shopping for Groceries	.99	.29	.36	.27
Washing Your Hair	.78	.59	.64	.60
Barbecuing a Steak	.87	.31	.21	.26

*Unless otherwise specified, all Ws were significant at beyond the $p < .001$ level when tested by the chi-square statistic ($df = 11$).

** n.s. Computing W involves a correction for ties and since almost all subjects rated almost all actions in this activity as "always," the variance estimate in the numerator was very low. *** $p < .0025$.

order information, even though it may be activity-specific, is an appropriate measure of the temporal structure of the actions and is normalized to the different lengths of the activities. A similar argument can be made with respect to centrality, for which some overall measure of importance may be somewhat irrelevant compared with a measure of the importance of an action vis-à-vis other actions in the same activity. For example, the actions in the "cashing a check" activity may be more important (in some sense) than those involved in "smoking a pipe," but this is irrelevant to the centrality ranks of the actions.

The ratings of the last two dimensions, distinctiveness and standardness, are less activity-specific. Thus, actions from two different activities having the same mean distinctiveness rating are roughly comparable in distinctiveness. The same is true of standardness. Furthermore, since both of these norms involved an estimation of frequency of performance, it makes sense to compare the norms of the two scales with each other. The two dimensions show somewhat different patterns. The standardness ratings tended to cluster at the upper end of the ratings scale (towards the "always" end). The median of the 360 standardness mean ratings was 7.563 (the scale was scored from 0 to 9, where 9 equaled "always"). The range of these ratings was 1.188 to 9. The median of the distinctiveness ratings was 4.438, with a range of 1.188 to 8.375. This difference in the distributions may have been due to a bias (in the original selection of the actions for the activities) towards choosing more standard actions. Such a bias may not have operated for the distinctiveness dimension, which would explain why the ratings of this dimension were spread out more evenly across the scale. Nevertheless, in both groups there was sufficient variation around the medians (as evidenced by the ranges) to permit the selection of stimuli to orthogonalize the two dimensions in experiments.

Correlations Among the Dimensions

Finally, it is interesting to examine correlations among the four dimensions to see if some of them may be providing different measures of the same underlying dimension or set of dimensions. There are six pairs of the four dimensions to discuss. In order to examine these correlations, I used the means for the actions to rank the actions on each dimension. Spearman rank correlation coefficients (r_s) were computed for each activity for each pair of dimensions, using the ranks of the actions on the dimensions. This provided a rough indication of the degree of association between any pair of norms for any activity. The interpretation of so many correlations has its problems, and, of course, the actions cannot be presumed to be independent and randomly sampled, so some correlation between any two orderings might be expected. However, these correlation coefficients can at least indicate where there might be overlap between these dimensions.

The range of the thirty r_s values for the sequence and centrality norms was between .315 and -.739, with a median of -.244. These r_s values for the activities are given in Table 4. As a guide, the .05 significance level for a correlation of 12 items is .506. On the whole, the conclusion to be made from this analysis is that the centrality and sequence dimensions are reasonably independent. However, some of the activities (e.g., "changing the linens" or "washing your hair") seem to have their more important actions occurring early in the sequence and their less important ones happening later. This pattern would be expected of activities in which the later actions are highly contingent on the successful completion of earlier actions. Thus, getting the earlier actions done correctly would be important to getting the activity as a whole accomplished.

Next, let us look at the correlations of standardness and distinctiveness ratings with the centrality ranks. The distinctiveness and standardness mean ratings of the actions in each activity were rank ordered such that 1 was lowest in both distinctiveness and standardness. The correlations between centrality and standardness ranged from -.326 to .883, with a median correlation of .482. This is the highest median correlation for any pair of dimensions. It indicates that, for at least some of the activities, the standardness judgments seem to approximate the centrality ranks. Highly central actions tend to be standard or frequent in their activities. There are some low centrality actions that are also standard (e.g., "counting the money" when "cashing a check," or "disposing of ashes" when "smoking a pipe"). The existence of this sort of action lowers the correlation and opens the possibility of experimentally confounding centrality and standardness effects.

The correlations between centrality and distinctiveness range from -.506 to .769, with a median of .179. The median correlation here is not high, and the range of the 30 correlations is the widest of the six comparisons. For some of the activities (e.g., "making a campfire" and "making new clothes"), the central actions are very distinctive to the activity and the noncentral actions are low in distinctiveness. For others (e.g., "going on vacation" and "going to restaurants"), this pattern is reversed. These dimensions seem to be fairly independent in that an action that is distinctive to an activity can be either central to it (e.g., "applying the shampoo" when "washing your hair") or not (e.g., "putting away jack" when "changing a flat"). Similarly, central actions vary in distinctiveness. This pattern of correlations bodes well for selection of stimuli that covary these dimensions (e.g., Galambos & Black, 1982).

The other three sets of correlations indicate a reasonable degree of independence between the dimensions compared. The correlations between distinctiveness and standardness ranged from -.639 to .550, with the median being .090. There seems to be little consistent overlap between these two dimensions. It is interesting that an action that is very diagnostic of a particular

Table 4
Rank Order Correlations Among Pairs of the Four Dimensions Measured on Actions

Activity	Centrality/ Standardness	Centrality/ Distinctiveness	Distinctiveness/ Standardness	Sequence/ Centrality	Sequence/ Standardness	Sequence/ Distinctiveness
Cashing a Check	.26	.75	-.08	.22	.30	.04
Making New Clothes	.48	.74	.23	-.47	-.36	-.73
Going on Vacation	.66	-.43	-.06	-.39	.03	.31
Serving Good Wine	.21	.16	.26	.23	-.51	-.10
Sending a Gift	.45	-.20	-.28	-.07	.08	.29
Changing the Linens	.20	.24	.36	-.74	-.20	-.36
Taking a Photograph	.51	-.39	-.44	.15	.09	.13
Checking Out Books	-.07	.34	.20	-.15	.04	.48
Playing Some Tennis	.45	.00	-.02	-.17	-.37	-.19
Making a Campfire	.29	.77	.05	-.38	-.48	-.13
Throwing a Party	.73	.15	.41	-.07	.18	.20
Xeroxing a Page	.36	.04	.55	-.27	.40	.42
Cleaning Your Clothes	.62	.73	.22	-.32	-.14	.12
Starting a Car	.70	.50	.13	.32	-.05	.41
Getting a Suntan	.65	.00	-.26	-.32	-.03	-.33
Going to Movies	.52	.14	.07	-.54	-.01	.05
Changing a Flat	.47	.24	.31	-.03	-.02	.38
Writing a Letter	-.02	.07	-.23	-.46	-.06	.39
Pitching a Tent	.25	-.06	.13	-.26	.02	-.03
Catching a Plane	.52	.09	.26	-.42	-.10	-.49
Buying a Car	.15	.29	.11	-.23	-.10	-.29
Doing the Dishes	.62	.68	.20	.28	.17	.13
Going to Restaurants	.50	-.51	-.31	-.03	.61	-.10
Smoking a Pipe	.60	.39	.05	.02	.23	.02
Taking the Subway	.07	-.06	.49	-.39	.07	.00
Painting a Room	.18	.20	-.64	-.55	.24	-.17
Brewing Some Tea	.36	.39	-.09	-.03	.30	.06
Shopping for Groceries	-.33	-.18	.49	-.54	.26	.18
Washing Your Hair	.88	.41	.22	-.66	-.67	-.31
Barbecuing a Steak	.53	.33	-.11	.06	.55	-.51

activity (i.e., one that is highly distinctive) need not be a highly standard action. Thus, a distinctive action in the restaurant activity is "see head waiter," but that action is not high in standardness. Likewise, a standard action like "eat the meal" is not very distinctive to the restaurant activity, since that action occurs in other contexts.

Finally, the sequence dimension does not seem particularly correlated with either distinctiveness or standardness. The correlations between sequence and standardness ranged from $-.673$ to $.606$, and the median was $.023$. The correlations between sequence and distinctiveness ranged between $-.729$ and $.483$, with a median of $.026$. These results indicate that distinctive and standard actions can occur at any point in the temporal order of the performance of the activity.

The upshot of the correlational analyses is that centrality and standardness may be different measures of the same underlying dimension, but that all the other dimensions seem to be reasonably independent of each other.

CONCLUSIONS

We have begun to provide evidence that the dimensions examined in this paper reflect structural characteristics of the mental representation of the activities.

Some of this evidence was obtained in the membership decision studies reported in Galambos and Rips (1982) and Galambos (Note 1). In another type of study, Reiser, Galambos, and Black (Note 2) employed these norms in the investigation of retrieval of memories of personal experiences. The main finding was that the same dimensions that organize our general knowledge of these activities also affect the retrieval of memories of personal experiences.

Other researchers have been exploring this area with the norms presented here. Haberlandt and Bingham (Note 3) examined the manner in which knowledge structures are used in comprehension. In one experiment, subjects were asked to name the activities in which a presented action could be performed. (A subset of the activities and actions in Table 2 was used.) Haberlandt and Bingham examined the number of different activities and the frequency with which a particular activity was mentioned for an action. Good agreement between these measures and the distinctiveness rating of the action in Table 2 was reported. Distinctive actions received a smaller number of different activities than less distinctive actions. Furthermore, the more distinctive the action, the more likely the subjects were to mention the "correct" activity. That is, they mentioned the activity from which the action was drawn in Table 2. These results indicate the robustness of the

distinctiveness dimension across different methods of measurement. Furthermore, these results underscore our interpretation of that factor as relevant to the retrieval of the activity concept when searching from the action. Galambos (Note 1) and Haberlandt and Bingham, in another experiment in the same paper (Note 3), provide further support for this interpretation.

The study of knowledge structures like scripts, schemata, MOPs, and activities is an important and interesting recent development. However, it is an area of study that can benefit from considerably more methodological rigor. Selecting stimuli to provide controlled tests of hypotheses concerning knowledge structures requires a good deal of care to avoid confounding factors. Designing experiments in this domain is further hampered by the lack of knowledge about what factors may be important to control. This paper represents an initial attempt to quantify a fairly diverse set of common activities on a number of potentially important dimensions. In a number of memory retrieval experiments, some of these dimensions have been shown to influence reaction time. It is thus important that researchers be aware of these dimensions in order that their effects can be either examined by direct manipulation or controlled in tests of other effects.

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