Free-throw shooting during dual-task performance: Implications for attentional demand and performance

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Abstract:

In this study, the dual-task paradigm was used to determine peak attentional demand during the free-throw process. Thirty participants completed 40 free-throw trials. The free throw was the primary task, but participants also verbally responded to a tone administered at one of four probe positions (PP). Repeated measures analysis of variance showed no significant difference in free-throw performance across PPs, indicating participants were able to keep the free throw as the primary task. Repeated measures analysis of response time (RT) showed significant differences, with RT at PP1 (preshot routine) and PP2 (first upward motion of the ball) significantly higher than baseline RT. These results suggest that PP1 requires the greatest attentional demand, followed by PP2.

Keywords: basketball | capacity theory | dual-task paradigm | reaction time

Article:

Limits in attentional capabilities become readily apparent when attempting to perform multiple tasks at the same time, such as making business calls while driving or balance the checkbook while cooking dinner. No matter how programmed the tasks are when performed individually, interference affects the one, if not both, actions when done simultaneously. The division of attention among multiple streams of incoming information is a classic psychological dilemma. William James (1890) defined attention as "The taking possession of mind in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. It implies withdrawal from some things in order to deal effectively with others…" (pp. 403–404). The definition suggests that attention is a constant battle of attending to the appropriate information at the appropriate times. James also implied that drawing attention from certain stimuli to attend to others is not passive but requires intention and conscious effort.

Research on observations of dual-task performance led to two predictions: (a) interference occurs even when the two activities do not share common mechanisms; and (b) the extent of interference depends in part on the attentional load each activity imposes (Kahneman, 1973). Therefore, performance on any task done concurrently with another is likely to be interrupted by capacity interference, and the amount of attention the task requires determines the extent of interference. These predictions are based on capacity theory, which states that attentional capacity is limited and interference occurs when the demands of two activities exceed available capacity (Kahneman, 1973). Posner and Rossman (1965) demonstrated the limits in attentional capacity when they asked participants to retain three letters for a brief interval during which they engaged in mental tasks of varied complexity. Retention decreased with increasing difficulty of the secondary task, demonstrating that an increase in attention to one task left less attention available for a second task.

While capacity theory states that attention can be allocated between two tasks with considerable freedom, performance falters or fails when the attention supply does not meet the demands. In addition, the theory holds that different tasks require varying amounts of attention. Therefore, an "easy" task leaves attentional resources available to support a secondary task. However, a "difficult" task requires greater attention, leaving fewer resources for secondary task performance (Styles, 2006).

The dual-task paradigm was developed to determine task difficulty and, therefore, the amount of attention devoted to a particular task at any given time (James, 1890). It is used to test attentional capacity theories and is based on the premise that (a) different tasks demand varying degrees of processing and (b) simultaneous task performance can overload the limited capacity system (Kahneman, 1973). In a dual-task setup, participants are asked to complete a primary task alone and then concurrently with a secondary task. Each task is assigned a weight, indicating how strongly it competes for limited attentional resources (Bourke, Duncan, & Nimmo-Smith, 1996). The greater the weight of a primary task, the greater its interference with all secondary tasks being performed concurrently. Performance on the secondary task is then assessed and used to derive the attentional demand of the primary task. Therefore, if primary Task A relates to decreased secondary task performance as compared to primary Task B, it can be concluded that Task A requires greater attention than Task B.

The response time (RT) probe technique is commonly used within the dual-task paradigm (Prezuhy & Etnier, 2001). This technique assumes that (a) a fixed attentional capacity is available to perform the primary task, and (b) examining RT of the secondary task can be used to assess this capacity. If the primary task requires a large portion of the individual's limited attention pool, then only a small fraction remains to devote to the secondary task; RT, then, will suffer in order to maintain primary task performance (Prezuhy & Etnier, 2001). Thus, research using the RT probe technique and dual-task paradigm is useful to determine time course of attention for a particular task and the impact of multiple tasks on attentional demands in real-world sport settings.

The RT probe technique has been used to document the time of peak attention in several sport tasks. Castiello and Umilta (1988) found that RT was slowest in both a tennis and volleyball reception task just as the ball landed in the near court. Castiello and Umilta also found that for both the 100-m dash and 110-m hurdles, RTs were slower at the beginning and end of the race than at intermediate times. Rose and Christina (1990) found a different pattern of attentional demand in pistol shooting: the mean probe RT to an auditory tone increased in a near linear fashion as the time to the shot neared, concluding that the demands on attentional capacity were greatest at the interval (0–2,500 ms) immediately preceding the shot.

In horseshoe pitching, Prezuhy and Etnier (2001) found that RTs were faster at PP2 (when the throwing hand reached its farthest extention behind the body) and slower at PP1 (when the initiating movements began) and PP3 (point just prior to horseshoe release), suggesting participants devoted more attentional resources toward the primary task at PP1 and just prior to PP3 than they did at PP2. In addition, Sibley and Etnier (2004) used a dual-task paradigm to examine the pattern of attention demands in a volleyball set. An auditory tone was played at four probe positions: (a) as the ball was being tossed, (b) just prior to the peak of the toss, (c) just after the peak of the toss, and (d) just prior to the ball touching the participant's hands. Participants were instructed to respond verbally to the auditory tone as quickly as possible. Results showed a significantly greater RT at PP1, indicating the greatest attentional demand was during the initial portion of the ball's flight. Through numerous studies, the dual-task paradigm and RT probe technique were shown to be effective in investigating the role of attention in performing motor skills in sport settings. However, extending these applied studies to new sport skills is needed to further understand this role (Rose & Christina, 1990).

Purpose and Hypotheses

The free throw is a critical skill for successful basketball performance. As the throw is "free" from defenders, one would assume it to be the least likely basketball skill to be affected by distractions. However, because the shooter is singled out, he/she is more vulnerable to and often the target of attentional distractions, particularly auditory and visual distractions that are unexpected and irrelevant to performance. Successful free-throw performance requires both attentional skills and physical ability; therefore, understanding the attentional demands of the skill may provide guidance for improving performance.

The purpose of this study was to determine the time course of attention during the basketball free throw. Because verbal RT to the tone was a secondary priority to free throw performance, the actions requiring the greatest attentional demand would require more central processing capacity, leading to decreased performance on the auditory RT task compared to baseline RT performance. In particular, we hypothesized that RTs would be slowest during PP2 (preshot) and PP3 (shot), when the shooter's attention was directed to kinesthetic movement. Attention is critical during these phases to carry out precise muscle coordination and maintain proper technique to make a shot.

Method

Participants

Participants were 30 individuals (4 women, 26 men), ranging in age from 18 to 62 years (M age = 23.9 years, SD = 8.3). Most participants were 18–28 years of age, with 3 outside this range (at 30, 37, and 62 years). Each participant had at least 2 years of basketball experience at high school level. Playing experience ranged from junior varsity (n = 2) to varsity (n = 14) and college (n = 14). The institutional review board approved the research, and all participants signed an informed consent form before beginning the study.

Measures/Instrumentation

The study took place in a gym with a free-throw line marked at the regulation NCAA and high school distance of 4.57 m from the backboard. Because of the experiment design and the need to administer tones at specific probe positions unique to each individual, the experimenter controlled the auditory tones by manually pressing “play” on the iTunes program. The tone played through speakers attached to a laptop computer and lasted 0.915 s. As in the Prezuhy and Etnier (2001) study, a speaker system helped maintain ecological validity, because environmental noise from spectators and other background noise are common in basketball, especially during free throws.

Digital videotaping with frame-by-frame breakdown capability was used to ensure tones were presented at the four analysis points. Following each free-throw session, the investigator examined the videotapes to ensure each tone was presented in the defined probe position time (see Table 1). If a particular tone was not administered within the defined period, the average of the other trials for that specific probe position (1, 2, 3, etc.) was used for that particular trial. If more than two tones in a specific probe position were incorrectly administered, the participant’s data were excluded.

Table 1. Probe positions

No.	Name	Description
1	Preparation	After catching the bounce pass and before the first upward motion of the ball (during preshot routine)
2	Preshot	The first upward motion of the ball—before ball reaches chest level
3	Shot	The remaining upward motion of the ball—until the ball leaves the fingertips
4	Flight	Immediately after the ball leaves the fingertips and before contact with the hoop/backboard
5	Catch	No tone is sounded—used to reduce anticipatory effects

Auditory equipment was also used to detect the tone and the participant’s verbal response to measure and record RT. Audacity® (Audacity Team, 1999–2008) audio editor and recorder were used to record both the tone and response. A microphone clipped to the participant’s shirt picked up sound and sent a signal to a voice-activated relay mechanism to measure and record RT. A built-in spectrogram and “plot spectrum” allowed for detailed frequency analysis.

Procedures

Each participant performed in one individually arranged session, which took approximately 20 min, including arrival, briefing, warm-up, and the dual-task procedures. Participants were first briefed on what they could expect, the number of shots they would take, and instructions for their response to the auditory tone. Next, they began at the free-throw line and were asked to respond to the auditory tone as quickly as possible by saying “ball.” The average RTs of these five trials, which did not include a ball, served as a baseline RT score. Immediately following the baseline trials, the participant took five warm-up free throws, which were not scored; then they shot 10 free throws that were not interrupted by the auditory tone. Although RT was not measured during these trials, the shooter wore the auditory equipment (microphone) to maintain stable conditions across the experiment. All 10 shots were scored, and performance on 8 (chosen randomly by the investigator) of the 10 comprised the baseline measure for analyses. Based on pilot data, a shooting percentage of eight shots was assumed to be a reliable representation of performance. Only data from participants who shot a baseline performance of 50% or greater were used for analysis to ensure that (a) the participants were moderately to highly skilled free-throw shooters, and (b) any poor performance observed during the secondary task condition was not due to a lack in skill.

Scoring was based on complete miss (0 points), near miss (ball hits rim; 1 point), or make (2 points). Participants then completed the same free-throw task concurrently with a secondary auditory RT test. They were reminded to treat the free-throw shot as the primary task, assigning it the most attentional weight. Given that constraint, they were also asked to do as well as possible on the secondary task. The investigator administered eight tones at each of the four probe positions. Eight catch trials were also included for a total of 40 shots. As suggested by both Prezuhy and Etnier (2001) and Sibley and Etnier (2004), catch trials, in which no tone is given, were included to eliminate anticipation effects. Catch trials were separate from the four probe position trials. Because no tone was sounded, RT was not measured during these trials. However, free-throw performance was recorded to compare it to baseline performance. Because anticipation of the tone could lead to faster RTs, participants were told the catch trials would be random to provide more accurate and real RT measurement. The random order was set prior to the experiment. As in the baseline RT trials, participants responded to the tone by yelling “ball” as quickly as possible.

Data Reduction

The basketball free throw is characterized by a preshot routine unique to every individual, making it difficult to identify specific probe positions common to all shooters. However, the investigator identified four probe positions that could be visually identified for all shooters at some point of the free throw. The shooter was allowed to use the preshot routine he/she felt most comfortable with but used the same routine prior to each shot. The four probe positions were: (a) preparation, (b) preshot, (c) shot, and (d) flight and are described in more detail in Table 1. To establish interobserver reliability, a second observer examined each trial for a randomly selected participant to ensure the investigator had appropriately administered the tone at each probe position and had properly measured RT.

The time of peak attentional demand was determined by the point of time (probe position 1, 2, 3, or 4) at which RT was significantly slowest. At the same time, to examine the effect of this dual-task on performance, free throw performance scores were compared between primary and secondary tasks. Additionally, free-throw performance on the catch trials was compared to baseline performance to ensure the secondary task did not impact primary task performance.

Audacity waveforms were enlarged and audio playback was slowed to 20% of the original speed so that the investigator could pinpoint the exact point of each sound. Audacity automatically displays the time elapsed between any two waves, making data analysis more accurate.

Therefore, by placing the cursor on the wave representing the auditory tone, then dragging to the wave representing the vocal response, RT was measured with a resolution of 0.0001 s.

Data Analysis

For this study, RT is defined as the time from the beginning of the auditory tone to when the verbal response reaches a waveform amplitude of 0.1 dB. All recorded data were analyzed through the Audacity program. The beginning of the auditory tone was distinguished by visual and aural identification of a burst in waveform activity. The beginning of the verbal response was identified by using envelope editing, a tool provided by the Audacity program that automatically marks a waveform amplitude of 0.1 dB for each trial. The point at which the waveform representing the verbal response first intercepts a waveform value of 0.1 dB is used as the ending time of the RT measurement. Figure 1 illustrates how these data were derived.

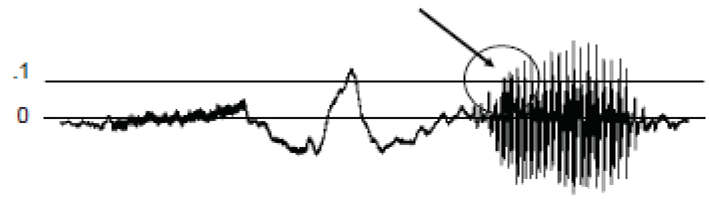

Figure 1. Measuring verbal response time

With the RT probe technique, attentional demand cannot be properly assessed if the primary task is not given the most attentional weight (Prezuhy & Etnier, 2001). To check that participants maintained primary task performance during the experimental trials, analysis of variance (ANOVA) with repeated measures was used to compare primary task performance at baseline and across the four probe positions and catch trials.

To examine the time course of attentional demands, RT was examined using a one-way ANOVA with repeated measures. Because the auditory tone was sounded eight times for each probe position, the average of these trials was used as the dependent measure in the one-way, within-participants ANOVA with five different levels (the four probe positions and baseline RT). Finally, to establish differences between participants, they were grouped by level, years of experience, and number of years inactive from competitive basketball. Three separate two-way mixed ANOVAs were then used to reveal differences in free-throw performance as a function of each factor.

Results

Separate repeated measure ANOVAs were used to determine how the timing of the auditory tone affected performance and RT. Significant ANOVAs were followed by tests of simple contrasts. Finally, to examine whether differences in basketball experience affected the dependent variables, a two-way mixed ANOVA was used. Participants were grouped according to their level of basketball experience, the number of years they had been active in a basketball-related activity, and the number of years they had been inactive from competitive basketball.

RT Recordings

Figure 2 shows a representative sample of the recordings used to derive RT data. For each participant, 37 trials were analyzed (eight trials for each of the four probe positions and five baseline RT trials). Only one participant did not meet the 50% baseline performance minimum requirement, and those data were not included. As the figures indicate, dual-task recordings had a greater amount of background “noise” due to the sound of the ball bouncing, participant’s movement, etc. The increase in waveform amplitude due to the sound of the auditory tone and the verbal response was identified with confidence by using both visual and auditory evidence.

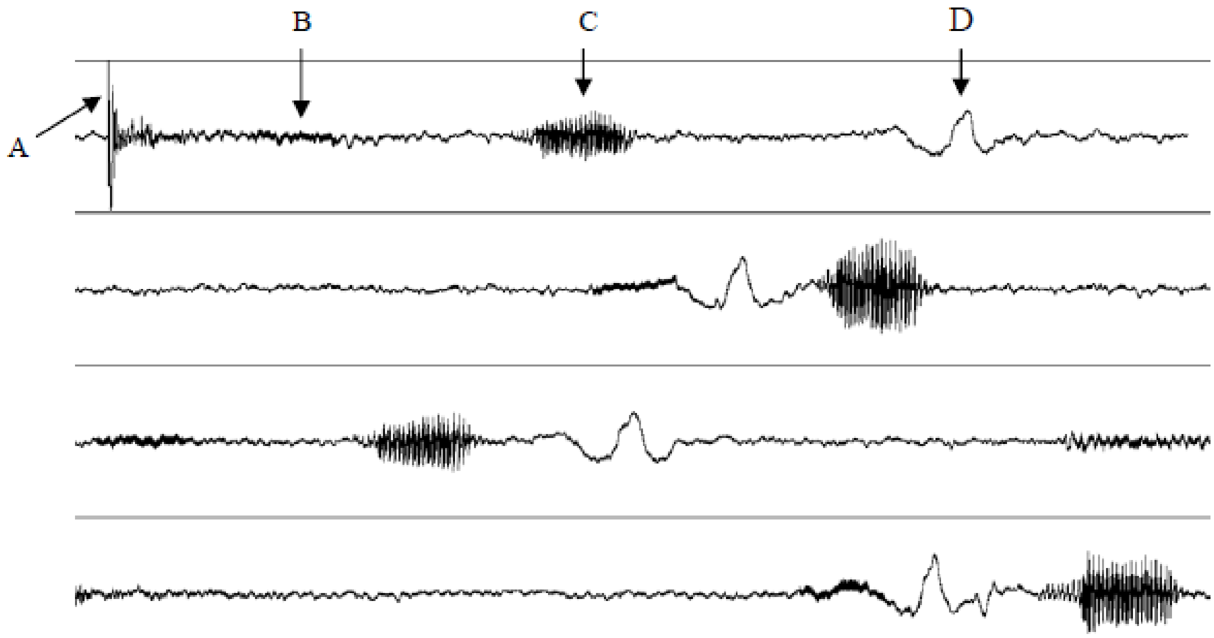

Figure 2. Response time recordings during dual-task performance (A—ball bounce; B—auditory tone; C—verbal response; D—background noise, such as ball hitting rim).

Interobserver Reliability

To prevent transcription errors, the investigator entered the start and end times of the RT measurement into an excel spreadsheet. The computer program rounded values to .0001 s. In addition, the spreadsheet did not display the order in which recordings were presented, so the investigator was not aware which probe position was being analyzed. A secondary observer analyzed both video and RT data for one participant in the same manner to establish reliability of data measurement. Intraclass correlation showed that the measured RTs between the two observers were highly reliable (interval of 0.967–0.991 with 95% confidence), suggesting the guidelines were appropriate for measuring RT and scores can be reliably reproduced by other observers. A second observer also reviewed videotaped data to ensure that each tone was administered in the intended and defined probe position. The second observer was in 93.75% agreement with the investigator over 32 trials for a single participant, with the investigator being stricter in scoring. Overall, the investigator was accurate in administering the tones within their defined probe positions. Of a total of 960 trials (32 tone-administered trials x 30 participants), only 22 tones (2.3%) were misplayed and the average of the remaining correct trials was used to replace these data. The breakdown of incorrect tones is as follows: PP1—seven; PP2—ten;

PP3—three; PP4—two. No data had to be excluded due to investigator error on tone administration.

Free-Throw Performance

Repeated measures ANOVA showed no significant difference in performance as a function of condition (probe position), $F(5, 145) = .870$, $p > .05$, $\eta^2 = .029$. Table 2 shows the performance means and standard deviations for all conditions. Additional tests of simple contrasts showed no significant differences among any of the four probe positions and baseline performance. This suggests participants maintained the free throw as the primary task, assigning it the most attentional weight. Figure 3 is a graphical presentation of free-throw performance across conditions. Given these results, with the dual-task paradigm, any increases or decreases in RT performance across probe positions can be attributed to attentional demand.

Table 2. Influence of condition on free throw performance

Condition	Min.	Max.	*M*	% Perf.	*SD*
PP1	1.375	2	1.70	85.0	.1986
PP2	1.125	2	1.66	83.0	.2520
PP3	1.250	2	1.67	83.5	.1955
PP4	1.125	2	1.65	82.5	.2008
Catch	1.250	2	1.73	86.5	.1740
Baseline	1.380	2	1.69	84.5	.1930

Note. Min. = minimum; Max. = maximum; Perf. = performance; *M* = mean; *SD* = standard deviation; PP = probe position.

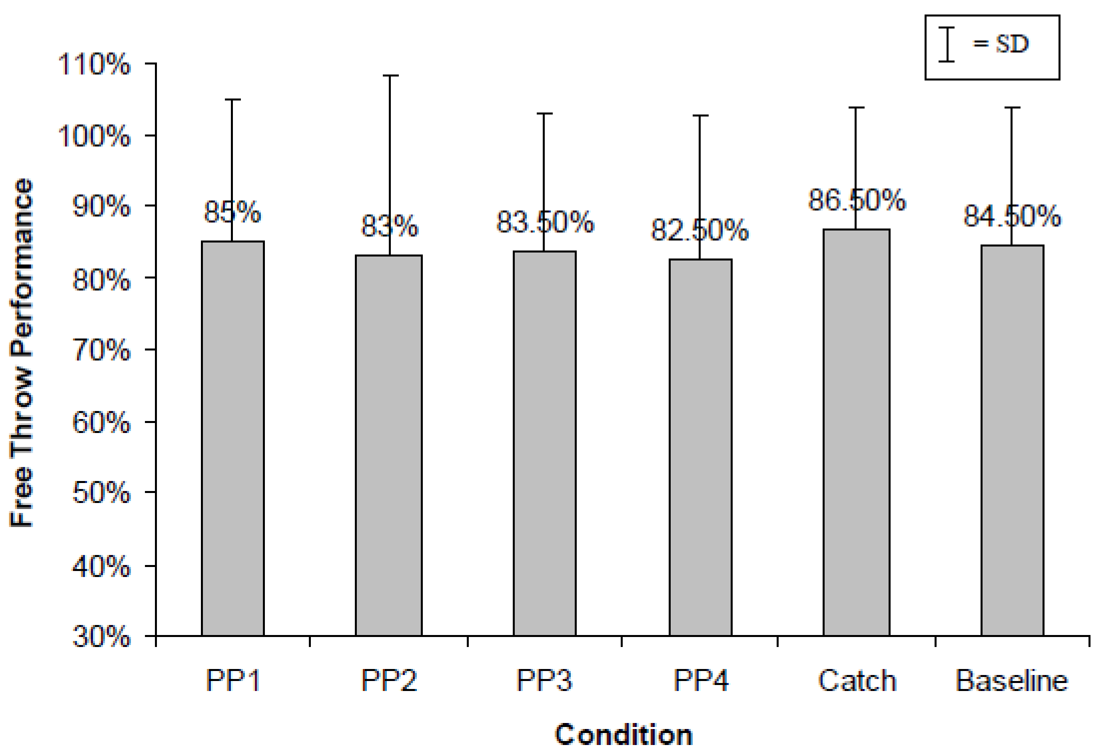

Figure 3. Influence of condition on free throw performance

Response Time

Repeated measures analysis showed an overall significant difference in RT as a function of condition, $F(4, 116) = 20.79$, $p < .05$, $\eta^2 = .418$. Table 3 shows the RT means and standard deviations for all conditions. Tests of simple contrasts, which compare RTs at each PP to the baseline measure, showed that RT at PP1, $F(1, 29) = 38.23$, $p < .05$, $\eta^2 = .569$, and PP2, $F(1, 29) = 8.56$, $p < .05$, $\eta^2 = .228$, were significantly higher than baseline RT. In addition, tests of repeated contrasts, which compare RTs at successive PPs showed that RT on PP1 was significantly higher than PP2, $F(1, 29) = 12.86$, $p < .05$, $\eta^2 = .307$, and RT at PP2 was significantly higher than RT at PP3, $F(1, 29) = 16.96$, $p < .05$, $\eta^2 = .369$. Figure 4 illustrates the effect of condition on RT. According to the dual-task paradigm, these results suggest that PP1 requires the greatest attentional demand, followed by the first upward motion of the ball. In addition, these results indicate that following PP2, the remaining free throw requires no more attention than required for the baseline RT task, suggesting the free throw is carried out automatically and requires a minimal amount of attention after a particular point.

Table 3. Influence of condition on response time

Condition	**Min.**	**Max.**	***M***	***SD***
PP1	.3421	.7735	.5274*	.1001
PP2	.3146	.7049	.4695*	.1009
PP3	.3149	.5965	.4245	.0756
PP4	.3088	.8004	.4037	.1024
Baseline	.2554	.6461	.4129	.0881

Note. Min. = minimum; Max. = maximum; *M* = mean; *SD* = standard deviation; PP = probe position.
*Significantly different from baseline response time.

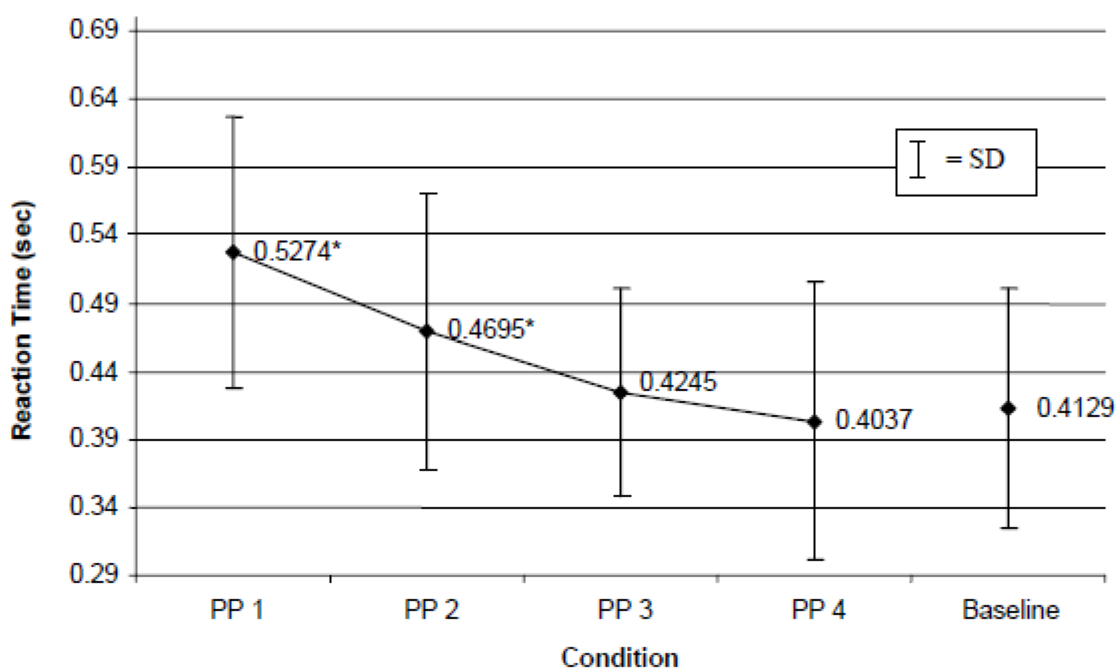

Figure 4. Influence of condition on response time; * = significantly different from baseline response time

Between-Participant Factors

A two-way mixed ANOVA (Group x Condition) on free-throw performance revealed a significant difference in performance as a function of experience level, $F(1, 28) = 8.07$, $p < .05$, $\eta^2 = .224$. Participants who had participated at the college level ($M = 1.75$, $SD = .031$) had significantly higher free-throw performance scores than those who had participated at the high school level only ($M = 1.628$, $SD = .029$). No significant Group x Condition interaction was found, $F(5, 140) = 0.928$, $p > .05$, $\eta^2 = .032$.

There was a statistically significant difference in free-throw performance as a function of years active in a basketball-related activity, $F(1, 27) = 8.18$, $p < .05$, $\eta^2 = .233$, with those who had participated in basketball longer ($M = 1.738$, $SD = .029$) having a significantly greater free-throw performance than those who had participated less ($M = 1.616$, $SD = .031$). Again, no significant interaction, $F(5, 135) = .517$, $p > .05$, $\eta^2 = .019$, was found.

While participants who were currently active or inactive for less than 1 year had a tendency to shoot better than those who had been inactive longer, there was no significant difference in free-throw performance as a function of years participants had been inactive, $F(1, 28) = 3.47$, $p > .05$, $\eta^2 = .110$. Again, no significant interaction was found, $F(5, 140) = .597$, $p > .05$, $\eta^2 = .021$. Differences in RT as a function of playing experience, years active, and years inactive were also investigated using the same groupings and ANOVA, but no significant main effects or interactions were found.

Discussion

Kahneman's (1973) theory described attention as a limited resource that can be flexibly allocated from moment to moment. When two tasks are combined, resources must be allocated between both tasks. As tasks become more difficult, more attention is needed, increasing the amount of interference on secondary task performance (Styles, 2006). In a dual-task setup, a primary task requiring increased attentional demand will require more central processing space, causing decreased performance on the secondary task (Sibley & Etnier, 2004).

Overall, results showed that more experienced participants performed better across all conditions but did not display a significantly lower RT. Therefore, while those with more basketball experience generally have better free-throw performance, it did not require less attention. Contrary to the hypothesis, results showed that divided attention had a near linear effect, as RT at PP1 and PP2 were significantly higher than baseline RT measurements. Because performance did not change across probe positions as compared to baseline performance, we can assume that PP1 and PP2 required greater attentional demand, leaving less attention available to respond to the auditory tone and, therefore, decreasing secondary task performance. Consequently, divided attention had its most negative effect on performance during the preshot routine and the first upward motion of the free throw.

Because these findings are contrary to the hypothesis, we must look at how PP1 and PP2 differed from the other conditions. In basketball, the preshot routine is commonly used to help focus attention, reduce anxiety, eliminate distractions, and prepare for a successful free throw (Czech, Ploszay, & Burke, 2004). After a closer examination of the preshot routine, the importance of undivided attention and concentration in the free throw become clear. Our results show that the preshot routine is not performed automatically as originally thought. Despite how rehearsed, repetitive, and unvarying a preshot routine was, the data indicated that participants assigned this task the most attentional weight, suggesting that athletes implement attention-demanding focusing strategies at this time.

We also saw significantly higher RTs at PP2 than baseline. This could be explained in a couple of ways. First, the concentration required to initiate the free throw could be a continuation of the high attention level needed during the preshot routine. On the other hand, the attention required to initiate the free throw may not be a continuation of attention at all. PP3 and PP4 did not require any more attention than was required at baseline trials or single-task performance (RT task only). These findings suggest that although PP3 and PP4 may be carried out automatically and do not demand a substantial amount of attention, significant attention is needed to initiate the shot. The free throw may be part of a generalized motor program that relies on a motor plan for initiation (at PP2) but once activated is carried out with minimal additional neural input or kinesthetic feedback. However, further research investigating the mechanics of the free throw is needed to confirm these conclusions.

The Effect of Varying Levels of Expertise

Standard findings of the influence of skill level on dual-task performance suggest that sport skill does not heavily depend on step-by-step monitoring and attentional control. Rather, well learned tasks can operate via automatic processing based on fast control procedures that can function largely without the assistance of attention. For example, Beilock, Carr, MacMahon, and Starkes (2002) explored the attentional demands involved in a soccer dribbling task at different levels of soccer expertise. Results demonstrated that a secondary auditory task harmed the dribbling performance of less skilled players but did not affect experienced players' dominant foot dribbling performance. These findings suggested that novel or less practiced skills may demand more attentional resources for successful performance than needed for well learned skills and more practiced athletes.

Contrary to these results, our study did not find RTs differed as a function of expertise. Therefore, we cannot conclude that the free-throw task required more attention from high school-level participants than from college-level participants. Instead, different components of the free throw required similar attention levels across participants of varying basketball experience. The results suggest that once they have learned the free throw, athletes store the information needed to execute the task so they can recall it without increased attentional demand. This is consistent with the suggestion that athletes use a generalized motor program to learn the free throw, and once stored in memory it is available to be recalled and put into action when needed. Again, further research and evidence are needed to validate this explanation. Although our study's sample was sufficient to provide information on the time course of attention for the free throw, future studies using participants of greater ranges of experience and free-throw ability would provide more information about the impact of these factors on the dependent variables.

Conclusions

These findings suggest practical implications for practitioners, coaches, and athletes. Mapping the time course of attention for a particular skill yields a model to develop focusing strategies. For example, results from the present study suggest that focusing strategies should be used during the preshot routine for free-throw shooting and the first upward motion of the ball. If athletes use techniques to focus attention to the preshot routine and initiation, distractions from the crowd, the opposing team, or negative self-talk might be less likely to divide attention and, hence, less likely to hurt performance. However, future studies designed to examine training of focus at these time points may validate the implications of this study, especially in situations where a crowd is trying to distract the shooter. In addition, future studies using distractions from actual crowds would make results more generalizable to real-world settings.

The results of this study are similar and different from previous research on dual-task sport performance. The dual-task paradigm and RT probe technique were successful in identifying the times of peak attentional demand in the basketball free throw. However, the results differed from those with other skills in different sports. Similar to the argument made by Sibley and Etnier (2004), based on task demands, different classes of attentional patterns seem to exist among varying sport skills. Tasks requiring a ball-tracking component (Sibley & Etnier, 2004; Castiello & Umilta, 1988) may require different patterns of attentional demand than tasks that involve an aiming component (Prezuhy & Etnier, 2001; Rose & Christina, 1990) or even nonball sport skills (Castiello & Umilta, 1988). This suggests that attentional demands are unique to individual skills and that task considerations are important in applying focusing strategies for performance enhancement.

Difference in free-throw accuracy among individuals playing at elite levels may be related to attentional skills as well as physical ability. Thus, establishing mental skills in addition to training the body are of particular importance; those who can control both physical and mental skills have a clear advantage. Although the current study provides insight into the impact of attentional disruption on performance, future studies may provide further evidence as to how athletes manage multiple forms of incoming information and allocate attentional resources to varying task demands.

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