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AN INQUIRY INTO THE PROCESS OF TEMPORAL ORIENTATION*

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A recent study (Koriat and Fischhoff 1974) in which subjects were asked to respond to the question 'What day is today?' revealed ease of day retrieval to be a curvilinear function of the day of the week, with greatest difficulty being encountered in midweek. Data suggested a twostage model for the day retrieval process, with the weekend serving as a facilitating 'landmark.' It was unclear whether these results were due to the day on which the subject was questioned or to the day label which he was requested to produce, the two being completely confounded. In the present experiment, subjects at each of the six working days of two weeks were presented with questions of the form 'Is today . . .?' until 12 correct RT's were obtained for each Actual Day–Proposed Day combination. Major results include significant quadratic effects for Actual Day, Proposed Day and Actual Day–Proposed Day temporal distance; greater latencies for acceptance ('yes, today is . . .') than rejection responses; and details of the weekend effect. The nature of temporal orientation and the role of landmarks are discussed as well as the specifics of the day label retrieval and day label evaluation processes.

In a study of the process of temporal orientation, Koriat and Fischhoff (1974) presented subjects with the question 'What day is today?'. Two indices of day label retrieval difficulty were obtained: proportion of incorrect responses and mean latency for the production of a correct response. The test question was presented to Israeli students on each of the six work days (Sunday to Friday) of two consecutive weeks. A clear quadratic relationship emerged between retrieval difficulty and ordinal position of the day in the week, with longest RT's and most frequent errors occurring in the middle of the week. These results were taken to

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support the hypothesis that temporal orientation utilizes temporal 'landmarks,' such as the weekends, with ease of orientation increasing as a function of landmark proximity.

It was further hypothesized that the search for the appropriate day label proceeds in two stages. In the first stage, the preliminary orientation stage, the general location of the target day in the week is assessed through an intuitive, 'preattentive' judgment (Neisser 1967). In the second stage, the analytic stage, relatively articulate information is utilized to select the appropriate day label from among the restricted set delimited by the preliminary evaluation. The two stages can be conceptualized as involving hypothesis-generation – asking 'what day could today be?' – and hypothesis-testing – determining which of the possible labels does, in fact, refer to today.

Two additional observations consistent with the two-stage hypothesis were that: (a) the majority of incorrect responses were labels of days contiguous to the target day, and (b) when asked how they had arrived at their day labels, subjects increasingly reported using information regarding the following day as the week progressed, and decreasingly reported using information regarding the previous day.

However intuitively reasonable they may seem, both the landmark and two-stage hypotheses need additional testing and elucidation. Neither the effect of landmark proximity, the workings of the two stages, nor the interaction between them has been worked out in any detail. Thus, proximity of a landmark may aid temporal orientation by facilitating determination of the approximate location of the target day in the week (Stage 1), or by reducing the size of the set of potential day labels processed in the second stage, or by producing a set of potential day labels which are more readily processed.

With the 'what day is today?' procedure, there is no way of determining whether the curvilinear effects are due to the stimulus situation (subjects' location in the week), the response label solicited, or both, the two being completely confounded. Nor is it possible to determine whether the effects are due to differential difficulty in knowing what day today is or in knowing what day today is not, as only the former response is ever elicited.

The purpose of the present study is to gather further information regarding temporal orientation which might elucidate the underlying processes. On each of the six work days of two weeks (the Actual Days), subjects were presented with a statement of the form 'Today is

X,' where X (the Proposed Day) was one of the seven possible day labels. True–false reaction time was measured. This design makes it possible (a) to distinguish between effects attributable to the subjects' location in the week (Actual Day), those due to the day labels which they must consider (Proposed Day), and those due to the distance between them; and (b) to separately assess the manner in which acceptance ('yes, today is . . .') and rejection ('no, today is not . . .') responses vary as a function of the Actual Day, the Proposed Day, and the relationship between them. As presently formulated, the two-stage model incorporates three types of responses: rapid (first stage) rejection of highly inappropriate day labels and slow (second stage) acceptance and rejection of possible day labels. A rough operationalization of the model would be that the second stage involves responses to yesterday's, today's, and tomorrow's day labels; the first stage involves responses to the week's remaining day labels. If this definition is accepted, the present data permit separate evaluation of the effect of the landmark on each stage of the process.

Method

Design and subjects

Five hundred and sixty-two passers-by at the Hebrew University of Jerusalem, primarily students, participated in the experiment. The critical task was providing a 'yes' or 'no' response to one statement of the type 'today is X' where X was the name of one of the seven days of the week. Each S's response and reaction time (RT Day) were recorded. The experiment was run between 10 a.m. and noon during the work days of two weeks. As the work week in Israel runs from Sunday to Friday, there were twelve experimental days. The initial 42 Ss run on each day were divided into seven groups of six. The members of each group received a different day as the Proposed Day in the critical statement. Ss indicated their response by pressing one of two buttons with the index finger of the appropriate hand. The righthand button was labelled 'yes' for half of each group and 'no' for the remainder. For each week, the design was 6 × 7 × 2 for Actual Day × Proposed Day × Hand, with three Ss in each cell.

Proposed Days were varied systematically over consecutive Ss, with the first, eighth, fifteenth, etc. Ss receiving Sunday as the Proposed Day; the second, ninth, sixteenth, etc., receiving Monday, and so on. The button labels were switched after every three Ss.

Following the first 42 Ss, additional Ss were run to replace those who had responded incorrectly to the critical task. In this fashion, it was possible to fill the 7 × 2 cells of each experimental day with either the first 42 Ss, or with 42 correctly-responding Ss. Over the two weeks, fifty of the original Ss erred. Eight of their replacements erred as well and were in turn replaced. Ss were not paid for their efforts. All were Hebrew-speaking volunteers, evidently attracted by the presence of the experimental apparatus in a public place and the crowd around it.

The critical statement was the last in a series of six statements to which the *S* was required to provide a 'yes' or 'no' response. The first five statements were identical in order and content for all *S*s. They were intended to serve as warm-up tasks for the *S*s and to provide estimates of individual differences in RT.

Apparatus

The experimental equipment consisted of a self-contained unit with a slide projector and a screen hidden from the view of all but the *S* (i.e., from other potential *S*s), and two buttons, labelled 'yes' and 'no.' Presentation of a slide started a timer which was stopped with the pressing of a button. Each of the six slides presented a sentence written on two lines. The projection of the slide on the screen occupied approximately 15 cm square with each letter appearing 2 cm in height. The slide appeared at eye level, approximately 50 cm from seated *S*s. All stimuli were in Hebrew.

Procedure

During the first week of the experiment, the equipment was set up in the lobby of a building in the Social Science area of the campus, during the second week in a Humanities Building. *S*s were seated by the instrument and read the following instructions (translated from Hebrew): 'We are about to project on the screen in front of you (Experimenter points) a series of sentences. Your task is to decide whether each sentence is true or false. For example, you might see 'A cow has four legs.' As the sentence is true, you are to press the 'yes' button. If you were shown 'A cow has three legs', you would press the 'no' button. Put an index finger on each of the two buttons. Your task is to press as quickly as possible. It is, however, most important that your response be correct. We will say 'Ready' just before the presentation of each slide. Note again where the 'yes' and 'no' buttons are in order to avoid confusion.' The six sentences were presented in the following order:

1. The sun rises in the east.
2. Oranges are blue.
3. A horse is an animal.
4. Nixon is the president of the Soviet Union.
5. You are presently in Jerusalem.
6. Today is X.

*S*s who inquired as to the purpose of the experiment were told that it concerned RT to different types of sentences. They were asked to refrain from discussing the experiment with their friends. The public circumstances of the experiment precluded the post-experimental questioning which proved fruitful in our previous study.

The experimental procedure was thus identical for all *S*s, except for the critical task and the labelling of the buttons.

Results

Unless otherwise noted, the statistical analyses presented below are based on the responses of the 504 ($= 2 \times 6 \times 7 \times 2 \times 3$) *S*s who responded correctly to the critical Day statement.

In order to control for individual differences in speed of response, the RT's of the 5 preliminary tasks were employed as five covariates in the analyses of the RT Day data. Using the sample of 504 'correct' *S*s, RT Day was found to correlate 0.177, 0.350, 0.353, 0.300, and 0.409 with RT for each of the five preliminary tasks respectively ($p < 0.001$ in all cases). The multiple correlation between the five preliminary RT's and RT Day was 0.437.

An alternative covariate was also considered: the mean RT of subjects' correct responses to preliminary tasks (Mean RT Correct). On intuitive grounds this choice might seem to be more appropriate than the former owing to the fact that only the RT of correct Day responses were used in the analyses below. The correlation between Mean RT Correct and RT Day was 0.365. ANCOVA's using Mean RT Correct as a covariate yielded substantially the same, but somewhat less articulate results and will not be reported.

All RT means used below are adjusted for the five covariates for the sample or sub-sample of subjects upon which that analysis was based.

Overall analysis of sources of variance

A 3-way ANCOVA (Actual Day × Proposed Day × Hand) was carried out for (correct) RT Day, with data for the two weeks combined. The results of this analysis appear in table 1. A preliminary ANCOVA using Week as a fourth factor revealed no significant Week effect nor interactions involving Week, justifying pooling data for the two weeks.

As can be seen, all three factors yield significant main effects, with none of the two-way or three-way interactions significant except for that due to Actual Day × Proposed Day. The main effect due to Hand indicates that RT Day is generally shorter when right hand response is 'yes' and left hand response is 'no', than when the relationship is reversed. In subsequent analyses the effect of Hand will be ignored since it does not interact with the effects of Actual Day and Proposed Day, which are the main concern of the present study. The adjusted RT Day means for both weeks combined appear in table 2. The following analyses examine in greater detail the Actual Day and Proposed Day effects.

Table 1
Analysis of covariance for correct RT Day for Actual Day × Proposed Day × Hand.

Source	*df*	*F*	*p*
Actual Day (AD)	5	3.26	0.01
Proposed Day (PD)	6	12.34	0.001
Hand (H)	1	7.87	0.01
AD × PD	30	1.62	0.025
AD × H	5	0.16	n.s
PD × H	6	1.09	n.s.
AD × PD × H	30	0.79	n.s.
Cov	5	21.13	0.001
I(AD × PD × H)	415		
Total	503		

Table 2
Mean correct RT Day responses, adjusted for preliminary task RT, by Actual Day and Proposed Day (in msec).

Actual Day	Proposed Day							
	Su	M	Tu	W	Th	F	Sa	Total
Su	1811	1708	1936	1794	1836	1729	1522	1762
M	1715	2131	2071	1842	1893	1501	1313	1781
Tu	1740	1780	2155	1814	1960	1913	1513	1839
W	1491	1833	2709	1912	1963	1426	1388	1818
Th	1865	2172	2043	1806	1953	1664	1328	1833
F	1537	1403	1625	1712	1761	1437	1498	1568
Total	1693	1838	2090	1813	1894	1612	1427	1767

Actual Day effect

Fig. 1 presents adjusted mean RT Day as a function of Actual Day. As is readily apparent, the significant effect obtained for Actual Day reflects a quadratic relationship between RT and ordinal position of the experimental day in the week. An F-test for quadratic trend Yielded $F(1,415) = 9.62$, $p < 0.005$. The greatest latencies are obtained in midweek, with the most rapid responses by far occurring on Friday, a pattern which largely replicates that found in our previous study. Proximity of a weekend seems to facilitate correct evaluation of candidate day labels, much as it facilitates retrieval of a proper day label.

A one-way (Actual Day) analysis of variance for the mean RT on the five preliminary tasks yielded $F(5,498) = 1.34$, which is not significant. This finding rejects the explanation of the RT Day pattern in terms of a midweek decrement in overall performance due to sluggishness, fatigue, etc.

Proposed Day effect

Fig. 2 presents mean RT Day for responses to each Proposed Day statement. Again the significant effect observed in Table 1 seems largely to reflect a quadratic relationship between RT Day and the ordinal position of the proposed day in the week. An F-test for quadratic trend yields $F(1,415) = 42.28$, $p < 0.001$. It takes longer to decide whether today is a day in the middle of the week, than whether today is Friday, the Sabbath, or Sunday.

Judging by fig. 1 and 2 and by the F-ratios from table 1, the Proposed Day effect seems to be substantially stronger than that for Actual Day. It should be noted, however, that the Proposed Day effect includes a substantial contribution from rejection of 'Today is the Sabbath,' by far the most readily responded-to statement. Presumably, if asked on the Sabbath, *S*s would be readily able to respond to any PD statement. However, as noted, the Sabbath does not appear as an Actual Day owing to the closure of the university on that day. After elimination of responses to the statement 'Today is the Sabbath', a two-way, 6 × 6 ANCOVA yielded the following statistics:

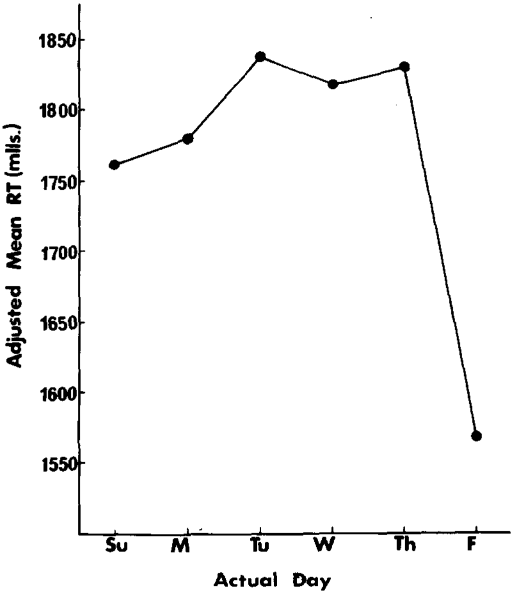

Fig. 1. Mean RT as a function of Actual Day.

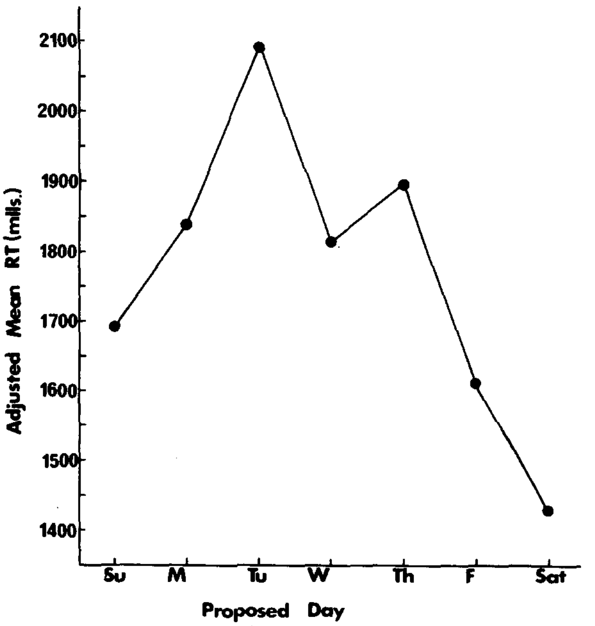

Fig. 2. Mean RT as a function of Proposed Day.

Actual Day effect: $F(5{,}391) = 3.91$, $p < 0.002$;
quadratic trend: $F(1{,}391) = 23.52$, $p < 0.001$.
Proposed Day effect: $F(5{,}391) = 6.75$, $p < 0.001$;
quadratic trend: $F(1{,}391) = 23.52$, $p < 0.001$.

Thus, some of the difference in the size of the Actual Day and Proposed Day effects can be attributed to the inclusion of the Sabbath statement. A regression analysis revealed that Proposed Day accounts for 10.4% of the variance in RT Day compared to 2.0% accounted for by Actual Day. With the exclusion of the Sabbath, the respective values became 5.3% and 3.0%, respectively. The Sabbath statement appears to be responsible for the Actual Day × Proposed Day interaction, since this interaction becomes insignificant ($F(25{,}391) = 1.49$, $p < 0.05$) when the Sabbath statement is eliminated.

Acceptance and rejection responses

In this section the results for acceptance and rejection responses will be first examined separately, and then compared. Mean latencies of acceptance responses ('yes, today is *X*') appear in the diagonal cells of table 2 (with the last column eliminated), while mean latencies of rejection responses ('no, today is not *X*') appear in the off-diagonal cells.

The first question to be considered is whether the quadratic relationships of RT Day to Actual Day and Proposed Day are due to acceptance responses, rejection responses, or both. Obviously, a strong enough curvilinear relationship between RT acceptance and day of week would account for both main effects.

For RT acceptance, a one-way ANCOVA yielded a weak effect of Day ($F(5{,}61) = 2.21$, $p < 0.10$). The weakness of this effect may in part be attributed to the lack of power in the statistical test, with but 12 *S*s in each cell. The adjusted means obtained in this analysis for Sunday, Monday, etc., are 1785, 2113, 2228, 1899, 1910, and 1451, respectively. The quadratic trend is rather more significant ($F(1{,}61) = 7.23$, $p < 0.01$). Thus, it takes less time to correctly endorse the statement 'today is *X*' when *X* respresents a day close to the weekend than when it is a day in the middle of the week.

Rejection responses may be analysed in terms of the effects of Actual Day, Proposed Day, and their interaction. A two-way ANCOVA following deletion of acceptance response (i.e., treating the diagonal cells as missing cells) yielded $F(5{,}391) = 1.98$, $p < 0.08$, for Actual Day; $F(6{,}391) = 11.76$, $p < 0.001$, for Proposed Day; and $F(24{,}391) = 1.89$, $p < 0.01$ for their interaction.

For Actual Day, the mean rejection RTs for Sunday to Friday were 1754, 1723, 1787, 1802, 1813, and 1589, respectively. The quadratic trend was significant ($F(1{,}391) = 4.76$, $p < 0.05$). Thus, in the middle of the week it takes somewhat longer to reject incorrect day labels than it does on Sunday, Monday, or Friday.

For Proposed Day, mean rejection RTs for Sunday to Saturday were 1669, 1779, 2077, 1794, 1883, 1647, 1427, respectively (see Fig. 3). The quadratic trend here was rather more significant ($F(1{,}391) = 44.99$, $p < 0.001$). Thus, overall it takes longest to reject the labels of mid-week days. Elimination of the Sabbath does not appreciably reduce the significance of these analyses.

Fig. 3 presents the adjusted means of acceptance and rejection RTs as a function of Actual Day. On every day of the week, except Friday, accepting the correct day label takes longer than the rejection of alternative day labels. Interestingly, the difference between acceptance and rejection RTs is strongest for mid-week days and decreases towards the weekends. The differences between corresponding RT acceptance and rejection means (as a function of Actual Day) are +31, +391, +442, +98, +97 and −128, for Sunday, Monday, . . .respectively.

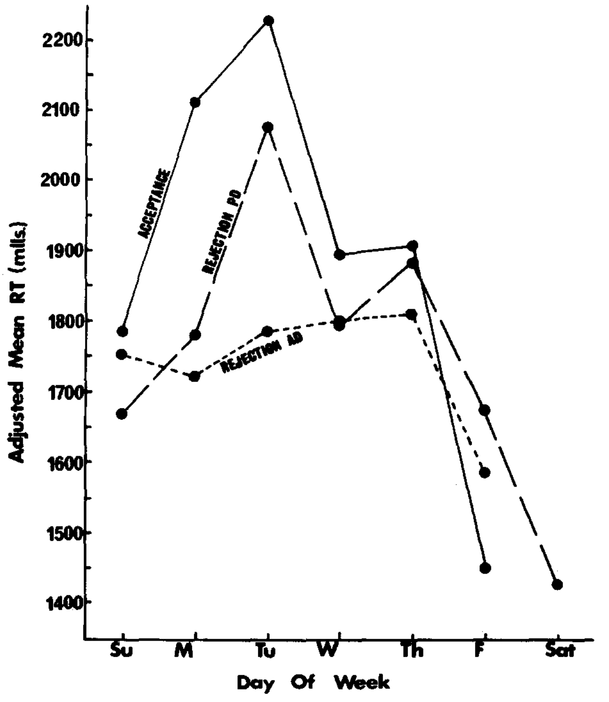

Fig. 3. Mean RT for acceptance and rejection responses as a function of Actual Day (AD) and rejection responses as a function of Proposed Day (PD).

Inspection of fig. 3 reveals that the curvilinear relationship with Actual Day is clearly stronger with acceptance than rejection responses. Rejection RT appears to be practically stable over different ADs except for a decline on Friday – which is not surprising in view of the particular position of this day in the Israeli week (see Koriat and Fischhoff 1974). These results suggest that if the day label retrieval process does indeed proceed in two stages, then the curvilinear relationship between retrieval difficulty and ordinal position of target day is due to the second stage, which involves acceptance and rejection, rather than the first stage, which involves rejection alone.

Additional support for this hypothesis may be seen from separate consideration of the day labels likely to be considered in the two stages of the search. As noted above, these may reasonably be defined as Proposed Days referring to yesterday, today, or tomorrow, relative to Actual Day for the second stage, and the remaining Proposed Days for the first stage. Mean latencies for Stage 1 and Stage 2 responses for each day of the week (Actual Day) appear in fig. 4. A clear curvilinear trend emerges for Stage 2 responses, while no consistent trend emerges for Stage 1. In the construction of fig. 4, the Sabbath was treated as any other day. If rejection of the Sabbath as a possibility is considered a part of Stage 1 even on Sunday and Friday, as the landmark hypothesis suggests, the resulting figure is slightly flatter for both Stage 1 and Stage 2.

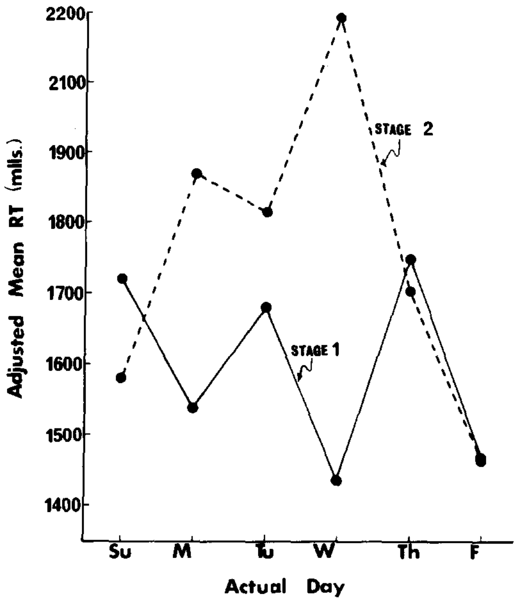

Fig. 4. Mean RT to yesterday, today, and tomorrow Proposed Day labels (Stage 2) and to more distant Proposed Day labels (Stage 1).

Distance between Actual Day and Proposed Day

In the previous study, analysis of errors revealed that in most cases, the incorrect response was the name of a day contiguous to the target day. This suggests that ease of rejection of a candidate label is a function of the temporal distance between the candidate and target days.

The present study affords a more thorough examination of this hypothesis. Fig. 5 presents mean RT as a function of the distance between Actual Day and the closest appearance of Proposed Day. Positive distances refer to cases in which the closest appearance of the Proposed Day follows the Actual Day; negative distances refer to cases in which the closest appearance of a Proposed Day precedes the Actual Day. For example, if Monday is the Actual Day, the distance to Thursday is +3, to Friday −3, Zero distances refer to acceptance responses. It can be readily seen that the greater the distance between Actual Day and Proposed Day, the greater the response latency.

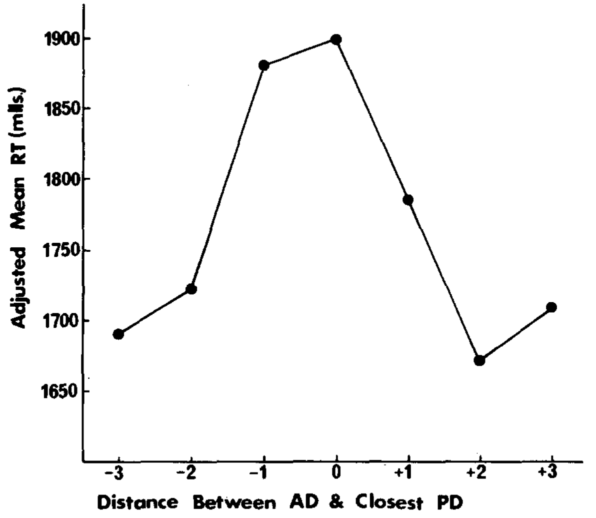

Fig. 5. Mean RT as a function of temporal distance between Actual Day (AD) and Proposed Day (PD).

The week as a psychological unit

In the construction of fig. 5, distances were defined without regard to whether or not the Actual Day and the Proposed Day fell in the same week. Both our previous study and the results presented above suggest, however, that the weekend plays an important role in the psychological organization of the week. One interesting hypothesis in the present context is that the weekends create discontinuities in the subjective temporal continuum. That is to say, they serve as 'boundaries' delimiting the Sunday to Sabbath interval as a psychologically cogent unit. If this is the case, then a more appropriate way to define psychological distance between the Proposed Day and the Actual Day is within the calendar week. By this approach, the psychological distance between Monday (Actual Day) and Friday (Proposed Day) is +4 and not −3.

Thus, the measurement of Actual Day-Proposed Day psychological distances may be operationalized in two ways, each embodying a somewhat different hypothesis regarding temporal organization: (a) a 'closest appearance' hypothesis used in the construction of fig. 5; and (b) a 'same week' hypothesis which looks at Actual Day-Proposed Day distances within a single calendar week. For most Actual Day-Proposed Day pairs, these two methods converge as the closest appearance of the Proposed Day lies within the same week as the Actual Day. There are, however, nine Actual Day-Proposed Day pairs for which the closest appearance of the Proposed Day lies in the preceding or subsequent week. For these pairs, the 'closest appearance' hypothesis and the 'same week appearance' hypothesis provide divergent predictions. Table 3 presents these pairs and their distances as measured in accordance with the two hypotheses, ignoring signs.

Table 3
RT for Actual Day-Proposed Day pairs as a function of temporal distance defined according to 'Closest Appearance' and 'Same Week Appearance'.

Actual Day-Proposed Day Pairs	Distance		
	Closest Appearance	Same Week Appearance	Mean RT (in msec)
SU-Th; M-F; Tu-Sat; Th-Su; F-M	3	4	1626
Su-F; M-Sat; F-Su	2	5	1529
Su-Sat	1	6	1522

If it is assumed that rejection RT should decrease (rather than increase) with increasing Actual Day-Proposed Day distance, the data presented in table 3 are in keeping with the 'same week appearance' rather than with the 'closest appearance' hypothesis.

It might be instructive now to reevaluate the relationship between RT and Actual Day-Proposed Day distances using the 'same week appearance' definition of distance. This relationship, presented in fig. 6a, is remarkably smooth. One-way ANCOVA over the 12 Actual Day-Proposed Day distance cells yielded F (11,486) = 2.334, p <0.001. Repetition of this analysis following elimination of the 0-distance (acceptance) responses yielded nearly identical results.

In the above analyses which assumed that the week constitutes a discrete psychological unit, the psychological week was defined as starting on Sunday and ending on the Sabbath. Despite the traditional acceptance of this definition (Genesis 2:2), the psychological week might be viewed as beginning on the Sabbath and ending on Friday, the last work day of the week, or as beginning and ending on successive Sabbaths. Fig. 6b and 6c repeat the analysis presented in fig. 6a using these two alternative definitions. A comparison of these three figures appears to indicate that the most regular relationship between RT and Actual Day-Proposed Day distance is obtained when the week is defined as extending from Sunday to Saturday.

Asymmetry in the temporal continuum

A number of minor results in our previous study and references cited there indicated an asymmetry in temporal orientation to past and future events. Contiguous days in the past appear to be more distinguishable than contiguous days at a comparable objective temporal distance in the future. Examination of fig. 6 suggests that the decrease in rejection RT with increasing distance from the Actual Day is steeper for past Proposed Days (negative distances) than for future Proposed Days, although the difference in slopes is not significant, z = 1.08, p <0.15.

Errors

As was noted earlier, 50 of the 504 initial *S*s responded erroneously, and eight of their replacements erred as well. The proportion of erring *S*s in the present study is thus comparable to that found in the previous study (12.5%).

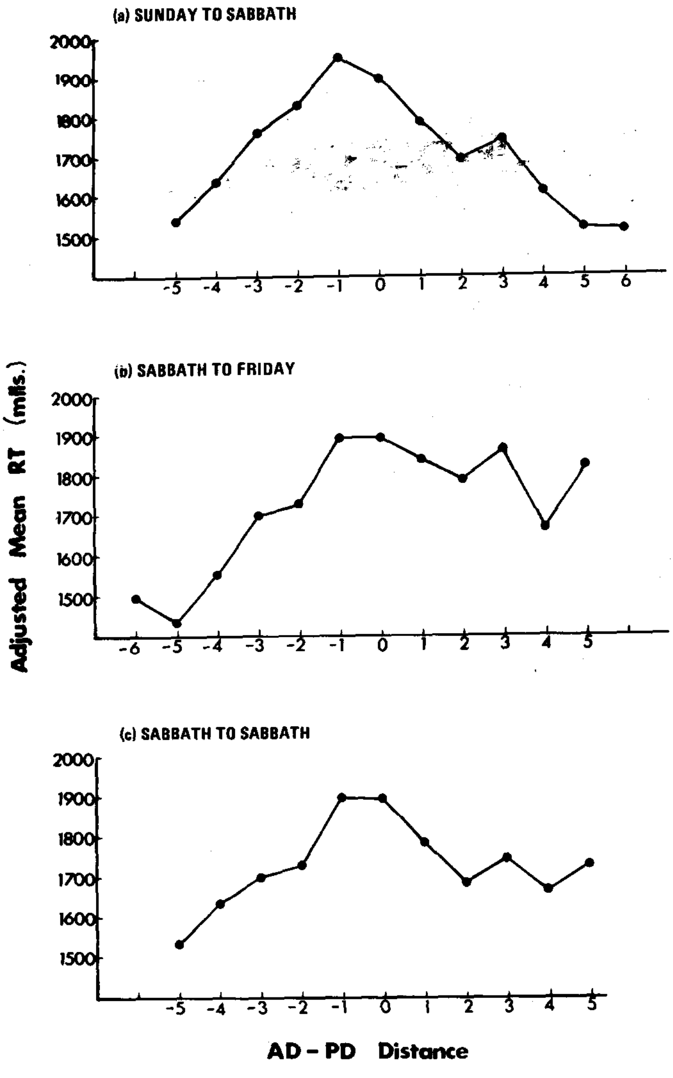

Fig. 6. Mean RT as a function of 'same week' temporal distance between Actual Day (AD) and Proposed Day (PD), with 'week' defined as (a) Sunday to Sabbath, (b) Sabbath to Friday, or (c) Sabbath to Sabbath.

Neither the distribution of errors over Actual Days nor the distribution of errors over Proposed Days differed from random. This is in sharp contrast with the results of our previous study in which substantially more errors were made in the middle of the week. No explanation of this difference is readily available.

Thirty-two percent of the errors constituted false rejections (i.e., appear in diagonal of the Actual Day × Proposed Day table). This is significantly more than would be expected if errors were randomly distributed over the various Actual Day-Proposed Day conditions (χ^2 [1] = 2.81, p <0.001). Of the remaining 34 false acceptance errors, 17 or 50% constituted acceptance of a Proposed Day which is either one day earlier or one day later than the Actual Day. This proportion, too, is more than would be expected by chance (χ^2 [1] = 4.25, p <0.05).

Discussion

Aside from its intrinsic interest, the present, day label evaluation task allows for two distinctions obscured by the previous, day label retrieval task: (a) a distinction between the effects attributable to Actual Day and to Proposed Day: and (b) a distinction between acceptance and rejection operations. Each of these distinctions has contributed informative, and moderately surprising, results regarding temporal orientation, in general, and the workings of temporal landmarks and the two stage model, in particular.

As expected, RT Day was found to show a concave relationship with both Actual Day and Proposed Day. Unexpectedly, however, the results indicated a substantially stronger effect for Proposed Day than for Actual Day. In our previous study, it was assumed that the critical determinant of day label retrieval difficulty lay in the characteristics of the stimulus situation, i.e., the location of the Actual Day in the week. We hypothesized that the weekends serve as temporal landmarks whose proximity assists temporal orientation. The strong Proposed Day effect suggests that the key element in determining day label retrieval difficulty may actually lie within the characteristics of the response solicited. That is to say, it is more difficult to correctly endorse or produce correctly the names of midweek days. It should be noted that only the rejection responses undo the confounding of Actual Day and Proposed Day found in our previous study and these revealed particularly strong effects for Proposed Day and weak effects for Actual Day.

Why is it easier to correctly reject the labels 'Sunday' or 'Friday' than 'Tuesday' or 'Wednesday'? The key seems to lie in the connotation of each of these labels, i.e., in what one expects a Sunday or a Wednesday to be. Consider the statement 'Today is the Sabbath,' which was most readily rejected when presented on any weekday. Apparently, because of the distinctive character of the Sabbath in the Israeli week, the label 'Sabbath' is clearly inappropriate for any other day, even before one can tell with accuracy what that day is. We propose that a well-differentiated weekly schedule carried for a long enough period of time gives rise to a well-differentiated system of day labels, with each day label characterized by a distinctive configuration of associations conditioned to it through the repeated experience with the activities scheduled on that day every week. If this is the case, then the differential ease of rejection of different day labels can be accounted for by differences in the distinctiveness of the connotations or the 'feel' associated with each.

Although many of these day label associations are idiosyncratic, there are doubtless some common to any given population which will emerge in group results. The universal distinctiveness of the Sabbath, what we have called the 'consensual landmark', is readily apparent. The Sabbath is not only the most readily rejected Proposed Day, it is seldom, if ever, confused with other days, and also seems to anchor the psychological week. The first and last days of the work week are relatively distinct for most people because of their relation to the weekend. The expressions 'Blue Monday' and 'Thank goodness it's Friday' capture the American interpretation of this distinctiveness. Day labels associated with the 'gray mass' of midweek days seem to carry relatively fewer distinctive associations for most people and should therefore be harder to reject.

This explanation could account for the weaker Actual Day effect by noting that whereas our subjects have worked with and experienced the day labels for years, the day on which they are questioned was approximately four hours old at the time of the experiment and may not even have been noticed as yet. Only 17% of the subjects in our previous study reported noted what day it was before being asked by the experimenter.

Underlying the role of the Sabbath in this account is a concept of landmark quite distinct from the one employed in our previous report. As originally proposed by Norman (1970), landmarks are highly prominent and accessible items in memory. In locating a less accessible item one proceeds to a landmark in its neighborhood and then uses it as an anchor for a more systematic search for the specific item. Perhaps, however, landmarks may facilitate search without being directly accessed. A possibly compelling analogy might be the comparison between 'cognitive maps' and 'cognitive strip maps'. The latter tell one how to get from one point to another along a circumscribed route with some indication of what might be encountered along the way.[1] Norman's landmarks resemble embarkation points in these strips. Cognitive maps, however, depict an entire area without an explicit search algorithm. Landmarks in them are points which are themselves well defined and which give definition to the contiguous area. The weekend appears to be this kind of landmark. It is highly distinct and lends distinction to temporal labels in its vicinity. Whatever search algorithm one uses, he is likely to be better off if what he is looking for is in the neighborhood of such a landmark. Needless to say these remarks are highly speculative.

The distinction between acceptance and rejection operations also provided data of considerable interest. The observation of longer acceptance than rejection latencies is rather surprising in view of the fact that in RT studies of semantic memory sentences involving 'false' responses are generally found to require longer response latencies than comparable sentences involving 'true' responses (Collins and Quillian 1969; Trabasso et al. 1971; Wason and Jones 1963). Similarly, in matching studies (Posner and Boies 1971) 'different' responses are generally longer than 'same' responses. As delineated in fig. 3, the acceptance-rejection differences indicate that it is more difficult to tell where one is (in terms of days) than where one isn't, with the greatest distances emerging in mid-week. These results, too, are consistent with the notion that Proposed Day labels are psychologically better defined than Actual Days.

Unless, of course, it is assumed that the day label retrieval and day label evaluation processes are identical, the present data do not afford an independent test of the hypothesized two-stage model. They do, however, clarify how such a two-stage process would work, if it is indeed invoked. In particular, they indicate that the curvilinear relation between retrieval difficulty and day of the week is due to the second, analytic stage of the process. This conclusion was pointed out in the discussion of fig. 3 and 4. It is also supported by the weak Actual Day rejection effects which indicated that it is not generally easier in mid-week to exclude candidate day labels (the task delegated to the first stage).

[1] The term 'cognitive triptiks' may be suggestive for readers familiar with the individually tailored routings prepared for travelers by the American Automobile Association.

How does the day label retrieval process proceed? The best account suggested by the present results is as follows. (1) Day labels are represented in memory as an organized sequence whose order corresponds to the temporal order of the days in the week. (2) Each day label is characterized by a configuration of associations; the greater the proximity of a day to the beginning or the end of the weekly cycle, the more distinctive are the associations of the corresponding day label. (3) The retrieval of a day label starts off with automatic elimination of clearly unlikely day labels, through a relatively rapid process whose duration appears to be little affected by the Actual Day. (4) The second, testing and acceptance, stage proceeds within the confines of a contiguous set of alternatives defined by the initial stage, and its duration depends on the nature of the labels which remain to be tested. Since midweek day labels are less readily distinguishable from each other than contiguous days at the beginning or the middle of the week, retrieval difficulty reveals a concave relationship with Actual Day.

How does the day label evaluation process proceed? The most compelling account would be again a two stage process. In the first the subject accepts or rejects proposed day labels which are clearly appropriate or inappropriate. When this is not possible, he turns around and asks himself, 'What day is today?' and proceeds to a day retrieval process which may, in turn, have two stages.

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