

## Further Evidence That Mice Learn a Win-Shift but Not a Win-Stay Contingency Under Water-Escape Motivation

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Previous research (C. Locurto, C. Emidy, & S. Hannan, 2002) indicated that mice quickly learned a water-escape task under a win-shift contingency but did not exceed chance-level performance under a win-stay contingency. We examined the robustness of this conclusion in two experiments by varying procedural and temporal aspects of that earlier experiment. Results of both experiments indicated that the preference for win-shift learning in mice under water-escape motivation could not be attributed to procedural or design features of that earlier study and were independent of the influence of intertrial interval, normally a variable that produces strong effects on learning. In neither experiment did subjects exposed to a win-stay contingency perform at above-chance levels.

The use of win-shift and win-stay procedures is commonplace in the study of complex problem solving. In each procedure, a trial consists of two runs. In the first or forced-choice run, only one response option is available. For example, in a spatial problem for rodents in a T maze, a forced-choice run would consist of a single arm in the maze being open and associated with reinforcement. In the second or free-choice run, both arms would be open. In the win-stay version, the arm open on the forced-choice run would be correct on the free-choice run. In the win-shift version, the arm not available on the forced-choice run would be correct on the free-choice run.

These procedures have proven to be particularly useful in the study of working memory in that both procedures require the subject to retain information acquired on the forced-choice run to respond correctly on the free-choice run within a trial. Given this similarity in format, one might expect that these strategies would be acquired at the same rate. Although the results of numerous investigations have not yielded uniform findings, the weight of evidence supports the contention that under appetitive motivation, win-shift strategies are acquired more rapidly than are win-stay strategies (Locurto et al., 2002). These behavioral differences have been underscored by the suggestion that different neurologic mechanisms may subservise each procedure (e.g., McDonald & White, 1993; Packard & White, 1990; Sakamoto & Okaichi, 2001). There has also been speculation that each procedure may require subjects to rely principally on different associative mechanisms: stimulus–response learning in the case of win-stay learning and stimulus–stimulus learning in the case of win-shift learning (Sage & Knowlton, 2000).

The superiority of win-shift learning under appetitive motivation has been explained from one of two complementary perspec-

tives. One explanation focuses on the advantages of foraging by avoiding previously visited food patches (e.g., Laughlin & Mendl, 2000; Olton & Schlosberg, 1978). An alternative interpretation does not emphasize foraging but instead focuses on the tendency to engage in spontaneous alternation in a situation in which a subject confronts old and new response options (Gaffen & Davies, 1981).

These interpretations are subject to two problems. One problem concerns the generality of the finding of win-shift superiority under appetitive motivation. Several studies have reported an advantage for win-stay learning in appetitive preparations using a variety of species: goldfish (*Carassius auratus*; Goldman & Shapiro, 1979) common marmosets (*Callithrix jacchus*; MacDonald, Pang, & Gibeault, 1994), rats (*Rattus norvegicus*; Nakagawa, 1993; Reed, Skiera, Adams, & Heyes, 1996, Experiment 4), and honey bees (*Apis mellifera*; Giurfa, Zhang, Jenett, Menzel, & Srinivasan, 2001; but see also Demas & Brown, 1995). Although these differences have been interpreted as a reflection of variations among species (e.g., Laughlin & Mendl, 2000; Olton & Schlosberg, 1978), there are also questions of whether win-shift superiority under appetitive motivation is independent of the conditions of testing. Several studies have indicated that procedural variations can alter the preference for a win-shift strategy in rats (Herrmann, Bahr, Bremner, & Ellen, 1982; Goodlett, Nonneman, Valentino, & West, 1988). Additionally, several investigators have suggested that the superiority of win-shift learning under appetitive motivation must be interpreted within the framework of the foraging strategies used by a particular species within its natural ecological niche. Those strategies may reveal a preference for win-shift learning at some temporal parameters and a win-stay preference at other temporal parameters (Burke & Fulham, 2003; Hughes & Blight, 2000).

The second problem is how the interpretations of a win-shift preference under appetitive motivation can extend to aversive motivation. One might reason that animals would be likely to choose previously safe locations under aversive motivation. This intuition was formalized by Mitchell, Koleszar, and Scopatz (1984) who argued that under conditions of high arousal, such as those that obtain under aversive motivation, animals would choose less-arousing choices rather than novel ones. The opposite would

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obtain under conditions of appetitive motivation when animals should choose conditions of higher arousal. The implication of this reasoning is that animals would prefer win-stay to win-shift learning under aversive motivation, just the reverse of what is often seen using appetitive motivation. Mitchell et al. (1984) tested this assumption in CBA and NZB mice using a spontaneous alternation task. In addition to noting strain differences, they noted overall that under a stress condition mice tended to choose formerly visited locations, just the opposite of the pattern observed under a no-stress condition. Means (1988; Comer & Means, 1989) tested this assumption in rats using water-escape motivation and found that a win-stay contingency was acquired significantly faster than was a win-shift contingency in a water-escape procedure.

Locurto et al. (2002), however, found that in a water-escape procedure using a T maze with mice, win-shift learning was superior to win-stay learning to the extent that win-stay learning did not produce above chance-level performance. The mice in that study were second filial generation offspring ( $F_2$ ) derived from a cross between C57BL/6 and DBA/2J inbred strains. In addition to species/strain differences, there are a number of differences between the procedures used by Locurto et al. (2002) and those used in the other studies. The two experiments reported herein were designed to explore the robustness of the win-shift preference that Locurto et al. observed in mice using water-escape motivation.

### Experiment 1

Locurto et al. (2002) used a mixed design in which two groups of mice were run under water-escape motivation in a T maze. Groups were exposed to one sequence of training, either a win-stay  $\rightarrow$  win-shift sequence or the reverse, a win-shift  $\rightarrow$  win-stay sequence. In the win-stay condition, the platform was placed in the same arm for both forced-choice and free-choice runs. In the win-shift condition, the blocked arm during forced-choice runs contained the escape platform during free-choice runs. Conditioning was arranged so that each subject received all 10 trials within a session before the next subject was run. The subject remained on the escape platform between runs and between trials. This procedure resulted in an intertrial interval (ITI) of 20 s. Win-shift training was conducted for 10 sessions; win-stay training was conducted for 15 sessions. Results indicated that irrespective of when win-shift learning occurred, it resulted in rapid acquisition, whereas win-stay learning did not result in conditioning above chance levels irrespective of when it was experienced.

Two aspects of this procedure may have affected acquisition. The procedure of having subjects remain in the arena for all trials within a session is not standard and, when coupled with the use of a relatively short ITI, may have led to a condition in which different trials were not sufficiently demarcated. A more distinctive marking of trial initiation and termination might improve performance in the win-stay condition in which the escape platform remained in the same location throughout all runs of a given trial. Second, a variety of evidence indicates that long ITIs produce more rapid acquisition than do short ITIs. An ITI of 20 s is typically considered to be of short duration in preparations that use other parameters that are similar to the ones used in this experiment. Locurto, Travers, Terrace, and Gibbon (1980), for example, found that ITI values of between 12 and 24 s produced the slowest acquisition scores in an autoshaping procedure with pigeons (see

Marx, 1969, for a summary of early work on this issue; see also Gibbon, Baldock, Locurto, Gold, & Terrace, 1977; Lattal, 1999; and Terrace, Gibbon, Farrell, & Baldock, 1975).

In the present study, both a 20-s and a 180-s ITI were used in a between-subjects design in which different groups of subjects were exposed to only one combination of ITI and contingency (either win-stay or win-shift). The 180-s value was chosen after review of several past studies in which acquisition was found to be more rapid at longer ITIs. For example, Locurto et al. (1980) found that ITI values of between 192 and 384 s produced the most rapid acquisition in their preparation.

Subjects were removed from the maze between trials and placed in a holding cage, thereby provided with more distinct cues of trial onset and termination.

### Method

#### Subjects

Thirty-six male CD-1 mice, an outbred albino strain, were used (Charles River Laboratory, Wilmington, MA). We have previously shown that this strain evidences few differences in water-escape performance compared with the  $F_2$  mice used by Locurto et al. (2002; Locurto & Scanlon, 1998). Given these similarities, we chose CD-1 mice because they are readily available compared with the long lead-in time needed to breed  $F_2$  mice and are significantly lower in cost. They were housed in groups of 2–4 animals in polycarbonate cages (Ancare, Bellmore, NY) that measured  $29.5 \times 15 \times 10.5$  cm. Mice had constant access to food and water for the duration of the experiment. They were maintained on a reverse 12:12 hr day/night cycle that was keyed to approximately 6 a.m. and 6 p.m. local time. Testing occurred at least 1 hr into the dark cycle. The mice were approximately 4 months old at the start of the study. They had participated in pilot experiments but had not been exposed to any water-escape procedures.

#### Apparatus

The apparatus consisted of a T maze constructed of black Plexiglas (Atofin Chemicals, Philadelphia, PA). Each arm of the maze measured  $30.5 \times 38.0 \times 15.2$  cm. The height of each arm (38 cm) reduced the visibility of extramaze cues although these cues were available in the form of various poster board displays and a window. The escape platform measured  $15.2 \times 10.2 \times 14.6$  cm and was submerged just below the water line. Water temperature was maintained at  $26^\circ \pm 1^\circ\text{C}$ . Between trials, subjects were placed in individual holding cages that were identical to the animals' home cages. Strips of paper were placed on the floor of these cages and were replaced as necessary during a session to keep the interior of the cage dry.

#### Procedure

A  $2 \times 2$  between-subjects design was used with the ITI (either 20 or 180 s) and contingency (either win-stay or win-shift) serving as independent variables. Training under all conditions was continued for 10 sessions. Each session consisted of 10 trials. Each trial consisted of two forced-choice runs and one free-choice run. After each forced-choice run, the subject remained on the escape platform for 10 s and was then returned to the start arm for the next run. After the free-choice run, a subject was placed in a holding cage for either 20 or 180 s depending on group assignment. Errors were defined as entries 14 cm (excepting the animal's tail) into an incorrect arm or into the start arm during a free-choice run. The location of the escape platform was determined by a random procedure with the restriction that the platform was located in the same location on free-choice runs for no more than three consecutive trials and, within a

session, the left and right arms each contained the platform on five free-choice runs. Water was cleaned during training by partially replacing it periodically during the day as needed and was whisked between trials to remove debris. We have not found the need to make the water opaque in these procedures. Several control procedures run in our laboratory have indicated that mice cannot use visual cues associated with the escape platform.

Training began with one session of habituation in which the escape platform was randomly placed in either choice arm for six trials. The left or right arm that was not in use on that trial was blocked. Mice had 40 s to find the escape platform. If they found the platform, they remained on it for 10 s before being removed from the maze and placed in a holding cage. If they did not find the platform, they were placed on it for 10 s before being placed in their holding cage. This same correction procedure of ending each trial with the mouse on the escape platform was used during habituation and conditioning. Mice were run in subgroups of 3 or 4 mice. All subjects within a subgroup finished their first trial before the first subject received its second trial. During habituation, ITIs averaged between 60 and 90 s. The experimenter remained in the same location during all trials and recorded latencies and errors via a monitor that took its feed from a camera placed at the center of the arena.

*Results and Discussion*

The results are summarized in Figure 1 for errorless trials. Errorless trials were used to provide a measure of the percentage of successful trials in each session. There was a significant effect of contingency,  $F(1, 32) = 61.70, p < .001$ , with win-shift producing more errorless trials summed across sessions. There was no main effect of ITI ( $p > .10$ ) nor was there an interaction between ITI and contingency ( $p > .10$ ). The analysis of latencies reflected the differences observed in errorless trials. There was a significant effect of contingency,  $F(1.32) = 9.27, p < .01$ ; no main effect of ITI; and no interaction between ITI and contingency. Win-stay subjects averaged 8.1 s ( $SE = .97$ ) across training, whereas win-shift subjects averaged 5.1 s ( $SE = .35$ ).

Figure 2 provides a summary of performance over the 10 sessions of training collapsed across ITI values for win-shift and win-stay groups. The differences between the two contingencies was evident early in training and persisted throughout training. There was no main effect of sessions, nor was there an interaction between sessions and contingency ( $p > .10$  for each comparison).

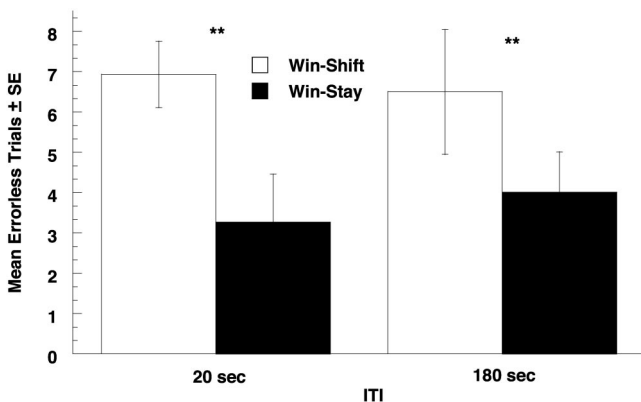


Figure 1. Mean errorless trial performance and one SE for win-shift and win-stay subjects at each intertrial interval (ITI) level in Experiment 1. Groups that differ significantly are noted with asterisks (\*\* $p < .01$ ).

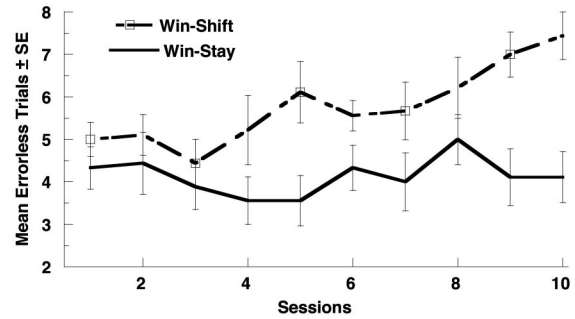


Figure 2. Mean errorless trial performance and one SE across sessions for win-shift and win-stay groups collapsed across intertrial interval (ITI) levels in Experiment 1.

Figure 3 gives the individual differences in errorless trial performance averaged across training within each contingency collapsed across ITI values. Within each panel, the data are arranged from the lowest to highest scoring subject. There is little overlap between the two groups. Only 1 win-stay subject exceeded the chance-level performance of 5.0 errorless trials (dotted horizontal line), whereas only 2 win-shift subjects failed to exceed chance-level performance. The performance of win-stay subjects as a group was significantly below chance as tested against a population mean of 5.0 errorless trials,  $t(17) = 5.08, p < .01$ . The performance of win-shift subjects was significantly above chance,  $t(17) = 5.92, p < .01$ . Over the 10 sessions of training, win-stay subjects averaged 3.6 errorless trials ( $SE = .27$ ), whereas win-shift subjects averaged 6.7 errorless trials ( $SE = .29$ ).

Experiment 1 differed in three procedural ways from the study by Locurto et al (2002). That earlier study used a mixed design, a short ITI, and followed a protocol in which subjects remained in the arena for all trials within a session. The present study was performed between subjects, manipulated ITIs, and trial onset and termination were demarcated by removing subjects from the arena between trials. Despite these differences, the present results were virtually identical to those of that earlier study. In neither study did win-stay subjects exceed chance levels of performance. Mean performance within the win-stay and win-shift conditions did not

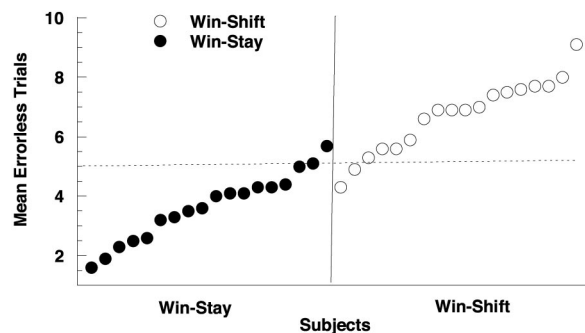


Figure 3. Individual differences in errorless trial performance for win-shift and win-stay subjects summed across sessions and collapsed across intertrial interval (ITI) levels in Experiment 1. The dotted horizontal line represents chance-level performance. Within each panel, individual scores are arranged from low to high.

differ between studies. For win-stay learning in the earlier study, subjects averaged 3.7 errorless trials ( $SE = .39$ ) over 15 sessions of training, whereas win-stay subjects in this study averaged 3.6 errorless trials over 10 training sessions ( $p > .10$ ). In the earlier study, under a win-shift contingency subjects averaged 6.5 errorless trials ( $SE = .20$ ), whereas they averaged 6.7 in this study over the same number of training sessions ( $p > .10$ ). These similarities obtained despite the fact that Locurto et al. (2002) used  $F_2$  mice, whereas the subjects used in Experiment 1 were CD-1 mice. The similarities in outcomes confirm our earlier findings that these two heterogeneous strains show few average differences in water-escape performance (Locurto & Scanlon, 1998).

These results support the conclusion that mice readily adopt a win-shift strategy and appear incapable of learning a win-stay strategy under these conditions. This conclusion does not support the commonsense notion that animals would prefer to return to previously safe locations when faced with aversive motivation. These results also would not be predicted from the well-established finding derived from experiments using the Morris water maze that rodents are particularly well suited for locating an escape platform that remains in the same location from trial to trial (Morris, 1981). The Morris water maze has become the most often used task for studying spatial cognition in mice (Mihalick, Langlois, Krienke, & Dube, 2000; Crawley, 2000). As typically run, it demands a type of win-stay learning, at least with respect to the location of the escape platform. The Morris maze consists of an open circular pool in which an escape platform is placed. The platform remains in the same location from trial to trial, whereas the subject is started from different compass points around the perimeter of the pool on successive trials.

There are several differences between the Morris maze and the T maze used in our laboratory. Our T maze has relatively high walls that extend nearly 30 cm above the water line, thereby likely occluding extramaze cues and encouraging the subject to attend to intramaze cues. The Morris maze, on the other hand, by the nature of the arena, encourages the use of extramaze cues. Although there is no reason a priori to assert that the use of intramaze cues should facilitate win-shift compared with win-stay learning, there is considerable evidence that when allowed to do so rodents use extramaze cues to navigate (Brown, Rish, VonCulin, & Edberg, 1993; Morris, 1981; see also Brown & Moore, 1997, for evidence of successful navigation when extramaze cues are blocked.). It is also noteworthy that Means (1988) used a Morris-type water maze in demonstrating win-stay superiority in rats. To determine whether these arena differences might underlie the differences between the previous work in our laboratory and the large amount of literature demonstrating success in the Morris water maze, we used an open circular pool arena in Experiment 2.

## Experiment 2

### Method

#### Subjects

Subjects were male 19 CD-1 mice. They were maintained under the same conditions as were the mice in Experiment 1. They were approximately 4 months old at the start of the study and had histories similar to those of subjects in Experiment 1.

#### Apparatus

The arena consisted of a circular pool that measured 107 cm in diameter. A metal divider 61 cm in length was positioned inside the pool so as to divide it into halves. The divider extended 6 cm above the water line. The length of the divider left a 46-cm open area between the edge of the pool opposite the divider and the edge of the divider. That open area opposite the divider was used as the starting location on each trial. The water level was 8 cm below the lip of the pool and allowed a clear view of cues external to the pool on all sides. Various visual stimuli were placed on the walls of the room in which the experiment took place to serve as extramaze cues. The escape platform measured  $15.2 \times 10.2 \times 14.6$  cm and was submerged just below the water line. Water temperature was maintained at  $26^\circ \pm 1^\circ\text{C}$ . As was the case in Experiment 1, between trials subjects were placed in holding cages that were identical to the animals' home cage with strips of paper placed along the floor and replaced as needed.

#### Procedure

The experiment was conducted using a between-subjects design. Nine subjects received win-shift training and 10 subjects received win-stay training. Habituation consisted of two sessions of four trials each for every subject. During habituation, a platform was located in the middle of each half of the pool. On each trial in the first habituation session, mice had the choice of going left or right from the starting point that was located at the edge of the pool opposite the metal divider. On the second session of habituation, one half of the pool was blocked on each trial and the subject was forced to go to the opposite side. The platform during this session was placed twice in the left and right halves of the pool, respectively. On each trial during habituation and during conditioning, the subject had 40 s to locate the platform. The subject remained on the platform for 10 s. If the subject did not find the platform within 40 s, it was placed on the platform for 10 s.

The conditioning format was the same as the format used in Experiment 1. Training was continued for 10 sessions. Each session consisted of 10 trials. Each trial consisted of two forced-choice runs followed by a free-choice run. Between trials, subjects were returned to holding cages. Subjects were run in subgroups of 3 or 4 mice such that the each subject received the first trial before the first subject received the second trial. This procedure resulted in an ITI that averaged approximately 150–180 s across subjects. An error was recorded any time a subject's body (minus its tail) entered the wrong half of the arena on a free-choice run. Because there was no start arm in this arena, a subject's initial movements at the start of a run caused it to enter either half of the arena. As was the case in Experiment 1, the position of the platform on free-choice trials was arranged so that it was placed in the same half of the pool on no more than three consecutive trials, with the restriction that within a session it would be placed equally often in the left and right halves of the pool.

### Results and Discussion

Figure 4 provides the results for errorless trials across the 10 sessions of training. These data are highly similar to those presented in Experiment 1. Win-shift training exceeded win-stay training,  $F(1, 17) = 34.50$ ,  $p < .01$ , and there was no main effect of sessions or an interaction between sessions and contingency ( $p > .10$ ). By the second session, there was no overlap between the groups. Across the 10 sessions of training, win-stay subjects averaged 3.61 errorless trials ( $SE = .28$ ), whereas win-shift subjects averaged 5.98 errorless trials ( $SE = .29$ ). Neither of these values differed from those obtained in Experiment 1 ( $p > .10$  for each comparison). The win-stay mean was significantly lower than chance when tested against a population with a mean of 5.0

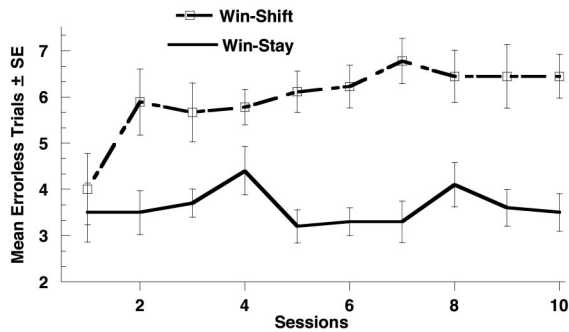


Figure 4. Mean errorless trial performance and one *SE* across sessions for win-shift and win-stay groups in Experiment 2.

errorless trials,  $t(9) = 6.49$ ,  $p < .01$ . The win-shift mean was significantly greater than chance,  $t(8) = 2.78$ ,  $p < .05$ . The analysis of latencies reflected the errorless trial analyses. Win-stay subjects averaged 10.64 s ( $SE = 1.05$ ), whereas win-shift subjects averaged 6.38 s ( $SE = 1.10$ ). There was a significant effect of contingency,  $F(1, 7) = 7.84$ ,  $p < .01$ , and a significant effect of sessions for latencies,  $F(1, 153) = 2.11$ ,  $p < .05$ . There was no interaction between sessions and contingency for latencies ( $p > .10$ ).

Figure 5 shows the individual means in errorless trials for each subject averaged across all sessions. Within each panel, subjects are ranked from lowest to highest. As was the case in Experiment 1, there was virtually no overlap between the two groups. No subject in the win-stay condition exceeded chance levels of responding, whereas only one win-shift subject responded at chance levels, and a second subject was slightly above chance.

These data indicate that the T maze arena used in our previous experiments was not responsible for the win-shift preference. In an arena that encouraged the use of extramaze cues, the differences between win-shift and win-stay learning were virtually identical to the differences observed in our prior experiments. It might have been expected that the arena used in this study would result in enhanced win-stay acquisition, given that the Morris water maze results in rapid acquisition. There remains a notable procedural difference between this study and the standard Morris maze procedure. Trials in the present experiment consisted of triads of runs, two forced-choice and one free-choice run, all to the same location in the case of win-stay learning. In the standard Morris maze procedure, trials consist of single runs, and the starting point is randomly rotated among several different compass locations around the perimeter of the maze. It has been shown, however, that normal rats learn a version of the Morris maze that uses a constant starting location as well as they do the standard version, although rats with hippocampal damage perform more poorly on the standard version (Eichenbaum, 2000). In our laboratory, we have observed significant reductions in latencies for both  $F_2$  and CD-1 mice in a Morris maze procedure with a constant starting location: In a study by Locurto and Scanlon (1998), escape latencies for  $F_2$  mice went from 40 s ( $SE = 4.8$ ) in Session 1 to 21 s ( $SE = 4.4$ ) in Session 5 (6 trials/session). Latency reductions for CD-1 mice went from 48 s ( $SE = 5$ ) in Session 1 to 35 s ( $SE = 4.6$ ) in Session 5.

The use of a constant starting location makes the Morris maze procedure even more similar to the procedures used in these

experiments. It appears that maintaining the same starting point and escape platform locations on each trial in the win-stay condition was not performed for the reason that performance fell significantly below chance. There must be something in the nature of requiring the subject to revisit the same escape location in a series of runs within a trial that leads to the preference to shift to a new location when the opportunity to do so becomes available on choice trials.

## General Discussion

The results of these two experiments offer a broader foundation for the conclusion that mice prefer win-shift learning to win-stay learning under water-escape motivation than was provided by Locurto et al. (2002). These results indicate that the superiority of win-shift learning under water-escape motivation in mice is not restricted to the conditions of testing that were used by Locurto et al., including the design, temporal parameters, or type of arena used in that earlier study. The win-shift preference also appears to be robust, given that in each experiment there was nearly no overlap in individuals' average performance between the two conditions. Interestingly, the results of Experiment 1 also suggest that ITI, a variable that often produces marked effects on performance, had no effect either on win-shift or win-stay learning over a wide range of ITI values.

As noted, earlier numerous characterizations of win-shift and win-stay learning have appealed to species differences as a way of understanding the outcomes of different experiments (e.g., Means, 1988; Olton & Schlosberg, 1978; Randall & Zentall, 1997). It might be argued with reference to the present findings that perhaps mice prefer win-shift learning, whereas rats, the subjects in Means' (1988) experiment, prefer win-stay learning under conditions of water-escape motivation. Species differences cannot be ruled out, but it should be recognized that it is often not a simple matter to form conclusions about species-typical preferences. In the appetitive literature (which is much more developed than is the aversive literature on this issue), win-shift is not invariably preferred by rats (e.g., Nakagawa, 1993; Reed et al., 1996, Experiment 4). Moreover, several studies using rats have reported that procedural manipulations alter the preference for win-shift or win-stay learning (e.g., Comer & Means, 1989; Herrmann et al., 1982). Goodlett et al. (1988), for example, studied the ability of rats to learn

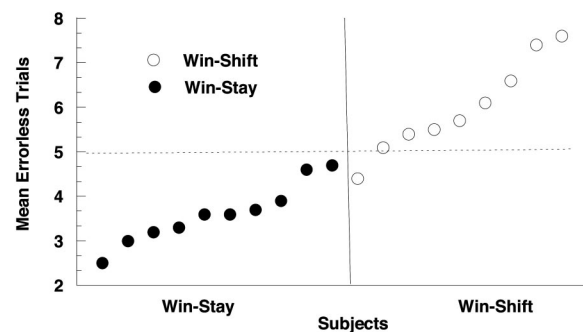


Figure 5. Individual differences in errorless trial performance for win-shift and win-stay subjects summed across sessions in Experiment 2. The dotted horizontal line represents chance-level performance. Within each panel, individual scores are arranged from low to high.

win-shift strategies under a variety of procedural manipulations. They found that changes in procedure often had the effect of altering the ease with which rats learned either win-shift or win-stay contingencies under both appetitive and aversive motivation.

Cast in this light, the present results should not be taken to mean that mice invariably prefer win-shift learning under any form of aversive motivation or that they are incapable of win-stay learning. Yet these data do identify a set of conditions of some breadth under which win-shift learning is clearly preferred to win-stay learning, to the extent that a win-stay contingency did not engender above-chance levels of responding either in these experiments or in those conducted by Locurto et al. (2002). It appears that at least under the conditions of water-escape motivation thus far studied, mice prefer to vary the destination of their escape rather than to return to a formerly safe location. We have also noted rapid acquisition of this type of win-shift contingency in aged mice (Markowski, Ungeheuer, Bitran, & Locurto, 2001).

Although these results are not anticipated by approaches that assume that returning to formerly safe locations would be observed in aversive paradigms, it would not be difficult to fashion an evolutionary explanation for a win-shift preference. One might argue for example that this preference is an extension of a risk assessment system in which rodents under the threat of predation, having found a safe location, nonetheless periodically leave that safe location to reassess the current threat situation, even when doing so exposes them once again to predation. This form of risk assessment has been noted in laboratory studies of defensive behavior in rodents as well as in more naturalistic conditions where actual predation is possible (Blanchard & Blanchard, 1996; Blanchard, Griebel, & Blanchard, 2001; Edut & Eilam, 2003). Similarly, it might be that the systematic shifting of escape preferences makes it more difficult for predators to locate prey. It might also be that this preference is confined to water-escape behavior and would not be found using land-based aversive paradigms. On this point, there is evidence that mice regularly retreat to a favored grooming location when faced with an unexpected aversive auditory stimulus (Santis & Diaz, 1983).

Although some type of evolutionary explanation might be fashioned, what is most striking about this win-shift preference is that it illustrates how little is known about the nature of flight behavior under aversive motivation. It is commonly argued that the repertoire of most rodent species consists of some combination of flight, freezing, and lunging/biting/attacking behavior (Blanchard & Blanchard, 1996). The topographies of freezing and attack have received considerable attention (e.g., Fanselow & Lester, 1988). The topography of flight is less well understood, perhaps because in its usual laboratory manifestation flight consists of moving to the opposite side of a shuttle box or down the unshocked alley in a T maze. There is little direct evidence on where animals would go if they were permitted a wider range of options. A richer understanding of defensive behavior must include that sort of knowledge, knowledge that is not available from standard escape/avoidance paradigms.

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### New Editor Appointed, 2007–2012

The Publications and Communications (P&C) Board of the American Psychological Association announces the appointment of a new editor for a 6-year term beginning in 2007. As of January 1, 2006, manuscripts should be directed as follows:

- *Emotion* ([www.apa.org/journals/emo.html](http://www.apa.org/journals/emo.html)), **Elizabeth A. Phelps, PhD**, Department of Psychology, New York University, 6 Washington Place, Room 863, New York, NY 10003.

**Electronic manuscript submission.** As of January 1, 2006, manuscripts should be submitted electronically via the journal's Manuscript Submission Portal (see the Web site listed above). Authors who are unable to do so should correspond with the editor's office about alternatives.

Manuscript submission patterns make the precise date of completion of the 2006 volumes uncertain. The current editors, Richard J. Davidson, PhD, and Klaus R. Scherer, PhD, will receive and consider manuscripts through December 31, 2005. Should 2006 volumes be completed before that date, manuscripts will be redirected to the new editor for consideration in 2007 volume.