

Multitasking

Bonnie A. Osif

So now I'm trying to be conscious of when I can multi-task and speed-task, and when I need to pay attention. Isn't it ironic? Just when the multitasking industry offers us the seamless world, the skill we need to handle it is the ability to shut out distractions and pay heed to the one thing that no one should take from us: our thoughts.

—Sarah Scott¹

The bustling nature of the twenty-first century demands that we skillfully and jointly attend to multiple tasks so that our roles and obligations as parent, spouse, child, employee, and boss are all met and surpassed.

—Kirk I. Erickson et al.²

Juggling is a learned skill. The term “implies a continuous pattern where each time an object is caught, it is thrown back up again.”³ The pattern, technique, and what is juggled can all vary, as can the number of items juggled. Modern life has become somewhat of a juggling exercise. While you are reading this column you might very well be cooking, listening to the radio, sitting in a meeting, eating lunch, or even driving. Rare is the person who can devote their entire day to only one activity at a time. This juggling of activities, or multitasking, is so routine and so ingrained in our daily lives that we don't even give it much thought. However, a number of researchers have, and the results are not always encouraging. A studied view of multitasking and task switching can be as mind-boggling as juggling nine knives while blindfolded.

Edward Hallowell's must-read book, *CrazyBusy: Overstretched, Overbooked, and about to Snap! Strategies for Coping in a World Gone ADD*, is an excellent beginning to the study of multitasking.⁴ It's a very interesting and quick read in which multitasking is defined as “a mythical activity in which people believe they can perform two or more tasks simultaneously as effectively as one.”⁵ While only one chapter is devoted specifically to multitasking, the entire book sets the stage for this pervasive aspect of our lives. Hallowell writes about the frantic lifestyle of modern culture and its hazards, but also considers the benefits and techniques to cope and succeed in it. He draws on his experience with attention deficit disorder to provide

insightful, practical, and positive guidance in navigating through the life. On multitasking he writes:

The adrenaline rush you get from the excitement of multitasking may help you in the short run, but it cannot be sustained. Furthermore, even when the adrenaline is at its peak, your performance doing three tasks at once will not be as good as if you were doing just one.⁶

The entire book is highly recommended, but if time is an issue, read the chapter on multitasking and part two, “Creating a System that Works for You.”

As previously cited, Scott and Freedman have written excellent articles to begin a look at multitasking.⁷ Freedman writes a short, readable look at the ups and downs of multitasking in which he tosses out a number of statistics, such as: “Companies lose an average of 2.1 hours per day of employee productivity because of multitasking and related interruptions, adding up to \$588 billion in lost productivity to United States businesses.”⁸ Another statistic comes from a study that shows people can only work for an average of eleven minutes before being distracted off task. We also learn that constant e-mail exposure lowers one's IQ by ten points. (Now, if these examples don't at least catch your attention, well, maybe you were distracted as you multitasked while you read this.) While it gives a business perspective, the examples and practical insight make this relevant to anyone who multitasks. Despite those statistics, though, Scott states that multitasking is seen by many as a badge of honor, even though most of us don't do it well.⁹ She reviews the multitasking skills of air traffic controllers and mothers as well as looks at the topics of memory, being on auto-pilot, and speed tasking. She concludes with comments on the problem of overloading and distraction and how to reclaim our lives. Both books are worth a look and great introductions to the topic.



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For a very fast overview of the topic, take a look at Lorch's article, "Slow Down, Multitaskers: Don't Read in Traffic."¹⁰ He cites several researchers and summarizes the issue in one line: "managing the technology, instead of merely yielding to its incessant tug."¹¹ The studies cited note that there is very little gain in time when multitasking; that there are some definite problems with it; and that there is less than expected, if any, difference between the generations in their skills at multitasking. (This last point is called into question by some other studies cited in this column.) Quoting Westwell, the deputy director of the Institute for the Future of the Mind at Oxford University, Lorch writes, "The older people think more slowly, but they have a faster fluid intelligence, so they are better able to block out interruptions and choose what to focus on."¹² This short article provides lots to think about and links for further research.

Sometimes real treasures come in small packages. While it is an editorial in a nursing publication, Girard's thoughts in "Multitasking: How Much Is Too Much?" provide an excellent two-minute overview of the science of multitasking.¹³ She mentions several studies, noting that there are safety, efficiency, and age issues involved. This great article should whet your reading appetite for more.

"A good juggler is able to maintain a stable pattern by keeping these errors from growing out of control."

In addition to business and quality issues, multitasking has been studied by a number of scientific researchers. Many of the articles note the decrease in performance when more than one task is involved in the experiment. Law, Logie, and Pearson discuss this idea in "The Impact of Secondary Tasks on Multitasking in a Virtual Environment," noting that with an overload situation, priority might be given to the more engaging task, not the most important one.¹⁴ While this is an experimental study, it would not be difficult to imagine implications for real life.

One of the most obvious multitasking situations, as well as one of the most obviously dangerous, is behind the wheel of a vehicle. Stutts et al. detail a study in which cameras were placed in seventy vehicles for one week to log driver behavior, which was then coded by the type of activities.¹⁵ In the study, 14.5 percent of the time spent in moving vehicles also included "one or more potentially distracting activities"; these activities included eating, drinking, smoking, cell phones, reading, writing, and grooming.¹⁶ The authors note:

The data provided some evidence that distractions can negatively affect driving performance, as measured by higher levels of drivers having no hands on the steering wheel, their eyes directed inside rather than outside the vehicle, and their vehicles wandering in the travel lane or crossing in to another travel lane.¹⁷

Time jumped on the multitasking bandwagon with a story on UCLA's Elinor Och's longitudinal study of family life.¹⁸ The impact of multitasking fast became an issue in the study. Families are seen to be performing multiple tasks routinely, much of them technology-based. Studies are briefly discussed that indicate some of the negative features of multitasking: error rates increase; time to perform the task increases; and there occurs a lack of critical thinking. Most multitasking is actually sequential processing that involves rapid toggling from one thing to another. Real multitasking is normally seen as one of the tasks being a skill or activity that the person can do without thinking, like walking. Another point made is that while the young are commonly thought to be able to multitask with ease and use technology and media effectively in their projects, they actually do so without any depth and a seeming inability to realize it. This interesting look at the generational differences and perspectives has enough citations to suggest additional study.

There are several articles that provide a look at the generation that grew up with pervasive technology and multitasking; a sample of these provides interesting insight. McHale writes a brief and interesting look into the world of the digital native and how they are natural multitaskers in "Portrait of a Digital Native."¹⁹ He cites research that indicates that the young may have trained their brains to a new organizational level to adapt to multitasking beyond that of adults—and different than many of the people who have been studied so far. And while it may sound like something from a Stephen King or Dean Koontz novel, this *Chronicle of Higher Education* article begins with "They're the Net generation—kids with wires running through their veins . . ."²⁰ The interviews that follow give interesting insights into a group of young people's views on communication, information, reading, classes, and more. Lastly, read Brown's *Growing Up Digital* for a look at what a group of fifteen-year-old students see as the future of education, literacy, work, and more.²¹

"Good jugglers will often accommodate a bad throw by adjusting the tempo and direction of subsequent throws."

An excellent article, "Attentional Limitations in Doing Two Tasks at Once," details the concept of a bottleneck, which is the human brain's limitation to processing serially rather than in parallel; in other words, the ability to do only one task at a time.²² In a brief review of the research, they discuss the role of practice in bypassing the bottleneck. One factor is the importance of practice, so the task becomes "automatized"; another is the "pre-approval" of tasks.²³ This involves actions that do not conflict with others, such as moving the eyes to follow something, which can be done without conscious thought. Another factor is that one task is easy, so it can be done more or less automatically. It should be noted that the authors state that it is rare to

have these situations; bottlenecks should be assumed when performing multiple tasks, and they do result in problems.

Wager, Jonides, and Smith's article is an excellent resource for looking at the type of experimental designs that study multitasking and task switching.²⁴ It provides a clear explanation of terms (a characteristic not always evident in research papers written for practitioners), as well as a brief review of some of the major works in the field. This study included more than two hundred adults who performed several task switching activities while responses were monitored. The researchers were concerned with both control mechanisms and individual differences in task and attention switching. They made three conclusions: switch costs were related to the difficulty of the tasks; different switching tasks involve different brain mechanisms and processes; and individual differences are evident. This is heavy reading, but it provides a basis for understanding the type of research crucial to a growing area of study and understanding of the ubiquitous trait of multitasking.

Waszak, Hommel, and Allport provide a very detailed look at the scholarship of task shifting with a good review of the literature and an excellent bibliography.²⁵ They note in their introduction that during task shift experiments, "shifts between intrinsically competing tasks produce substantial performance costs. RTs (reaction times) and error rates are considerably larger when a task shift occurs than when the same task is repeated across consecutive trials."²⁶ The authors detail five task-shifting experiments, and conclude that there are increased switching costs when the stimuli between the competing tasks is different or is without useful association. While this is a lab study in a controlled environment, it may make a person wonder whether the common rapid transition from text to graphics to video while listening to music or talking affects library information retrieval and research efficiency. This may be more than the average reader wants on the subject, but if you need or want this level of understanding on the task switching, it is an excellent resource.

We've all heard how we tend to only remember seven things, and we've seen many techniques that claim to increase our ability to remember. Fougne and Marois investigate the limits of visual and working memory and determine that the situation is actually more complex.²⁷ The results of their experiments indicate that attention has an impact, but is a "product of three cognitive operations: visuospatial attention; a central, amodal supervisory process; and local stage-specific operations."²⁸ They continue with another conclusion: "That dual-task costs are much higher when two VWM [visual working memory] tasks are performed concurrently than when a VWM task is paired with an attentional or verbal task."²⁹ Citing this study is Makovski, Shim, and Jiang, who report that in a study of the detection of visual changes, "results showed that the ability to detect visual changes was dramatically impaired by attending to a secondary task during the delay" in the time between visual displays.³⁰ These both hint at an

interesting and possibly important affect during Web and computer multitasking activities. Fascinating reading, and it might be worthwhile to check citation indexes to see who has referenced these articles for additional information.

"But in reality, even the most skilled juggler must allow for some amount of error."

The purpose of the Strickland and Galimba study is to "examine how the process of setting performance goals may influence people's strategies as they work on multiple tasks."³¹ The authors review a number of studies that indicate that goals (either self-generated or assigned) have a positive effect on performance. They devised a computer-based study employing university students to test the effect of goals on multitasking, which necessitated switching between three tasks. The results of their study indicated that those with goals switched tasks less frequently, and self-set goals were "associated with fewer switches between tasks and a stronger focus on the task at hand."³² Interestingly, their prediction that those who switched goals more frequently would decrease performance was not supported. They note that goal-setting was laboratory-based, and thus likely not the same type that would be set in real life; more tests would need to be run. However, it is interesting to note the role of self-goals, or intrinsic goals, on the time spent on a task and its achievement. The authors conclude with these observations: that "these scenarios seem to capture a real-life component of motivated behavior that is often missed in empirical research"; and "it also seems likely that the practice of setting goals to structure one's work day has ramifications for task strategy performance, and perhaps even job satisfaction."³³ This interesting article is worthy of consideration for actual workplace action.

Rubinstein discusses four experiments developed to measure the results of task switching.³⁴ Other studies have shown that when a person switches tasks, there can be interference from the prior task or contention between the first task and the second. In either case, there is a cost in time. The study indicates that "task dominance, familiarity, and other factors related to the degree of automaticity" are involved.³⁵ Again, while care must always be taken when applying a research study to real life, some practical implications come to mind, especially pertaining to the degree of automaticity.

For those very interested in scientific studies of what is happening in the brain and a careful study of multitasking, time, and efficiency, Erickson et al. have written the perfect article.³⁵ For those interested in a more general level, it is still worth a look. The authors provide a very good literature review before describing their study, which had thirty-one volunteers perform single and dual tasks to check the influence of training. They used brain scans to verify physical differences as well as timing of activities. They conclude that training does have an effect, but the

magnitude can vary. In addition, brain activity can shift with training. Overall, they write, “these results indicate that the trained participants reliably learned to reduce both reaction time and accuracy costs associated with multitasking.”³⁷ This could be due to increased neural efficiency and fewer brain regions needed to accomplish the tasks.³⁸ While this is a lab test and only preliminary, it is one of the hopeful studies for multitaskers. Could this imply that the generation that grew up with technology and multitasking has been trained on it, and is therefore better? Could this transfer to the older generation who trains on the technology? These are points that may be illuminated with additional studies.

An interesting literature review begins a study of behavior types and its effect on multitasking by Ishizaka, Marshall, and Conte.³⁹ Other studies cited in the article indicated that those with the Type A behavior pattern possessed some characteristics that made them better at multitasking (ability to ignore interference, hyper-concentration, focus, and so on). This test of individuals in a controlled multitask situation did not show significant correlations in general, but did find that some subcomponents, such as scheduling and urgency, have significance. While noting that this is only a beginning study, the authors say that:

the findings in this study have practical implications in managing the performance of employees with different attentional tendencies. For example, although prioritization of tasks is likely to be important for all individuals at work, this study suggests that employees high in list making, in particular, should be given prioritized work schedules and tasks. In addition employees high in achievement strivings may be assigned to a work environment where prioritization of multiple tasks is appropriate as compared to a situation where employees are required to be flexible in deciding which task to focus on from time to time.⁴⁰

Individual differences do matter, according to this study.

A hopeful note finally arrives from Wasson, in her article, “Multitasking During Virtual Meetings.”⁴¹ She states “that multitasking could enhance employee productivity when properly managed, but that it also had potential downsides.”⁴² For example, there is the ability to pay attention to a virtual meeting while monitoring e-mail. She notes that “employees who multitask are usually putting in an extra level of effort, not wasting time.”⁴³ To evaluate the role of multitasking and virtual meetings, members of four groups were watched or videotaped during meetings for nine months, for a total of twelve virtual meetings. The researchers also interviewed participants. They found that there were several factors that affected the amount of multitasking taking place. First are the barriers between interactional spaces (defined as a zone

of communication or access to interact or communicate). Meetings that used computer connections and allowed participants to remain in their own offices encouraged multitasking, while face-to-face meetings discouraged it. There was also a range of multitasking capability, and those who felt comfortable performed a range of activities, while others could not handle distractions from the virtual conference. Other factors included the degree of concentration necessary on the activities of the conference, the length of meeting, and the type of activity (ranging from low to high concentration levels in the following order: information sharing, routine decisions, idea generation, and problem solving).

Triggers are another important aspect. For example, how much relevance a topic has to the individual can affect their level of directed attention. The study showed that a trigger, something that alerts the participant to shift to a more attentive attitude, could cause a refocusing of attention. One last feature was the “urgency of competing claims” on time.⁴⁴ They conclude with:

1. Multitasking enhances *employee* productivity when it takes up “slack” in an employee’s attention resources that are not being utilized by the meeting.
2. Multitasking does not diminish the productivity of a meeting as long as employees make the meeting their first priority and only put their excess attention resources into other activities.
3. Under these two conditions, multitasking enhances the productivity of the *organization* as a whole.⁴⁵

The five conditions where multitasking is appropriate are when local space activities do not interfere with the meetings; there are existing multitasking skills; the meeting is not utilizing full attention; topics have lower relevance; and any high priority claims can be handled quickly. Multitasking becomes more of a detraction when people go beyond their multitasking skills and lose attention; fail to notice when high-relevance topics arise; or make logistical mistakes, such as not using mute on the phone, coming back to the conference after attending to high-priority issues, and so on.⁴⁶ She concludes that “multitasking can be a valuable tool for employees seeking to manage challenging workloads effectively.”⁴⁷

“Jugglers could speed the learning process and improve their form by seeing what these optimal patterns look like before starting.”

None of these studies are library-specific, nor can they be said to be directly applicable to our everyday activities. Cognition and efficiency in multitasking is still a relatively recent area of study. However, multitasking is a major, ingrained feature in our lives, and by all accounts is deeply ingrained in the lives of our younger patrons. We cannot

ignore the role and the impact of multitasking and its effect on efficiency and quality. A review of current literature is a good beginning; frequent updates are essential. Thank goodness the researchers are providing fascinating studies that give us a lot to think about.

Some studies are from related fields. Faff's study, "Multitasking Is Multitasking: Why Special Educators are Leaving the Field," indicates that multitasking is leading to burnout and attrition.⁴⁸ While the article does not apply directly to librarians, it is interesting to see the similarities. Noted are increased administrative duties, management problems (especially paperwork), workloads, and time issues. Juggling all of this causes a strain that can lead to burnout. Substitute "information literacy" for the term "special education," and the similarity becomes very clear.

Moving to the library world, Spink looks at the issue of task switching in relation to information research using a case study and concludes that there may be "potential efficiency costs," as well as possible batching, and more efficient and effective information behavior.⁴⁹ The study recommends additional research, especially in the area of planning and training, and larger studies. This definitely is research that needs to be reviewed for updates, as there are important implications not only for working with our patrons, but also for understanding our own professional activities. There are several other research articles of interest by Spink with other authors that look at multitasking and information research.⁵⁰

Librarians are professionals who look for documentation and proof. As with most areas of study, there are different schools of thought; generally the evidence is not strongly supportive of multitasking, but at the same time it is acknowledged that multitasking is a fact of life, and there may be ways to make it more efficient. One of the most intriguing aspects of this topic is that the research seems to fly in the face of many of our assumptions. Almost all of the studies mention the need for additional research, and the situations are somewhat artificial, but the findings are intriguing and may have some insight that can provide some practical guidance.

The idea of multitasking is pervasive. We all consider ways to multitask during our day, as there are so many competing expectations and deadlines looming. During the writing of this column, the number of task-switches was too high to count. We are jugglers even if we never touch the typical tools of that activity: we juggle tasks, jobs, meetings, and our lives. And it is nothing compared to the multitasking and life-juggling of the younger generation. An understanding of the topic, and the tricks and techniques necessary to accommodate it, are all crucial. Look at multitasking as an aspect of our professional lives we use to get our work done, and as a tool for teaching and working with the generations for whom multitasking is an accepted way of life. However, the research would remind us to look at multitasking carefully, because it is not all that we assume from anecdotal observation and information.

Authors note: All italicized headings are from Jack Kalvan, Optimal Juggling, www.juggling.org/papers?OJ.

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