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## Judgment Bias in Baseball Umpires' First Base Calls: A Computer Simulation

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An early experiment in psychology dealt with the individuals' ability to judge the order of two events presented in different sensory modalities. In his "complication experiment," Wundt (1901) tested his ability to judge the position of a swinging pendulum at the time a click occurred. When he focused his attention on the auditory stimulus, Wundt consistently thought it occurred earlier in the swing of the pendulum than it actually did. This phenomenon came to be known as prior entry, because the auditory stimulus appeared to occur prior to the time of actual occurrence. More recently, Cairney (1975) confirmed the existence of prior entry and concluded that this is not simply a perceptual phenomenon but results from the decision strategy of the subject.

Kendler (1987) has suggested that the complication experiment is similar to the problem faced by umpires calling plays at first base. The umpire must attend to the visual stimulus of the runner and the auditory stimulus of the ball hitting the first baseman's glove. There is a tradition among umpires to attend to these stimuli in a particular way. As Brinkman and Euchner (1987) stated in *The Umpire's Handbook*:

The only way to make a call at first base is to watch the bag and listen for the sound of the ball hitting the glove of the fielder at first base. *If you hear the ball hit the glove before the runner's foot hits the base* [italics added], the runner is out. Otherwise, the runner is safe. (p. 83)

Because umpires are directed to focus their attention on an auditory stimulus, much as Wundt (1901) listened for the sound of the click in his complication experiment, they may experience prior entry of the auditory stimulus. This would result in safe runners being called out on close plays. It would be useful in training umpires to know if prior entry can influence their judgments and to understand how their decision strategies might promote prior entry.

To test whether prior entry might affect calls at first base, a computer simulation of such plays was designed. It was hypothesized that more runners would be called out who were actually safe than would be called safe who were

actually out. The performance of a group of umpires and a group of students was compared on this task, and it was hypothesized that the umpires' experience with similar judgments would make them less vulnerable to this bias.

## **Method**

### *Subjects*

Thirty-nine male umpires, certified by a local umpire association, were paid \$12 for participating. Because they were volunteers, the umpires represented a range of experience and expertise. Thirty-nine male college students participated to fulfill an introductory psychology course requirement.

### *Stimulus Materials*

Visual and auditory stimuli were presented on an Epson Equity 1+ computer with a monochrome monitor. A 6 mm by 3 mm rectangle was plotted at the left of the screen to represent first base. The stimulus simulating the runner was a 1 cm asterisk that was plotted and erased from the computer screen so that a new stimulus was plotted every 26 milliseconds (ms). The asterisk moved from right to left across the screen, approaching and passing first base, to simulate the view of a first-base umpire. A 10-ms burst of sound at 1000 cps was emitted by the computer during one of the plots. The sound could occur at one of five time intervals relative to the time the asterisk first touched the rectangle, resulting in five judgment situations: 130 ms before (clearly out), 26 ms before (just out), at the same time (safe, because a tie goes to the runner), 26 ms after (just safe), or 130 ms after (clearly safe). Hirsh and Sherrick (1961) reported that the threshold for perceiving the order of two events in different senses is 20 ms. Therefore, events separated by 26 ms or more could be perceived as occurring at different times.

### *Procedure*

Subjects were seated at a comfortable viewing distance from the computer monitor and read a complete description of the task from a display on the computer screen. The instructions explained that the asterisk moving across the screen represented the runner, the rectangle represented first base, and the computer beep represented the sound of the ball reaching the first baseman's glove. Subjects were instructed to call the runner safe or out immediately by typing a 1 if the runner was safe and a 0 if the runner was out. They were reminded that in the case of a tie, the runner is safe (Rumble, 1986). Subjects initiated each trial by pressing the space bar. After five practice trials, subjects made 48 calls, 6 of which were clearly safe and 6 of which were clearly out. There were 12 calls each of just safe, safe because of a tie, and just out. Calls were presented in a different random order for each subject.

## **Results**

The clearly safe and clearly out calls were used only to verify the subject's ability to perform the task. It was arbitrarily decided to discard the data of subjects who missed 25% or more of these easy calls, and so the data of one umpire

**Table 1**  
**Mean Number and Percentage of Errors**  
**for Different Judgment Situations for Umpires and Students<sup>a</sup>**

Type of call	Umpires		Students	
	<i>M</i>	%	<i>M</i>	%
Just out	1.2	10	1.8	15
Safe (tie)	6.9	57	5.5	46
Just safe	2.9	24	1.2	10
Average of tie and just safe	4.9	40	3.4	28

<sup>a</sup>Note: For 12 calls of each type.

and one student were discarded. The mean number of errors and percentage of errors for the remaining judgment situations for umpires and students are displayed in Table 1.

A two-way ( $2 \times 3$ , types of subject by judgment situations) ANOVA of number of incorrect calls revealed a main effect for type of subject,  $F(1,74)=8.98$ ,  $p<.01$ , a main effect for judgment situation,  $F(2,148)=102.50$ ,  $p<.001$ , and an interaction,  $F(2,148)=5.89$ ,  $p<.01$ .

Follow-up analyses were conducted to test the two hypotheses. First, to test for prior entry, errors for just out were contrasted with the average number of errors for tie and just safe. This revealed a significant difference,  $F(1,74)=60.45$ ,  $p<.001$ . Subjects were more likely to make errors for tie and just safe calls than for just out calls. Second, calculation of simple effects for umpires versus students, with judgment situations held constant, demonstrated that there was no significant difference between umpires and students on just out calls,  $F(2,148)=1.41$ . However, umpires made significantly more errors on tie calls,  $F(2,148)=6.95$ ,  $p<.001$ , and on just safe calls,  $F(2,148)=10.95$ ,  $p<.001$ .

A signal detection analysis was conducted to assess the possibility that umpires and students used different decision criteria for calling runners safe (Tanner & Swets, 1954). In this analysis, correct safe calls were considered hits, and safe calls when the runner was actually out were considered false alarms. There was no difference in the difficulty of the task for umpires and students based on the nonparametric statistic  $A'$  (Grier, 1971),  $t(74)=1.12$ ; but there was a significant difference in their decision criteria, based on the measure  $B''$ ,  $t(74)=2.57$ ,  $p<.05$ . In this simulation, umpires used a significantly more stringent criterion for calling the runner safe than students did.

## Discussion

The hypothesis that there would be more errors when runners were just safe and safe because of a tie than when runners were just out was supported. The contrast was 28% to 15% for students and 40% to 10% for umpires. This indicates that prior entry did occur in this simulation of first-base calls. The hypothesis that, because of their experience with such judgments, umpires would

be less susceptible to prior entry than students was not supported. In fact, umpires made more of these errors.

One explanation for the latter finding is that the task may have been more difficult for umpires than students because the contextual cues that umpires have come to rely on were missing from the simulation. However, the signal detection analysis suggests this is not true. The measure of overall difficulty of the task (A') was not significantly different for umpires and students. In contrast, umpires did have a more stringent decision criterion (B'') than students for calling runners safe. That is, umpires were more likely than students to call runners out on close plays.

One possible explanation for this tendency is the existence of a normative rule among umpires, an informal rule that differs from the rule-book specification for first-base calls. Rainey and Larsen (1988) reported that umpires have developed normative rules for calling balls and strikes and suggested that the purpose of such rules might be to hasten the end of games. Although such an interpretation of the present results is speculation, it is clear that a tendency to call runners out on close plays would also tend to hasten the end of games. Further, in a follow-up survey of 42 umpires from the same association as those who participated in this study, 26% of the respondents stated that they call runners out on tie plays at first base despite the fact that the traditional rule-book interpretation is that these runners be called safe.

In summary, the results of this study indicate that prior entry occurred in a simulation of first-base calls. This phenomenon was especially pronounced among umpires. Cairney (1975) proposed that prior entry occurs because of judgment strategies employed by subjects, and it has been suggested that prior entry may have occurred in this simulation because some umpires adopt a strategy of calling runners out on close plays. These interpretations are speculative and limited by the simulation being artificial. It remains to be determined if prior entry occurs in more realistic situations and if normative rules are the best explanation for its occurrence.

## References

- Brinkman, J., & Euchner, C. (1987). *The umpire's handbook* (rev. ed.). Lexington, MA: Stephen Greene Press.
- Cairney, P.T. (1975). The complication experiment uncomplicated. *Perception*, 4, 255-265.
- Grier, J.B. (1971). Nonparametric indexes for sensitivity and bias: Computing formulas. *Psychological Bulletin*, 75, 424-429.
- Hirsh, I.J., & Sherrick, C.E. (1961). Perceived order in different sense modalities. *Journal of Experimental Psychology*, 62, 423-432.
- Kendler, H.H. (1987). *Foundations of modern psychology*. Chicago: Dorsey.
- Rainey, D.W., & Larsen, J.D. (1988). Balls, strikes and norms: Rule violations and normative rules among baseball umpires. *Journal of Sport and Exercise Psychology*, 10, 75-80.
- Rumble, B. (Ed.). (1986). *1986 official baseball rules*. Kansas City, MO: National Federation Publications.

- Tanner, W.P., & Swets, J.A. (1954). A decision-making theory of visual detection. *Psychological Review*, *61*, 401-409.
- Wundt, W. (1901). *Lectures on human and animal psychology* (J.E. Creighton & E.B. Titchener, Trans.). New York: Macmillan. (Original work published 1896)

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