APPLIED COGNITIVE PSYCHOLOGY
Appl. Cognit. Psychol. **14**: 277–291 (2000)

Multimedia Mug Books: How Multi Should the Media Be?

HUNTER A. McALLISTER*, MARK J. BLAIR, LAURA G. CERONE and MARK J. LAURENT

Southeastern Louisiana University, USA

SUMMARY

The impact of allowing witnesses to choose the type of cues presented in multimedia mug books was explored in two experiments. In Experiment 1, participants viewed a videotaped crime and attempted to identify the perpetrator from one of three types of mug books: (a) dynamic-combined – participants could choose to follow static mug shots with a computerized video clip combining three types of dynamic cues: the person walking, talking, and rotating; (b) dynamic-separable – participants could limit the types of dynamic cues presented; and (c) static – just the static mug shot was presented. The dynamic-separable condition produced significantly fewer false positive foil identifications than the static condition. Within the dynamic-separable condition, voice was the most preferred cue. Experiment 2 explored the contribution of the individual cues. Participants attempted identifications from single dynamic cue mug books where only one type of cue was presented if a participant chose additional information. It was found that providing individual cues did not improve performance over the static mug book control. Based on the potential danger of witnesses choosing to rely on single dynamic cues, it was suggested that multimedia mug books should present dynamic cues in combination. Copyright © 2000 John Wiley & Sons, Ltd.

There is a sizable body of research on whether performance in line-ups or photospreads can be improved by the addition of dynamic cues such as voice or gait (see reviews by Shapiro and Penrod, 1986; Cutler, Berman, Penrod and Fisher, 1994). If witnesses to a crime encoded such information as voice or gait cues at the same time that they encoded facial information, voice or gait cues could operate as retrieval cues for recognizing the perpetrator's face. Only recently has the feasibility of adding dynamic cues to mug books been explored (McAllister, Bearden, Kohlmaier and Warner, 1997).

McAllister *et al*. (1997) were concerned that the research on adding dynamic cues to lineups and photospreads might not generalize to mug books. Lineups and photospreads are used when there is a suspect; the basic procedure involves presenting the suspect along with just enough innocent foils to prevent bias. Adding dynamic cues to the 6 to 12 individuals typically presented in a lineup or photospread does not present any real difficulty. In contrast, mug book searches are used when there is no known suspect. Since there is no suspect, it might be necessary to look through literally thousands of pictures. The additional number of pictures that are viewed in standard,

*Correspondence to: Hunter A. McAllister, Department of Psychology, Southeastern Louisiana University, SLU 10665, 500 Western Avenue, Hammond, LA 70402, USA. E-mail: hmcallister@selu.edu

Contract grant sponsor: National Institute of Justice, Office of Justice Programs, US Department of Justice.
Contract grant number: 97-LB-VX-K024.

Received 23 July 1998
Accepted 15 March 1999

static mug books has been found to have a detrimental effect on an eyewitness' ability to identify the perpetrator (Laughery, Alexander and Lane, 1971; Lindsay, Nosworthy, Martin and Martynuck, 1994). This decrease in performance could be explained either by the interference of the additional decoy faces or by decay as a result of the time delay (Laughery *et al*., 1971). The negative effects of either interference or the time delay on a static mug book is compounded in a dynamic mug book since the dynamic cues involve increases in both time as well as in the amount of sensory information that could interfere with the original memory.

McAllister *et al*. (1997) suggested that the problems associated with the additional length of a dynamic mug book could be solved by allowing witnesses choice as to whether dynamic cues were presented. For example, if a mug shot was of an individual who was clearly not the perpetrator, a witness could choose to omit dynamic cues. By allowing witnesses to have dynamic cues only when desired, the amount of additional time and sensory information could be kept to a minimum.

In the first test of a computerized, multimedia mug book, McAllister *et al*. (1997) addressed two basic questions: (a) Is performance on a dynamic mug book superior to performance on the traditional static mug book? and (b) Would allowing witnesses choice concerning the presentation of dynamic cues improve performance over that of a dynamic mug book where no choice was allowed? Witnesses to a videotaped crime attempted to identify the perpetrator from one of three types of computerized mug books: (a) dynamic no-choice where every static mug shot was followed by the presentation of a computerized video clip of the person walking, talking, and rotating through 360°, (b) dynamic choice where static mug shots were followed by dynamic cues only when chosen by the participant, and (c) static where just the static mug shot was presented. The greatest impact of the dynamic cues occurred for false positives. There were significantly fewer false positive identifications of the foils in the dynamic-choice condition than in the static condition. The foil most similar to the perpetrator was also less likely to be falsely identified in the dynamic-choice condition. Thus, dynamic information was found to improve mug book performance when witnesses had a choice as to its presentation.

Given that providing witnesses choice as to whether dynamic cues would be presented improved performance, it might be possible to make further improvements by giving witnesses even greater control over the presentation of cues. Witnesses could be allowed choice not only as to whether dynamic cues would be presented, but also as to the type of dynamic cue presented. For example, some witnesses might believe that they had a very good memory of the voice but not of body or gait. It might be useful for such a witness to have the option of choosing to hear the voice without having to also view the person walking. Allowing witnesses choice in the type of dynamic cues presented could significantly reduce the negative impact of delay/interference resulting in even better performance than found in the dynamic choice condition in McAllister *et al*. (1997).

There is another reason why research on witness choice of dynamic cues would be important above and beyond its implications for creating the optimal dynamic mug book. Such research would offer a unique approach to answering the question of which cues are most important to witnesses. In the past, questions of cue importance have been addressed by varying which cues were available and then examining performance. In research on adding embellished cues to photospreads, Cutler, Penrod, O'Rourke and Martens (1986) manipulated the cues of body motion, three-quarter

pose, full-body, voice, and colour. None of the separately manipulated cues had a significant impact on hits or false alarms. However, in other research with the same stimulus material used by Cutler *et al.* (1986), the effect of the combined cues could, under certain circumstances, have an effect (Cutler, Penrod and Martens, 1987; Cutler and Penrod, 1988). In the Cutler *et al.* (1986) experiment, it was the experimenter who determined which witnesses received which cues. However, if witnesses themselves determined which cues were to be presented, the impact of individual cues might show a significant impact. This notion is consistent with Wells' (1988) comments concerning retrieval cues: 'Generally, retrieval cues must be generated by the witness (i.e. internal sources) because the officer questioning the witness has no knowledge of how the witness encoded the event' (p. 8).

Experiment 1 tests if allowing witnesses to separate the desired from the undesired dynamic cues would improve performance over the procedure used in McAllister *et al.* (1997) where the cues were only available in combination. To test this question, witnesses were presented with one of three types of mug books: (a) static, (b) dynamic-combined (dynamic cues only available in combination), and (c) dynamic-separable (witness determines which dynamic cues are presented).

EXPERIMENT 1

Method

Participants and design

A total of 288 introductory psychology students (96 males, 192 females) at Southeastern Louisiana University participated for course credit. The design was a 3 (Mug book type: Static, Dynamic-combined, or Dynamic-separable) $\times$ 2 (Perpetrator: Actor 1 or Actor 2) between-subjects design. Participants were randomly assigned to one of the six experimental conditions.

Apparatus and materials

Original witnessing stimuli. The original witnessing situation was the same as used in McAllister *et al.* (1997). It consisted of a colour videotape (presented on a colour television with a 48 cm screen) of two males who were supposedly students participating in an experiment on collaborative problem solving. The roles of the two students were played by actors who were drawn from a community over an hour away to minimize the chances of their being known. Both actors were Caucasian, 22 years old, and of medium build. Although there was no formal rating procedure, it appeared to the senior author that the two perpetrators did not have any distinguishing physical, voice, or gait characteristics.

In the videotape, Actors 1 and 2 were shown being led into an experimental room by a male experimenter (Actor 3). All three individuals were seen full-body as they walked into the room. When Actors 1 and 2 were seated, the experimenter began to describe the experiment. Abruptly he stopped, claiming that he had forgotten something and left the room. After a brief conversation with Actor 1, Actor 2 got up and walked over to a computer that was sitting on a desk and began to punch some of the keys. Suddenly, he announced that he had tapped into the file with his grades and that he had just raised his grade by 30 points. He asked Actor 1 if he would like his grade raised also. Actor 1 declined, and Actor 2 returned to his seat. The experimenter

entered the room, and the scene faded. The video clip lasted approximately 5 minutes. Actors 1 and 2 were visible for the entire 5 minutes.

A second videotape was constructed using the same three individuals and the same script. However, in the second tape the perpetrator of the computer crime was played by Actor 1 and the role of the innocent bystander by Actor 2.

Mug book material. This material was the same as used in McAllister *et al.* (1997). Three years before the current experiment, 72 males from introductory psychology courses volunteered to have their mug shots taken. With the exception of race and age, no attempt was made to match these foils to the perpetrator. The filming was done in colour with a S-VHS camcorder. First, foils were filmed head and shoulder, facing the camera. Foils orally gave the same name, address, and occupation. The length of the speech sample was approximately 10 seconds. Next, they were seated on a stool and turned at a pace to complete 360° in 10 seconds. During this process, the camera was focused on their heads resulting in a 360° scan of their heads. Finally, foils were filmed walking. The filming began with a full-body shot of the foils facing the camera; they then proceeded to walk a triangular path that took approximately 10 seconds. Mug shot stills were created by selecting one frame from the head and shoulder video clip with the individual facing the camera. The same set of mug shot videos were made for each of the three actors in the computer crime scene; all three wore clothes and shoes different from those in the computer crime video.

The video tapes of the foils and crime scenario actors were digitized and stored in files on a multimedia microcomputer. Visual images were displayed on a 35 cm S-VGA monitor. Audio was presented through two external speakers.

Procedure

Participants in groups of one to four were led to a room that contained four chairs and a TV monitor/VCR combination. Participants were instructed that they would view a video tape of an experiment on collaborative problem solving. Their task was to watch the videotaped experiment and then rate the degree to which the two participants in the video tape collaborated. Half of the participants viewed the tape with Actor 1 as perpetrator; half viewed the tape with Actor 2 as perpetrator.

After the participants viewed the tape, each was led to one of four cubicles. Each participant was told that after a 30-minute delay they would be asked to attempt to identify the individual who had committed the computer crime. Participants were allowed to read magazines as they waited.

After 30 minutes the experimenter went to each cubicle and instructed the participant in the use of the computer in their room that controlled the data collection. The computer informed participants that they would be attempting to identify the computer criminal from a set of 100 pictures and even if they made an early identification, they still would be asked to view all the pictures. In fact, participants only viewed 74 pictures; they were told there would be 100 in order to reduce any tendency to make a *yes* response as the end approached (Laughery *et al.*, 1974; Lindsay and Wells, 1985). Participants were also informed that just as in actual criminal cases, the perpetrator might or might not be in the mug book. The mug book procedure was explained with a complete sample of the task procedure. Only when participants had successfully completed this sample could they proceed onto the mug book itself.

All conditions began with a static mug shot picture of the first individual in the file. The picture appeared in the upper two-thirds of the screen. The bottom third of the screen contained the question 'Was this the person who committed the computer crime?' Underneath the question were three response buttons for participants to click; the buttons were labelled *Yes*, *Maybe*, and *No*. After a response was made, the question and response buttons were replaced with new question and new response buttons. The question was 'How confident are you of the answer that you have just given?' Underneath the question were seven response buttons labelled 1 (*Not at all confident*) to 7 (*Very confident*). After this response was given, the screen was cleared and, depending on the experimental condition, one of three things occurred.

In the static condition, the computer simply went to the next static picture. In the dynamic-combined condition, participants were asked the question 'Would you like additional information?' For participants who clicked the *No* button, the computer presented the static mug shot of the next individual as in the static condition. For those participants who answered *Yes*, the computer presented the dynamic clip of the individual containing all three types of dynamic information. Following the clip, the static picture was returned to the screen and the two questions concerning identification and confidence were asked again. In the dynamic-separable condition, participants were also asked if they wanted additional information. As in the dynamic-combined condition, when the *No* button was clicked, the computer presented the static mug shot of the next individual. A *Yes* response was followed by a second question 'Which type of information would you like?' Participants chose one of four buttons labelled *Voice*, *Rotating*, *Body*, or *None*. The position of these buttons was counterbalanced across subjects. The type of information chosen determined which of the three 10-second excerpts from the 30-second video clip was presented. Following a choice of one of the three types of information, the question concerning the type of additional information wanted was repeated with the restriction that the button already chosen was removed. This procedure continued until the participant answered *None* or until all three types of dynamic information were presented. The static picture returned to the screen and the questions concerning identification and confidence were asked again. The same procedures were followed for all 74 mug shots. The perpetrator's mug shot always appeared in position 70.

Results

Lindsay *et al*. (1994) argued that mug book procedures should be considered as an investigative instrument, and therefore a lenient criterion for an identification should be used. Following their recommendations, *Yes* and *Maybe* responses were combined and treated as an identification; only *No* responses were treated as non-identifications.[1]

Depending on their experimental condition, some participants responded to a mug shot twice. In the dynamic-combined and dynamic-separable conditions participants who chose to receive dynamic cues for a particular mug shot made an initial

[1]The identification of the perpetrator measure was given a value of 1 when a correct identification was made and a score of 0 when an incorrect non-identification was made. Because the dependent variable is dichotomous, some would argue that the appropriate analysis is a Logit Analysis. However, when the responses are relatively evenly split as they are here, either ANOVA or logit analysis is appropriate and will show similar results (Goodman, 1978).

identification judgement after viewing the static mug shot (but before the dynamic cues) and a final identification judgement after viewing the dynamic cues. Participants in the two dynamic conditions who did not choose to receive dynamic cues for a mug shot as well as participants in the static condition made only one identification judgement; their initial judgement on the perpetrator based on the static picture was also their final judgement.

Performance comparison of mug book types

Four measures of performance were analysed: final judgements on – identification of perpetrator, confidence in perpetrator judgement, number of false positive identifications of foils, and average confidence on foil judgements. A 3 (Mug Book Type: Dynamic-combined, Dynamic-separable, or Static) × 2 (Perpetrator: Actor 1 or Actor 2) × 2 (Sex of Participant) multivariate analysis of variance was conducted on these tests. All significant effects are reported at the $p < 0.05$ level. There was a significant multivariate main effect for the mug book type factor, $F(8,546) = 2.764$, $MS_e = 0.002$. There was also a significant univariate effect for the mug book type factor on the confidence in perpetrator judgement, $F(2,276) = 4.711$, $MS_e = 2.05$, number of false positive identifications of foils, $F(2,276) = 3.155$, $MS_e = 20.64$, and average confidence on foil judgements, $F(2,276) = 3.318$, $MS_e = 0.11$. There was not a significant effect of mug book type on identification of the perpetrator, $F(2,276) = 1.183$, $MS_e = 0.20$.[2] Newman–Keuls *post-hoc* analyses were conducted to explore further the effect of mug book type. As can be seen in Table 1, confidence in the perpetrator judgement was significantly higher in the dynamic-combined condition ($M = 6.17$) than in the static condition ($M = 5.48$) with neither condition being significantly different from the dynamic-separable condition ($M = 5.84$). For the foil judgements there were significantly fewer false positives and greater confidence in the dynamic-separable condition ($M = 2.76$) than in the static condition ($M = 4.50$) with neither condition being significantly different from the dynamic-combined condition ($M = 3.27$). Average confidence in foil judgements was significantly higher in the dynamic-separable condition ($M = 6.82$) than in the static

Table 1. Perpetrator correct identifications, perpetrator confidence, foils 1 to 69 false positives, and average foil confidence in Experiment 1 as a function of mug book type

	Mug book type		
Measure	Dynamic-separable	Dynamic-combined	Static
Perpetrator Id (% correct)	76.82_a	66.08_a	69.73_a
Perpetrator confidence[a]	5.84_{ab}	6.17_a	5.48_b
Foils 1–69 # false positives[b]	2.76_a	3.27_{ab}	4.50_b
Average foil confidence[a]	6.82_a	6.73_{ab}	6.68_b

Note: Within a row, means with different subscripts differ significantly.
[a]Confidence ranged from 1 to 7 with higher numbers indicating greater confidence.
[b]The number of false positives could potentially range from 0 (no foils falsely identified) to 69 (all foils falsely identified).

[2]The data were also analysed using a strict criterion for an identification with only *Yes* responses being treated as an identification. The pattern of results was essentially the same as for the lenient criterion and is not reported here.

Table 2. Percentage of initial and final yes, maybe, and no responses to the perpetrator in Experiment 1 as a function of mug book condition

	Response		
Condition	Yes	Maybe	No
Initial response			
Dynamic-combined	14.7	51.6	33.7
Dynamic-separable	17.7	67.7	14.7
Static	35.1	36.1	28.9
Final response			
Dynamic-combined	32.6	32.6	34.7
Dynamic-separable	33.3	42.7	24.0
Static	35.1	36.1	28.9

condition ($M = 6.68$) with neither condition being significantly different from the dynamic-combined condition ($M = 6.73$).

Further indication of the impact of the dynamic cues can be seen by comparing initial and final responses to the perpetrator. As can be seen in Table 2, witnesses in both dynamic conditions initially made *Maybe* responses more frequently than those in the static condition. After viewing the dynamic cues both dynamic conditions showed a reduction in the number of *Maybe* responses and an increase in the number of *Yes* responses.

Participants in the dynamic-combined and the dynamic-separable conditions who chose to have additional cues presented for a particular mug shot were given a score of 1 for that mug shot and those that did not a score of 0. The choice scores for each of the foils 1 to 69 were summed to create a total foil choices score. The choice score for the perpetrator and the total foil choices score were analysed in a 2 (Mug Book Type: Dynamic-combined or Dynamic-separable) × 2 (Perpetrator: Actor 1 or Actor 2) × 2 (Sex of Participant) multivariate analysis of variance. There was a significant multivariate effect for mug book type, $F(2,183) = 5.709$, $MS_e = 0.005$. There were also significant univariate main effects for mug book type on both the perpetrator choice score, $F(1,184) = 8.92$, $MS_e = 0.19$, and the total foil choices score, $F(1,184) = 4.43$, $MS_e = 86.71$. The proportion of participants choosing additional cues for the perpetrator was higher in the dynamic-separable condition (0.83) than in the dynamic-combined condition (0.59). The number of foils 1 to 69 for which addition cues were selected was also higher in the dynamic-separable condition ($M = 12.47$) than in the dynamic-combined condition ($M = 8.97$).

Retrieval cue preferences within the dynamic-separable condition

Perpetrator. The first choice of each of the 80 participants (out of 96) in the dynamic-separable condition who chose additional cues for the perpetrator was analysed using chi-square. There was a significant difference in the frequency with which the three types of information were chosen, $\chi^2(2,N = 80) = 49.38$. As can be seen in Table 3, voice was chosen most often and rotation least often. The standardized residuals for voice (5.47) and rotation (−4.20) both had an absolute value greater than 2, indicating that they were significant contributors to the significant χ^2 value (Haberman, 1973). The number of participants choosing voice was higher than expected and the number choosing rotation lower.

Table 3. Frequency of retrieval cue choices for perpetrator and foils in Experiment 1 dynamic-separable condition

	Type of cue chosen		
Measure	Voice	Body	Rotation
Perpetrator[a]			
Number choosing first	55	20	5
Number choosing	75	66	43
Foils 1 to 69[b]			
Mean first choices	7.26	2.61	0.82
Mean total choices	9.43	5.93	2.73

[a]Number choosing first (and number choosing) could potentially range from 0 (no one in the dynamic-separable condition choosing this type cue) to 96 (all participants in the dynamic-separable condition choosing this type cue).
[b]Mean choice could potentially range from 0 (no one selecting this type of cue for any of the 69 foils) to 69 (everyone selecting this type of cue for all of the 69 foils).

Table 4. Frequency of combinations of retrieval cue choices and correct identifications for perpetrator in Experiment 1 dynamic-separable condition

Combinations	Frequency	Correct IDs
No cues chosen	16	6
One cue chosen		
Voice	11	9
Body	2	2
Rotation	0	–
Two cues chosen		
Voice and body	24	19
Voice and rotation	3	2
Body and rotation	0	–
All three cues chosen	40	35

Note: Frequency could potentially range from 0 (no one in the dynamic-separable condition exhibiting this combination) to 96 (all participants in the dynamic-separable condition exhibiting this combination).

For participants who chose to view additional cues, the frequency with which the perpetrator's voice, rotation, and body was selected (collapsed over the three occasions to choose) was analysed using Cochran's Q-statistic for dependent samples. There was a significant difference in the frequencies for the three types of cues, $Q(2,N = 80) = 47.45$. As can be seen from Table 3, voice was selected most often and rotation least often. Each pairwise comparison of the frequencies of the three types of cues was analysed using McNemar's procedure for dependent samples. Voice was chosen significantly more often than rotation, $\chi^2(1,N = 80) = 33.03$, and significantly more often than body, $\chi^2(1,N = 80) = 9.00$. Body was chosen significantly more often than rotation, $\chi^2(1,N = 80) = 16.69$. Additional insights into witness choice can be gained by considering the combination of cues chosen. Table 4 shows the breakdown of witness choices into those witnesses who chose zero, one, two, or three additional cues. As can be seen in Table 4, most witnesses chose to have more than one cue presented with only 13 of the 96 witnesses choosing to have just one cue presented. Due to small number of individuals choosing only one type of cue, it was

not possible to compare the impact of the three types of cues on identification rates. Table 4 contains the number of correct identifications for each of the combinations of cues. It is interesting to note that the highest correct identification rate was obtained by witnesses who chose all three cues; however, a chi-square analysis did not reveal significant differences among those who chose one, two, or all three additional cues.

Foils. The number of times that the voice, rotation, and body cues were selected first was totalled for foils 1 to 69. A repeated-measures factor for type of cue (voice, rotation, or body) was created and analysed along with the between-factors of perpetrator and sex. The results of the 3 (Type of Cue: Voice, Rotation, or Body) $\times$ 2 (Perpetrator: Actor 1 or Actor 2) $\times$ 2 (Sex of Participant) ANOVA revealed a significant main effect for the repeated measures type of cue factor, $F(2,184) = 22.41$, $MS_e = 39.89$. As can be seen in Table 3, voice was most often chosen first and rotation was least often chosen first. *Post-hoc* analyses using the Newman–Keuls procedure for repeated measures revealed that voice was significantly different ($p < 0.05$) from the other two conditions.

The total number of times that the voice, rotation, and body information were chosen for foils 1 to 69 were also analysed in a 3 (Type of Cue: Voice, Rotation, or Body) $\times$ 2 (Perpetrator: Actor 1 or Actor 2) $\times$ 2 (Sex of Participant) ANOVA. Again there was a significant main effect for the type of cue factor, $F(2,184) = 31.31$, $MS_e = 29.03$). As can be seen in Table 3, voice was most often chosen and rotation was least often chosen. *Post-hoc* analyses using the Newman–Keuls procedure for repeated measures revealed that each condition was significantly different ($p < 0.05$) from each of the other two conditions.

Discussion

One of the purposes of Experiment 1 was to determine whether a multimedia mug book using dynamic-separable cues would be effective. Although the dynamic-separable condition had the highest percentage of correct identifications of the perpetrator, there were no significant differences on this measure. The failure to find mug book type differences on the perpetrator measure is consistent with past research (McAllister *et al.*, 1997). There were significantly fewer false positive identifications of foils in the dynamic-separable condition than in the static mug book. However, although false positives in the dynamic-separable condition were also lower than in the dynamic-combined condition, the difference was not significant. The one area where the dynamic-separable condition was significantly different from the dynamic-combined condition was in the number of times that the dynamic cues were used. Dynamic cues were selected for both the perpetrator and the foils significantly more often in the dynamic-separable condition than in the dynamic-combined condition. In summary, the dynamic-separable condition would seem to be superior to the static condition (based primarily on the reduction of false positives) and at least as effective as the dynamic-combined condition.

A second purpose of Experiment 1 was to determine which types of dynamic cues witnesses would find most important. In the past, research, which has added cues such as voice or movement, importance was inferred based on hits and false positives. In the current research, importance to the witness could be determined more directly by analysing how often the type of information was chosen as well as how often it was chosen first. Using these criteria, the preferred type of dynamic cue was clearly voice.

Voice was most often chosen and most often chosen first for both perpetrator and foils. The least preferred type of dynamic cue was consistently rotation. Rotation was least often chosen first and least often chosen overall for both perpetrators and foils.

The finding that the rotation information was not of particular interest to witnesses is rather ironic. One of the main features of rotation is that it provides a profile, and profiles are the one type of additional cue that often accompanies the front view mug shot in standard mug books. Thus, the additional cue that is currently most often provided in mug books is the cue that is of least interest to the witness.

Although it is clear that witnesses in this experiment much preferred the voice cues, it is not clear that they really knew what would have been most useful to them. Past research which has added voice to lineups or photospreads has not always resulted in improved performance. Does adding voice to mug books actually improve performance? Were the voice cues provided in McAllister *et al.* (1997) the major contributor to the success of the dynamic mug shots that combined voice, rotation, and body? Unfortunately Experiment 1 cannot answer the question of how important the individual cues were. Even though most participants did select voice more often than the other cues, the majority also selected additional cues; due to the very small N, it was not possible to compare witnesses who selected just voice cues with those who selected just body or just rotation. Experiment 2 was conducted to test these comparisons.

EXPERIMENT 2

Experiment 2 provides a test of the impact of the three types of dynamic cues. This was accomplished by limiting a witness's choice of additional dynamic cues to one type of cue. Participants were randomly assigned to a condition where they had one of the three types of cues available; a fourth group of participants was assigned to the static control condition.

A second purpose of Experiment 2 was to provide yet another indication of witnesses' preferences for dynamic cues. In Experiment 1, there was still a certain amount of inference required in determining which cues the witnesses found most important. It was necessary to infer that the type of information chosen first or chosen most often was seen as the most important by witnesses. However, witnesses always knew that they had the option of choosing any or all of the other cues. Experiment 2 provides a more direct measure of witnesses' preferences for dynamic cues. After all three types of dynamic cues were demonstrated, participants were told that they would be limited to only one of the three types of cue. They were then asked to pick the cue that they believed would be most useful to them because some participants would be assigned to the type of cue that they preferred. In reality, participants were randomly assigned to one of the four mug book conditions. This design first allows a comparison of the relative effectiveness of the three types of cue. In addition, after subdividing the participants as a function of their preferred cue, it would be possible to determine whether witnesses' preferences were related to their performance.

Method

Participants and design

A total of 240 introductory psychology students (80 males, 160 females) at Southeastern Louisiana University participated for course credit. The design was a 4 (Mug

Book Type: Voice, Body, Rotation, or Static) × 2 (Perpetrator: Actor 1 or Actor 2) between-subjects design. Participants were randomly assigned to one of the eight experimental conditions.

Apparatus and materials

The original witnessing situation and mug book material were the same as used in Experiment 1.

Procedure

The procedure was the same as in Experiment 1 up to the point where the computerized mug book was explained and an example given. Participants were told that the computer would assign some of them to conditions where additional information would be provided, and that information would be one of three types – voice, rotation, or full body. Participants then went through the example which showed them each of the three types of information. At the end of the example they were told that depending on the experimental condition to which they were assigned, it might or might not be possible to provide them with the type of information that they believed would be most useful to them. They were then asked which type of information that they would prefer, *Voice*, *Rotation*, or *Full body*. The left to right position of these buttons was randomized for each participant.

Following the choice of the preferred type of dynamic cue, participants were randomly assigned to one of the four mug book conditions; thus, approximately one quarter of the participants were assigned to their preferred dynamic cue and one quarter were assigned to each of the other three conditions. Participants in the static condition went through exactly the same procedure as in Experiment 1. Each static picture was followed by the question of whether this was the perpetrator (*Yes*, *Maybe*, or *No*), and the second question concerning confidence. For the two dynamic conditions, the presentation of the static picture and the two questions was followed by the question 'Would you like additional information?' For participants who answered *No*, the computer presented the static mug shot of the next individual. For participants who answered *Yes*, the computer presented either the voice, rotation, or full-body dynamic cue, depending on the participant's experimental condition. Following the dynamic cue, the static picture was returned to the screen, and the two questions concerning identification and confidence were asked again.

Results

Retrieval cue preference

Participants' choice of which of the three types of dynamic cues they preferred was analysed using chi-square. There was a significant difference in the frequency with which the three types of information were chosen, $\chi^2(N = 240) = 103.83$. Of the 240 participants, 153 chose voice, 56 chose body, and only 31 chose rotation. The standardized residuals for voice (8.16), body (−2.68), and rotation (−5.478), all had absolute values greater than 2 indicating that they were all significant contributors to the significant χ^2 value (Haberman, 1973).

Table 5. Perpetrator correct identifications in Experiment 2 as a function of mug book type and perpetrator

	Mug book type			
Perpetrator	Voice	Rotation	Body	Static
Actor 1	47.50_{a}	75.00_{ab}	82.00_{b}	85.00_{b}
Actor 2	76.52_{a}	80.16_{a}	74.17_{a}	75.31_{a}

Note: Within a row means with different subscripts differ significantly.

Performance comparison of mug book types

Four measures of performance were analysed: final judgements on–identification of perpetrator, confidence in perpetrator judgement, number of false-positive identifications of foils, and average confidence on foil judgements. A 4 (Mug Book Type: Voice, Rotation, Body, or Static) × 2 (Perpetrator: Actor 1 or Actor 2) × 2 (Sex of Participant) multivariate analysis of variance was computed on these tests. There was a significant multivariate main effect for the mug book type factor, $F(12,585) = 1.974$, $MS_e = 0.002$. The only significant univariate main effect for the mug book type factor was on the confidence in perpetrator judgement, $F(3,224) = 4.495$, $MS_e = 2.05$. Newman–Keuls *post-hoc* analyses revealed that confidence in the perpetrator judgement was significantly lower in the static condition than the other three conditions.

The MANOVA also revealed a significant interaction of Mug Book Type × Perpetrator, $F(12,585) = 1.789$, $MS_e = 0.002$. Follow-up univariate tests revealed a significant Mug Book Type × Perpetrator interaction on the identification of the perpetrator, $F(3,224) = 3.489$, $MS_e = 0.178$. Newman–Keuls *post-hoc* analyses were conducted to explore further the nature of the interaction. As can be seen in Table 5, there were no significant differences in identification rates among the four mug book conditions for Actor 2 as perpetrator. For Actor 1 as perpetrator, the identification rate for the voice condition was significantly lower than for the body or static condition.

Participants in voice, rotation, and full-body conditions that chose to have additional cues presented for a particular mug shot were given a score of 1 for that mug shot, and those that did not a score of 0. The choice scores for each of the foils 1 to 69 were summed to create a total foil choices score. The choice score for the perpetrator and the total foil choice score were analysed in a 3 (Mug Book Type: Voice, Rotation, or Body) × 2 (Perpetrator: Actor 1 or Actor 2) × 2 (Sex of Participant) multivariate analysis of variance. There were no significant multivariate or univariate effects. The grand mean for the proportion of witnesses requesting additional information for the perpetrator ($M = 0.79$) was comparable to the dynamic-choice condition ($M = 0.84$) in McAllister *et al.* (1997) and the dynamic-separable condition ($M = 0.83$) in Experiment 1. The grand mean for the number of times that information was chosen for foils ($M = 7.45$) was comparable to the dynamic-choice condition ($M = 8.54$) in McAllister *et al.* (1997) but somewhat less than chosen in the dynamic-separable condition ($M = 12.47$) in Experiment 1.

To determine whether witnesses' preferred cues were related to how effectively the various types of cue were utilized, participants were divided into three groups (Preference: Voice, Rotation, or Body) based on their initially stated cue preference.

The four measures of performance (final judgements on – identification of perpetrator, confidence in perpetrator judgement, number of false positive identifications of foils, and average confidence on foil judgements) and the two choices of additional information measures (perpetrator and total foil) were analysed in a 3 (Mug Book Type: Voice, Rotation, or Body) × 2 (Perpetrator: Actor 1 or Actor 2) × 3 (Preference: Voice, Rotation, or Body) multivariate analysis of variance. No new significant interactions involving the preference factor resulted.

Discussion

The results of Experiment 2 confirmed those of Experiment 1: witnesses preferred voice cues. In contrast to Experiment 1 where witnesses could choose all of the cues, in Experiment 2 witnesses were asked to choose the one type of cue that they believed would be most useful to them. Voice was the clear first choice, full-body a distant second choice, and rotation the last choice. These rankings were exactly the same as the ranking in Experiment 1 based on the type of cue chosen first and the cue chosen most often.

Although voice was clearly the preferred cue, was there evidence that it was the most useful? Analysis of the performance data found that contrary to past research with computerized mug books, there was no evidence that the addition of dynamic cues improved performance. In McAllister *et al.* (1997) and in Experiment 1, computerized mug books reduced the number of false-positive identification of foils. However, in Experiment 2 there was no evidence that the dynamic mug books using single dynamic cues were superior to the static control. In addition, not only did single dynamic cues fail to improve witnesses' ability to identify the perpetrator, one of the computerized mug books (voice) produced significantly *lower* correct identification rates of Actor 1 as perpetrator than the static control condition.

The differential effectiveness of computerized mug books in Experiments 1 and 2 is consistent with the finding by Cutler and his colleagues with photospreads. These researchers found that context cues presented in combination under certain conditions led to improved photospread performance (Cutler *et al.*, 1987; Cutler and Penrod, 1988). However, when the cues were tested separately, they did not have an effect on performance (Cutler *et al.*, 1986). It would appear that for mug books, just as for photospreads, the effectiveness of context cues is dependent on the cues being used in combination rather than singly.

It had been predicted that the effectiveness of the individual cues might be greater if witnesses determined which cues were presented. To test this possibility, a witness preference factor was included in an analysis with mug book type. To the extent that witness preference determines the effectiveness of the individual cues, a significant Preference × Mug Book interaction would have been expected on the performance scores; however, none was found. Giving witnesses their preferred individual cue did not improve their performance.

One possible limitation to the implications of this experiment for the importance of witnesses being able to determine their own context cues concerns the way in which this choice of cues was operationalized. In the current research a witness' preference was only taken at the beginning before the mug books search began. It is possible that witnesses might have wanted voice cues for some mug shots but wanted body information for others. To the extent that preferences changed from one face to

another, the procedure used in Experiment 2 might not have allowed for the strongest test of Wells' (1988) hypothesis.

GENERAL DISCUSSION

What do the results of the two experiments tell us about how to design multimedia mug books? Should witnesses be allowed to select which types of dynamic cues are presented? Based on Experiment 1, allowing witnesses to separate out the desired dynamic cues from the undesired cues would seem reasonable. Experiment 1 demonstrated that when allowed to select the types of dynamic cues to be presented, witnesses' performance was better than the static control for foils and at least as good for the perpetrator. Fewer false positives mean fewer false leads to investigate and hence savings in valuable police time. In addition, reductions in false positives reduce the likelihood that an innocent individual would be convicted based on being falsely identified in a mug book search. Any technique that can reduce the number of false positives without compromising correct identifications of the perpetrator is of value. Thus, it would appear that dynamic mug books should allow separable cues. However, there are some serious qualifications to this conclusion.

The mug book in Experiment 1 contained only 74 mug shots. Given the small size of the mug book, it is not surprising that most of the witnesses in the dynamic-separable condition were rather liberal in their choices. For example, as can be seen in Table 4, only 13 of the 80 participants in this condition who chose to have cues presented for the perpetrator stopped with one type of cue; in fact, 40 of the 80 chose to have all three types of cues presented. However, when dealing with much larger mug books, witnesses might be more judicious in their choices to speed up the search process. What would happen if witnesses began limiting themselves to just their preferred type of cue?

If witnesses did limit their choices of dynamic cues to their preferred cue, the results of both Experiment 1 and Experiment 2 suggest that the cue selected would be voice. If witnesses did fall into the pattern of just selecting voice, the results of Experiment 2 show that this could potentially have a negative impact on performance. Witnesses in Experiment 2 using voice cues performed worse in identifying Actor 1 as perpetrator than witnesses in the static control condition. Of course, the preference for voice might not occur in all situations. However, even if rotation or body were chosen, these single cues did not improve performance. Leaving the witness the option of selecting just one type of cue would not seem advisable. The slight gains that might occur with optimal use of dynamic-separable cues are more than offset by the potential danger of witnesses using single cues. Presenting the cues in combination as was done in the dynamic-combined condition in Experiment 1 and in the dynamic-choice condition of McAllister *et al.* (1997) would seem to be the better approach. As with photospreads, witnesses seem to need a combination of dynamic cues to improve mug book performance; we need to keep the 'multi' in multimedia mug books.

AUTHOR NOTE

This research was supported under award #97-LB-VX-K024 from the National Institute of Justice, Office of Justice Programs, US Department of Justice to Hunter

A. McAllister. Points of view in this document are those of the author and do not necessarily represent the official position of the US Department of Justice.

REFERENCES

Cutler, B. L., Berman, G. L., Penrod, S. and Fisher, R. P. (1994). Conceptual, practical, and empirical issues associated with eyewitness identification test media. In D. F. Ross, J. D. Read and M. P. Toglia (Eds), *Adult eyewitness testimony: Current trends and developments* (pp. 163–181). New York: Cambridge University Press.

Cutler, B. and Penrod, S. D. (1988). Improving the reliability of eyewitness identification: Lineup construction and presentation. *Journal of Applied Psychology*, **73**, 281–290.

Cutler, B., Penrod, S. D. and Martens, T. K. (1987). Improving the reliability of eyewitness identifications: Putting context into context. *Journal of Applied Psychology*, **72**, 629–637.

Cutler, B. L., Penrod, S. D., O'Rourke, T. E. and Martens, T. K. (1986). Unconfounding the effects of contextual cues on eyewitness identification accuracy. *Social Behaviour: An International Journal of Applied Social Psychology*, **2**, 113–134.

Goodman, L. A. (1978). *Analyzing qualitative/categorical data*. Cambridge, MA: Abt Books.

Haberman, S. J. (1973). The analysis of residuals in cross-classified tables. *Biometrics*, **29**, 205–220.

Laughery, K. R., Alexander, J. F. and Lane, A. B. (1971). Recognition of human faces: Effects of target exposure time, target position, pose position, and type of photograph. *Journal of Applied Psychology*, **55**, 477–483.

Laughery, K. R., Fessler, P. K., Lenorovitz, D. R. and Yoblick, D. A. (1974). Time delay and similarity effects in facial recognition. *Journal of Applied Psychology*, **59**, 490–496.

Leippe, M. R. (1980). Effects of integrative and memorial cognitive processes on the correspondence of eyewitness accuracy and confidence. *Law and Human Behavior*, **4**, 345–351.

Lindsay, R. C. L., Nosworthy, G. J., Martin, R. and Martynuck, C. (1994). Using mug shots to find suspects. *Journal of Applied Psychology*, **79**, 121–130.

Lindsay, R. C. L. and Wells, G. L. (1985). Improving eyewitness identifications from lineups: Simultaneous versus sequential lineup presentation. *Journal of Applied Psychology*, **70**, 556–564.

McAllister, H. A., Bearden, J. N., Kohlmaier, J. R. and Warner, M. D. (1997). Computerized mug books: Does adding multimedia help? *Journal of Applied Psychology*, **82**, 688–698.

Shapiro, P. N. and Penrod, S. (1986). Meta-analysis of facial identifications studies. *Psychological Bulletin*, **100**, 139–156.

Wells, G. L. (1988). *Eyewitness identification: A system handbook*. Toronto, Ontario, Canada: Carswell.

