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Concurrent multitasking

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References

- Aasman, J. (1995). *Modeling driver behaviour in Soar*. Delft University of Technology.
- Adcock, R. A., Constable, R. T., Gore, J. C., & Goldman-Rakic, P. S. (2000). Functional neuroanatomy of executive processes involved in dual-task performance. *Proceedings of the National Academy of Sciences of the United States of America*, 97(7), 3567–72. doi:10.1073/pnas.060588897
- Agresti, A. (2002). *Categorical data analysis* (2nd ed.). Wiley.
- Allen, P. A., Ruthruff, E., Elicker, J. D., & Lien, M. (2009). Multisession, dual-task psychological refractory period practice benefits older and younger adults equally. *Experimental Aging Research*, 35(4), 369–399. doi:10.1080/03610730903175766
- Allen, P. A., Smith, A. F., Vires-Collins, H., & Sperry, S. (1998). The psychological refractory period: Evidence for age differences in attentional time-sharing. *Psychology and Aging*, 13(2), 218–229. doi:10.1037//0882-7974.13.2.218
- Alm, H., & Nilsson, L. (1995). The effects of a mobile telephone task on driver behaviour in a car following situation. *Accident Analysis and Prevention*, 27(5), 707–715. doi:10.1016/0001-4575(95)00026-V
- Altmann, E. M., & Gray, W. D. (2000). An integrated model of set shifting and maintenance. *Proceedings of the Third International Conference on Cognitive Modelling*, 17–24.
- Altmann, E. M., & Trafton, J. G. (2002). Memory for goals: an activation-based model. *Cognitive Science*, 26(1), 39–83.
- Anderson, J. R. (2007). *How can the human mind occur in the physical universe?* USA: Oxford University Press.
- Anderson, J. R., Bothell, D., Fincham, J. M., Anderson, A. R., Poole, B., & Qin, Y. (2011). Brain regions engaged by part- and whole-task performance in a video game: a model-based test of the decomposition hypothesis. *Journal of Cognitive Neuroscience*, 23(12), 3983–97. doi:10.1162/jocn_a_00033
- Anderson, J. R., Fincham, J. M., Qin, Y., & Stocco, A. (2008). A central circuit of the mind. *Trends in Cognitive Sciences*, 12(4), 136–43. doi:10.1016/j.tics.2008.01.006
- Anderson, J. R., Taatgen, N. A., & Byrne, M. D. (2005). Learning to achieve perfect timesharing: architectural implications of Hazeltine, Teague, and Ivry (2002). *Journal of Experimental Psychology. Human Perception and Performance*, 31(4), 749–61. doi:10.1037/0096-1523.31.4.749
- Andrade, J. (2010). What does doodling do? *Applied Cognitive Psychology*, 24(1), 100–106. doi:10.1002/acp.1561
- Anstey, K., Wood, J., Lord, S., & Walker, J. (2005). Cognitive, sensory and physical factors enabling driving safety in older adults. *Clinical Psychology Review*, 25(1), 45–65. doi:10.1016/j.cpr.2004.07.008
- Atchley, P., & Chan, M. (2010). Potential benefits and costs of concurrent task engagement to maintain vigilance: A driving simulator investigation. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 53(1), 3–12.

doi:10.1177/0018720810391215

- Awh, E., Jonides, J., Smith, E., Schumacher, E., Koeppe, R., & Katz, S. (1996). Dissociation of Storage and Rehearsal in Verbal Working Memory: Evidence from Positron Emission Tomography. *Psychological Science*, 7(1), 25–31.
- Baddeley, A. (1986). *Working memory*. New York: Oxford University Press.
- Baddeley, A. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences*, 4(11), 417–423. doi:10.1016/S1364-6613(00)01538-2
- Baddeley, A. (2012). Working memory: Theories, models, and controversies. *Annual Review of Psychology*, 63, 1–29. doi:10.1146/annurev-psych-120710-100422
- Badre, D., & Wagner, A. D. (2007). Left ventrolateral prefrontal cortex and the cognitive control of memory. *Neuropsychologia*, 45(13), 2883–901. doi:10.1016/j.neuropsychologia.2007.06.015
- Baumeister, R. F. (1984). Choking under pressure: self-consciousness and paradoxical effects of incentives on skillful performance. *Journal of Personality and Social Psychology*, 46(3), 610–620. doi:10.1037/0022-3514.46.3.610
- Beilock, S. L., & Carr, T. H. (2001). On the fragility of skilled performance: what governs choking under pressure? *Journal of Experimental Psychology. General*, 130(4), 701–725. doi:10.1037/0096-3445.130.4.701
- Best, B. J., & Lebiere, C. (2003). Spatial plans, communication, and teamwork in synthetic MOUT agents. In *Proceedings of the 12th Conference on Behavior Representation In Modeling and Simulation*.
- Borst, J. P., & Anderson, J. R. (2013). Using model-based functional MRI to locate working memory updates and declarative memory retrievals in the fronto-parietal network. *Proceedings of the National Academy of Sciences*, 110(5), 1628–1633. doi:10.1073/pnas.1221572110
- Borst, J. P., Buwalda, T. A., Van Rijn, H., & Taatgen, N. A. (2013). Avoiding the problem state bottleneck by strategic use of the environment. *Acta Psychologica*, 144(2), 373–379.
- Borst, J. P., Nijboer, M., Taatgen, N. A., Van Rijn, H., & Anderson, J. R. (2015). Using Data-Driven Model-Brain Mappings to Constrain Formal Models of Cognition. *Plos One*, 10(3), e0119673. doi:10.1371/journal.pone.0119673
- Borst, J. P., Taatgen, N. A., Stocco, A., & Van Rijn, H. (2010). The neural correlates of problem states: testing fMRI predictions of a computational model of multitasking. *PloS ONE*, 5(9), e12966. doi:10.1371/journal.pone.0012966
- Borst, J. P., Taatgen, N. A., & Van Rijn, H. (2010). The problem state: a cognitive bottleneck in multitasking. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, 36(2), 363–382. doi:10.1037/a0018106
- Borst, J. P., Taatgen, N. A., & Van Rijn, H. (2015). What makes interruptions disruptive? A process-model account of the effects of the problem state bottleneck on task interruption and resumption. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 2971–2980.
- Bratzke, D., Rolke, B., & Ulrich, R. (2009). The source of execution-related dual-task

- interference: Motor bottleneck or response monitoring? *Journal of Experimental Psychology: Human Perception and Performance*, 35(5), 1413–1426.
- Braver, T., & Cohen, J. (2001). Working memory, cognitive control, and the prefrontal cortex: Computational and empirical studies. *Cognitive Processing*, 2(1), 2555.
- Briem, V., & Hedman, L. R. (1995). Behavioural effects of mobile telephone use during simulated driving. *Ergonomics*, 38(12), 2536–2562. doi:10.1080/00140139508925285
- Brisson, B., & Jolicoeur, P. (2007). Electrophysiological evidence of central interference in the control of visuospatial attention. *Psychonomic Bulletin & Review*, 14(1), 126–132. doi:10.3758/BF03194039
- Brodsky, W. (2001). The effects of music tempo on simulated driving performance and vehicular control. *Transportation Research Part F: Traffic Psychology and Behaviour*, 4(4), 219–241. doi:10.1016/S1369-8478(01)00025-0
- Brookhuis, K., de Vries, G., & de Waard, D. (1991). The effects of mobile telephoning on driving performance. *Accident Analysis & Prevention*, 23(4), 309–316. doi:10.1016/0001-4575(91)90008-S
- Brumby, D., Davies, S., Janssen, C., & Grace, J. (2011). Fast or safe? How performance objectives determine modality output choices while interacting on the move. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI'11* (pp. 473–482).
- Buchweitz, A., Keller, T., Meyler, A., & Just, M. (2012). Brain activation for language dual-tasking: listening to two people speak at the same time and a change in network timing. *Human Brain Mapping*, 33(8), 1868–82. doi:10.1002/hbm.21327
- Buckner, R. L., & Wheeler, M. E. (2001). The cognitive neuroscience of remembering. *Nature Reviews. Neuroscience*, 2(9), 624–634. doi:10.1080/17588928.2010.503602
- Bunge, S. A., Hazeltine, E., Scanlon, M. D., Rosen, A. C., & Gabrieli, J. D. E. (2002). Dissociable contributions of prefrontal and parietal cortices to response selection. *NeuroImage*, 17(3), 1562–1571. doi:10.1006/nimg.2002.1252
- Byrne, M. D., & Anderson, J. R. (2001). Serial modules in parallel: the psychological refractory period and perfect time-sharing. *Psychological Review*, 108(4), 847–869. doi:10.1177/154193129203601810
- Cabeza, R., Dolcos, F., Prince, S. E., Rice, H. J., Weissman, D. H., & Nyberg, L. (2003). Attention-related activity during episodic memory retrieval: a cross-function fMRI study. *Neuropsychologia*, 41(3), 390–399.
- Carrier, L. M., Cheever, N. A., Rosen, L. D., Benitez, S., & Chang, J. (2009). Multitasking across generations: Multitasking choices and difficulty ratings in three generations of Americans. *Computers in Human Behavior*, 25(2), 483–489. doi:10.1016/j.chb.2008.10.012
- Chaparro, A., Wood, J. M., & Carberry, T. (2005). Effects of age and auditory and visual dual tasks on closed-road driving performance. *Optometry and Vision Science: Official Publication of the American Academy of Optometry*, 82(8), 747–754. doi:10.1097/01.opx.0000174724.74957.45

- Chavez, A., & Salvucci, D. (2003). An ACT-R model of the Wickens tracking task. In *Poster presented at the Twenty-Fifth Annual Conference of the Cognitive Science Society*.
- Cheyne, J. A., Carriere, J. S. A., & Smilek, D. (2009). Absent minds and absent agents: Attention-lapse induced alienation of agency. *Consciousness and Cognition*, 18(2), 481–493. doi:10.1016/j.concog.2009.01.005
- Cole, M. W., & Schneider, W. (2007). The cognitive control network: Integrated cortical regions with dissociable functions. *NeuroImage*, 37(1), 343–360. doi:10.1016/j.neuroimage.2007.03.071
- Collette, F., Hogge, M., Salmon, E., & Van der Linden, M. (2006). Exploration of the neural substrates of executive functioning by functional neuroimaging. *Neuroscience*, 139(1), 209–21. doi:10.1016/j.neuroscience.2005.05.035
- Collette, F., Olivier, L., Van der Linden, M., Laureys, S., Delfiore, G., Luxen, A., & Salmon, E. (2005). Involvement of both prefrontal and inferior parietal cortex in dual-task performance. *Brain Research. Cognitive Brain Research*, 24(2), 237–51. doi:10.1016/j.cogbrainres.2005.01.023
- Cowan, N. (1988). Evolving conceptions of memory storage, selective attention, and their mutual constraints within the human information-processing system. *Psychological Bulletin*, 104(2), 163–191. doi:10.1037/0033-2909.104.2.163
- Cowan, N. (1995). *Attention and memory: An integrated framework*. Oxford: Oxford University Press.
- Culham, J. C., & Kanwisher, N. G. (2001). Neuroimaging of cognitive functions in human parietal cortex. *Current Opinion in Neurobiology*, 11(2), 157–63.
- Czerwinski, M., Horvitz, E., & Wilhite, S. (2004). A diary study of task switching and interruptions. *CHI '04 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 6(1), 175–182. doi:10.1145/985692.985715
- Dobbins, I. G., & Wagner, A. D. (2005). Domain-general and domain-sensitive prefrontal mechanisms for recollecting events and detecting novelty. *Cerebral Cortex*, 15(11), 1768–1778. doi:10.1093/cercor/bhi054
- Dosenbach, N. U. F., Fair, D. A., Miezin, F. M., Cohen, A. L., Wenger, K. K., Dosenbach, R. T., ... Petersen, S. E. (2007). Distinct brain networks for adaptive and stable task control in humans. *Proceedings of the National Academy of Sciences of the United States of America*, 104(26), 11073–11078. doi:10.1073/pnas.0704320104
- Dux, P. E., Ivanoff, J., Asplund, C. L., & Marois, R. (2006). Isolation of a central bottleneck of information processing with time-resolved fMRI. *Neuron*, 52(6), 1109–20. doi:10.1016/j.neuron.2006.11.009
- Erickson, K. I., Colcombe, S. J., Wadhwa, R., Bherer, L., Peterson, M. S., Scalf, P. E., & Kramer, A. F. (2005). Neural correlates of dual-task performance after minimizing task-preparation. *NeuroImage*, 28(4), 967–979. doi:10.1016/j.neuroimage.2005.06.047
- Ericsson, K. A., & Kintsch, W. (1995). Long-term working memory. *Psychological Review*, 102(2), 211–245. doi:10.1037/0033-295X.102.2.211

- Forster, S., & Lavie, N. (2009). Harnessing the wandering mind: The role of perceptual load. *Cognition*, *111*(3), 345–355. doi:10.1016/j.cognition.2009.02.006
- Friston, K. J., Ashburner, J. T., Kiebel, S., Nichols, T., & Penny, W. D. (2007). *Statistical parametric mapping: The analysis of functional brain images*. London: Academic Press.
- Fu, W. T., Bothell, D., Douglass, S., Haimson, C., Sohn, M. H., & Anderson, J. (2004). Learning from real-time over-the-shoulder instructions in a dynamic task. *Proceedings of the Sixth International Conference on Cognitive Modeling*, 100–105.
- Gershon, P., Ronen, A., Oron-Gilad, T., & Shinar, D. (2009). The effects of an interactive cognitive task (ICT) in suppressing fatigue symptoms in driving. *Transportation Research Part F: Traffic Psychology and Behaviour*, *12*(1), 21–28. doi:10.1016/j.trf.2008.06.004
- Gherri, E., & Eimer, M. (2011). Active listening impairs visual perception and selectivity: an ERP study of auditory dual-task costs on visual attention. *Journal of Cognitive Neuroscience*, *23*(4), 832–844. doi:10.1162/jocn.2010.21468
- Giambra, L. M. (1995). A laboratory method for investigating influences on switching attention to task-unrelated imagery and thought. *Consciousness and Cognition*. doi:10.1006/ccog.1995.1001
- Glass, J. M., Schumacher, E. H., Lauber, E. J., Zurbriggen, E. L., Gmeindl, L., Kieras, D. E., & Meyer, D. E. (2000). Aging and the psychological refractory period: task-coordination strategies in young and old adults. *Psychology and Aging*, *15*(4), 571–595. doi:10.1037/0882-7974.15.4.571
- González, V. M., & Mark, G. (2004). “Constant , constant , multi-tasking craziness ”: managing multiple working spheres. In *CHI '04 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Vol. 6, pp. 113–120).
- Gould, S. J. J., Brumby, D. P., & Cox, A. L. (2013). What does it mean for an interruption to be relevant? An investigation of relevance as a memory effect. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *57*(1), 149–153. doi:10.1177/1541931213571034
- Gray, W. D., Sims, C. R., Fu, W.-T., & Schoelles, M. J. (2006). The soft constraints hypothesis: a rational analysis approach to resource allocation for interactive behavior. *Psychological Review*, *113*(3), 461–82. doi:10.1037/0033-295X.113.3.461
- Green, A. L., & Helton, W. S. (2011). Dual-task performance during a climbing traverse. *Experimental Brain Research*, *215*(3-4), 307–313. doi:10.1007/s00221-011-2898-2
- Green, D. M., & Swets, J. A. (1966). *Signal detection theory and psychophysics*. John Wiley and Sons Inc.
- Gugerty, L. J. (1997). Situation awareness during driving: Explicit and implicit knowledge in dynamic spatial memory. *Journal of Experimental Psychology: Applied*, *3*(1), 42–66. doi:10.1037/1076-898X.3.1.42
- Hazeltine, E., Ruthruff, E., & Remington, R. W. (2006). The role of input and output modality pairings in dual-task performance: evidence for content-dependent

- central interference. *Cognitive Psychology*, 52(4), 291–345. doi:10.1016/j.cogpsych.2005.11.001
- Hazeltine, E., & Wifall, T. (2011). Searching working memory for the source of dual-task costs. *Psychological Research*, 75(6), 466–75. doi:10.1007/s00426-011-0343-6
- He, J., Becic, E., Lee, Y., & McCarley, J. (2011). Mind wandering behind the wheel: performance and oculomotor correlates. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 53(1), 13–21. doi:10.1177/0018720810391530
- Henson, R. N., Burgess, N., & Frith, C. D. (2000). Recoding, storage, rehearsal and grouping in verbal short-term memory: an fMRI study. *Neuropsychologia*, 38(4), 426–40. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10683393>
- Herath, P., Klingberg, T., Young, J., Amunts, K., & Roland, P. (2001). Neural correlates of dual task interference can be dissociated from those of divided attention: an fMRI study. *Cerebral Cortex*, 11(9), 796–805.
- Herbert, M. J. (1963). *Analysis of a complex skill: vehicle driving*. U.S. Army Medical Research Laboratory.
- Horrey, W. J., & Wickens, C. D. (2006). Examining the impact of cell phone conversations on driving using meta-analytic techniques. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 48(1), 196–205. doi:10.1518/001872006776412135
- Hoshi, E., & Tanji, J. (2004). Differential roles of neuronal activity in the supplementary and presupplementary motor areas : from information retrieval to motor planning and execution. *Journal of Neurophysiology*, 92(6), 3482–3499. doi:10.1152/jn.00547.2004.
- Howes, A., Lewis, R. L., & Vera, A. (2009). Rational adaptation under task and processing constraints: implications for testing theories of cognition and action. *Psychological Review*, 116(4), 717–51. doi:10.1037/a0017187
- Ishai, A., Ungerleider, L., Martin, A., Schouten, J., & Haxby, J. (1999). Distributed representation of objects in the human visual pathway. *Proceedings of the National Academy of Sciences*, 96(16), 9379–9384.
- Jaeggi, S. M., Seewer, R., Nirkko, A. C., Eckstein, D., Schroth, G., Groner, R., & Gutbrod, K. (2003). Does excessive memory load attenuate activation in the prefrontal cortex? Load-dependent processing in single and dual tasks: functional magnetic resonance imaging study. *NeuroImage*, 19(2), 210–225. doi:10.1016/S1053-8119(03)00098-3
- Janssen, C. P., & Brumby, D. P. (2015). Strategic adaptation to task characteristics, incentives, and individual differences in dual-tasking. *Plos One*, 10(7), e0130009. doi:10.1371/journal.pone.0130009
- Janssen, C. P., Brumby, D. P., & Rae, G. (2012). Natural break points: the influence of priorities and cognitive and motor cues on dual-task interleaving. *Journal of Cognitive Engineering and Decision Making*, 6(1), 5–29. doi:10.1177/1555343411432339.
- Jeffreys, H. (1961). *The theory of probability* (3rd ed.). Oxford: Oxford University Press.

- Jiang, Y. (2004). Resolving dual-task interference: an fMRI study. *NeuroImage*, 22(2), 748–54. doi:10.1016/j.neuroimage.2004.01.043
- Junco, R., & Cotten, S. R. (2011). Perceived academic effects of instant messaging use. *Computers & Education*, 56(2), 370–378. doi:10.1016/j.compedu.2010.08.020
- Junco, R., & Cotten, S. R. (2012). No A 4 U: The relationship between multitasking and academic performance. *Computers & Education*, 59, 505–514. doi:10.1016/j.compedu.2011.12.023
- Just, M. A., Carpenter, P. A., Keller, T. A., Emery, L., Zajac, H., & Thulborn, K. R. (2001). Interdependence of nonoverlapping cortical systems in dual cognitive tasks. *NeuroImage*, 14(2), 417–26. doi:10.1006/nimg.2001.0826
- Just, M. A., Keller, T. A., & Cynkar, J. (2008). A decrease in brain activation associated with driving when listening to someone speak. *Brain Research*, 1205, 70–80. doi:10.1016/j.brainres.2007.12.075
- Just, M. A., & Varma, S. (2007). The organization of thinking: what functional brain imaging reveals about the neuroarchitecture of complex cognition. *Cognitive, Affective & Behavioral Neuroscience*, 7(3), 153–91.
- Just, M., Carpenter, P., Keller, T., Emery, L., Zajac, H., & Thulborn, K. (2001). Interdependence of nonoverlapping cortical systems in dual cognitive tasks. *NeuroImage*, 14(2), 417–26. doi:10.1006/nimg.2001.0826
- Just, M., Keller, T., & Cynkar, J. (2008). A decrease in brain activation associated with driving when listening to someone speak. *Brain Research*, 1205, 70–80. doi:10.1016/j.brainres.2007.12.075
- Juvina, I., & Taatgen, N. A. (2007). Modeling control strategies in the n-back task. In *Proceedings of the 8th International Conference on Cognitive Modeling* (pp. 73–78). New York: Psychology Press.
- Kieras, D. E., Meyer, D. E., Mueller, S., & Seymour, T. L. (1999). Insights into working memory from the perspective of the EPIC architecture for modeling skilled perceptual-motor and cognitive human performance. In *Models of Working Memory: Mechanisms of Active Maintenance and Executive Control* (pp. 183–223). doi:10.1037/e443442005-001
- Kiesel, A., Steinhauser, M., Wendt, M., Falkenstein, M., Jost, K., Philipp, A. M., & Koch, I. (2010). Control and interference in task switching--a review. *Psychological Bulletin*, 136(5), 849–74. doi:10.1037/a0019842
- Killingsworth, M., & Gilbert, D. (2010). A wandering mind is an unhappy mind. *Science*, 330(6006), 932–932. doi:10.1126/science.1192439
- Klingberg, T. (1998). Concurrent performance of two working memory tasks: potential mechanisms of interference. *Cerebral Cortex*, 8(7), 593–601.
- Koelsch, S., Schulze, K., Sammler, D., Fritz, T., Müller, K., & Gruber, O. (2009). Functional architecture of verbal and tonal working memory: an fMRI study. *Human Brain Mapping*, 30(3), 859–73. doi:10.1002/hbm.20550
- Kriegeskorte, N., Simmons, W. K., Bellgowan, P. S. F., & Baker, C. I. (2009). Circular analysis in systems neuroscience: the dangers of double dipping. *Nature*

- Neuroscience*, 12(5), 535–40. doi:10.1038/nn.2303
- Kushleyeva, Y., Salvucci, D. D., & Lee, F. J. (2005). Deciding when to switch tasks in time-critical multitasking. *Cognitive Systems Research*, 6(1), 41–49. doi:10.1016/j.cogsys.2004.09.005
- Lesch, M. F., & Hancock, P. A. (2004). Driving performance during concurrent cell-phone use: are drivers aware of their performance decrements? *Accident; Analysis and Prevention*, 36(3), 471–80. doi:10.1016/S0001-4575(03)00042-3
- Levy, B. J., & Wagner, A. D. (2011). Cognitive control and right ventrolateral prefrontal cortex: reflexive reorienting, motor inhibition, and action updating. *Annals of the New York Academy of Sciences*, 1224(1), 40–62. doi:10.1111/j.1749-6632.2011.05958.x
- Lewis-Peacock, J. A., Drysdale, A. T., Oberauer, K., & Postle, B. R. (2012). Neural evidence for a distinction between short-term memory and the focus of attention. *Journal of Cognitive Neuroscience*, 24(1), 61–79. doi:10.1162/jocn_a_00140
- Luck, S. J. (1998). Sources of dual-task interference: Evidence from human electrophysiology. *Psychological Science*, 9(3), 223–227.
- Mark, G., & Gonzalez, V. (2005). No task left behind? Examining the nature of fragmented work. In *CHI '05 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 321–330).
- Marois, R., & Ivanoff, J. (2005). Capacity limits of information processing in the brain. *Trends in Cognitive Sciences*, 9(6), 296–305. doi:10.1016/j.tics.2005.04.010
- Marti, S., Sigman, M., & Dehaene, S. (2012). A shared cortical bottleneck underlying attentional blink and psychological refractory period. *NeuroImage*, 59(3), 2883–98. doi:10.1016/j.neuroimage.2011.09.063
- Martin-Emerson, R., & Wickens, C. D. (1992). The vertical visual field and implications for the head-up display. In *Human Factors Society, Annual Meeting, 36th.* (pp. 1409–1412).
- Marvel, C., & Desmond, J. (2010). The contributions of cerebro-cerebellar circuitry to executive verbal working memory. *Cortex*, 46(7), 880–895. doi:10.1016/j.cortex.2009.08.017.The
- Mayka, M., Corcos, D., Leurgans, S., & Vaillancourt, D. (2006). Three-dimensional locations and boundaries of motor and premotor cortices as defined by functional brain imaging: a meta-analysis. *Neuroimage*, 31(4), 1453–1474.
- McElree, B. (2001). Working memory and focal attention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 27(3), 817–835.
- McKenzie, B., & Rapino, M. (2011). *Commuting in the United States: 2009. US Department of Commerce, Economics and Statistics Administration, US Census Bureau.*
- McKnight, A. J., & McKnight, A. S. (1993). The effect of cellular phone use upon driver attention. *Accident Analysis and Prevention*, 25(3), 259–265. doi:10.1016/0001-4575(93)90020-W
- Meyer, D. E., & Kieras, D. E. (1997). A computational theory of executive cognitive

- processes and multiple-task performance: part 2. Accounts of psychological refractory-period phenomena. *Psychological Review*, 1109–20.
- Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience*, 24(1), 167–202. doi:10.1146/annurev.neuro.24.1.167
- Mittner, M., Boebel, W., Tucker, A. M., Turner, B. M., Heathcote, A., & Forstmann, B. U. (2014). When the brain takes a break: A model-based analysis of mind wandering. *Journal of Neuroscience*, 34(49), 16286–16295. doi:10.1523/JNEUROSCI.2062-14.2014
- Mizuno, K., Tanaka, M., Tanabe, H. C., Sadato, N., & Watanabe, Y. (2012). The neural substrates associated with attentional resources and difficulty of concurrent processing of the two verbal tasks. *Neuropsychologia*, 50(8), 1998–2009. doi:10.1016/j.neuropsychologia.2012.04.025
- Mochizuki, H., Tashiro, M., Gyoba, J., Suzuki, M., Okamura, N., Itoh, M., & Yanai, K. (2007). Brain activity associated with dual-task management differs depending on the combinations of response modalities. *Brain Research*, 1172, 82–92. doi:10.1016/j.brainres.2007.07.046
- Navon, D., & Gopher, D. (1979). On the economy of the human-processing system. *Psychological Review*, 86, 254–284.
- Newman, S. D., Keller, T. A., & Just, M. A. (2007). Volitional control of attention and brain activation in dual task performance. *Human Brain Mapping*, 28(2), 109–17. doi:10.1002/hbm.20257
- Neyens, D. M., & Boyle, L. N. (2007). The effect of distractions on the crash types of teenage drivers. *Accident Analysis & Prevention*, 39(1), 206–212. doi:10.1016/j.aap.2006.07.004
- Nieuwenhuis, S., Forstmann, B. U., & Wagenmakers, E.-J. (2011). Erroneous analyses of interactions in neuroscience: a problem of significance. *Nature Neuroscience*, 14(9), 1105–7. doi:10.1038/nn.2886
- Nijboer, M., Borst, J. P., Van Rijn, H., & Taatgen, N. A. (2014). Single-task fMRI overlap predicts concurrent multitasking interference. *NeuroImage*, 100, 60–74. doi:10.1016/j.neuroimage.2014.05.082
- Nijboer, M., Taatgen, N. A., Brands, A., Borst, J. P., & Van Rijn, H. (2013). Decision making in concurrent multitasking: Do people adapt to task interference? *PLoS ONE*, 8(11). doi:10.1371/journal.pone.0079583
- Oberauer, K. (2002). Access to information in working memory: Exploring the focus of attention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 28, 411–421. doi:10.1037/0278-7393.28.3.411
- Oberauer, K. (2009). Design for a working memory. *Psychology of Learning and Motivation*, 51, 45–100. doi:10.1016/S0079-7421(09)51002-X
- Obeso, I., Robles, N., Marrón, E. M., & Redolar-Ripoll, D. (2013). Dissociating the role of the pre-SMA in response inhibition and switching: A combined online and offline TMS approach. *Frontiers in Human Neuroscience*, 7, 150. doi:10.3389/

- fnhum.2013.00150
- Olesen, P. J., Westerberg, H., & Klingberg, T. (2004). Increased prefrontal and parietal activity after training of working memory. *Nature Neuroscience*, 7(1), 75–79. doi:10.1038/nn1165
- Owen, A., McMillan, K., Laird, A., & Bullmore, E. (2005). N-back working memory paradigm: a meta-analysis of normative functional neuroimaging studies. *Human Brain Mapping*, 25(1), 46–59. doi:10.1002/hbm.20131
- Pashler, H. (1994). Dual-task interference in simple tasks: data and theory. *Psychological Bulletin*, 116(2), 220–244. doi:10.1037/0033-2909.116.2.220
- Radeborg, K., Briem, V., & Hedman, L. R. (1999). The effect of concurrent task difficulty on working memory during simulated driving. *Ergonomics*, 42(5), 767–777. doi:10.1080/001401399185441
- Ranney, T. A., Garrott, W. R., & Goodman, M. J. (2000). NHTSA driver distraction research: Past, present, and future. *Driver Distraction Internet Forum*, (233), 9.
- Redelmeier, D. A., & Tibshirani, R. J. (1997). Association between cellular-telephone calls and motor vehicle collisions. *The New England Journal of Medicine*, 336(7), 453–458. doi:10.1056/NEJM199702133360701
- Rescorla, R., & Wagner, A. (1972). A theory of Pavlovian conditioning: Variations in the effectiveness of reinforcement and nonreinforcement. In *Classical conditioning II: Current research and theory* (pp. 64–99).
- Roberts, S., & Pashler, H. (2000). How persuasive is a good fit? A comment on theory testing. *Psychological Review*, 107, 358–367. doi:10.1007/3-540-35375-5
- Salvucci, D. D. (2001). Predicting the effects of in-car interface use on driver performance: an integrated model approach. *International Journal of Human-Computer Studies*, 55(1), 85–107. doi:10.1006/ijhc.2001.0472
- Salvucci, D. D. (2005). A multitasking general executive for compound continuous tasks. *Cognitive Science*, 29(3), 457–492. doi:10.1207/s15516709cog0000_19
- Salvucci, D. D., & Bogunovich, P. (2010). Multitasking and monotasking: the effects of mental workload on deferred task interruptions. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: CHI 10*, 85–88.
- Salvucci, D. D., & Macuga, K. L. (2002). Predicting the effects of cellular-phone dialing on driver performance. *Cognitive Systems Research*, 3(1), 1–19.
- Salvucci, D. D., & Taatgen, N. A. (2008). Threaded cognition: an integrated theory of concurrent multitasking. *Psychological Review*, 115(1), 101–130. doi:10.1037/0033-295X.115.1.101
- Salvucci, D. D., & Taatgen, N. A. (2011). *The multitasking mind*. New York: Oxford University Press.
- Salvucci, D. D., Taatgen, N. A., & Borst, J. P. (2009). Toward a unified theory of the multitasking continuum : from concurrent performance to task switching, interruption, and resumption. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: CHI 2009*, 1819–1828.
- Sanbonmatsu, D., Strayer, D., Medeiros-Ward, N., & Watson, J. (2013). Who multi-

- tasks and why? Multi-tasking ability, perceived multi-tasking ability, impulsivity, and sensation seeking. *PLoS One*, 8(1), e54402. doi:10.1371/journal.pone.0054402
- Schoppek, W. (2002). Examples, rules, and strategies in the control of dynamic systems. *Cognitive Science Quarterly*, 2(1), 63–92.
- Schubert, T., & Szameitat, A. J. (2003). Functional neuroanatomy of interference in overlapping dual tasks: an fMRI study. *Brain Research. Cognitive Brain Research*, 17(3), 733–46.
- Schumacher, E. H., Seymour, T. L., Glass, J. M., Fencsik, D. E., Lauber, E. J., Kieras, D. E., & Meyer, D. E. (2001). Virtually perfect time sharing in dual-task performance: uncorking the central cognitive bottleneck. *Psychological Science*, 12(2), 101–108.
- Sheather, S. J., & Jones, M. C. (1991). A reliable data-based bandwidth selection method for kernel density estimation. *Journal of the Royal Statistical Society (B)*, 53, 683–690.
- Sigman, M., & Dehaene, S. (2008). Brain mechanisms of serial and parallel processing during dual-task performance. *The Journal of Neuroscience*, 28(30), 7585–98. doi:10.1523/JNEUROSCI.0948-08.2008
- Singh, T., & Kashyap, N. (2015). Does doodling effect performance: comparison across retrieval strategies. *Psychological Studies*, 60(1), 7–11. doi:10.1007/s12646-014-0293-3
- Smallwood, J., & Schooler, J. W. (2015). The science of mind wandering: empirically navigating the stream of consciousness. *Annual Review of Psychology*, 66(1), 487–518. doi:10.1146/annurev-psych-010814-015331
- Smith, E. E., & Jonides, J. (1998). Neuroimaging analyses of human working memory. *Proceedings of the National Academy of Sciences of the United States of America*, 95(20), 12061–12068. doi:VL - 95
- Sohn, M. H., Goode, A., Stenger, V. A., Jung, K. J., Carter, C. S., & Anderson, J. R. (2005). An information-processing model of three cortical regions: Evidence in episodic memory retrieval. *NeuroImage*, 25(1), 21–33. doi:10.1016/j.neuroimage.2004.11.001
- Stein, A., Parseghian, Z., & Allen, R. (1987). simulator study of the safety implications of cellular mobile phone use. In *American Association for Automotive Medicine Annual Conference*.
- Stoodley, C. J., & Schmahmann, J. D. (2009). Functional topography in the human cerebellum: a meta-analysis of neuroimaging studies. *NeuroImage*, 44(2), 489–501. doi:10.1016/j.neuroimage.2008.08.039
- Strayer, D., Cooper, J., & Turrill, J. (2013). *Measuring cognitive distraction in the automobile*.
- Strayer, D., & Johnston, W. (2001). Driven to distraction: dual-task studies of simulated driving and conversing on a cellular telephone. *Psychological Science*, 12(6), 462–466.
- Szameitat, A. J., Lepsien, J., von Cramon, D., Sterr, A., & Schubert, T. (2006). Task-order coordination in dual-task performance and the lateral prefrontal cortex:

- an event-related fMRI study. *Psychological Research*, 70(6), 541–52. doi:10.1007/s00426-005-0015-5
- Szameitat, A. J., Schubert, T., & Müller, H. J. (2011). How to test for dual-task-specific effects in brain imaging studies--an evaluation of potential analysis methods. *NeuroImage*, 54(3), 1765–73. doi:10.1016/j.neuroimage.2010.07.069
- Szameitat, A. J., Schubert, T., Müller, K., & Von Cramon, D. Y. (2002). Localization of executive functions in dual-task performance with fMRI. *Journal of Cognitive Neuroscience*, 14(8), 1184–99. doi:10.1162/089892902760807195
- Taatgen, N. A., & Anderson, J. R. (2002). Why do children learn to say “broke”? A model of learning the past tense without feedback. *Cognition*, 86(2), 123–155. doi:10.1016/S0010-0277(02)00176-2
- Taatgen, N. A., Juvina, I., Schipper, M., Borst, J. P., & Martens, S. (2009). Too much control can hurt: a threaded cognition model of the attentional blink. *Cognitive Psychology*, 59(1), 1–29. doi:10.1016/j.cogpsych.2008.12.002
- Taatgen, N., & Lee, F. (2003). Production compilation: a simple mechanism to model complex skill acquisition. *Human Factors*, 45(1), 61–76. doi:10.1518/hfes.45.1.61.27224
- Telford, C. (1931). The refractory phase of voluntary and associative responses. *Journal of Experimental Psychology*, 14(1), 1–36.
- Treffner, P. J., & Barrett, R. (2004). Hands-free mobile phone speech while driving degrades coordination and control. *Transportation Research Part F: Traffic Psychology and Behaviour*, 7(4-5), 229–246. doi:10.1016/j.trf.2004.09.002
- Ünal, A. B., Steg, L., & Epstude, K. (2012). The influence of music on mental effort and driving performance. *Accident Analysis and Prevention*, 48, 271–278. doi:10.1016/j.aap.2012.01.022
- Unsworth, N., & Engle, R. W. (2007). The nature of individual differences in working memory capacity: active maintenance in primary memory and controlled search from secondary memory. *Psychological Review*, 114(1), 104–132. doi:10.1037/0033-295X.114.1.104
- Van Maanen, L., Van Rijn, H., & Borst, J. P. (2009). Stroop and picture—word interference are two sides of the same coin. *Psychonomic Bulletin & Review*, 16(6), 987–999. doi:10.3758/PBR.16.6.987
- Van Rij, J., Van Rijn, H., & Hendriks, P. (2010). Cognitive architectures and language acquisition: A case study in pronoun comprehension. *Journal of Child Language*, 37(03), 731. doi:10.1017/S0305000909990560
- Van Rij, J., Van Rijn, H., & Hendriks, P. (2013). How WM load influences linguistic processing in adults: A computational model of pronoun interpretation in discourse. *Topics in Cognitive Science*, 5(3), 564–580. doi:10.1111/tops.12029
- Van Rossum, M. C. W. (1997). A new test of legibility. *Quaerendo*, 27, 141–147.
- Voskuhl, J., Huster, R. J., & Herrmann, C. S. (2015). Increase in short-term memory capacity induced by down-regulating individual theta frequency via transcranial alternating current stimulation. *Frontiers in Human Neuroscience*, 9(May), 1–10.

doi:10.3389/fnhum.2015.00257

- Wager, T. D., & Smith, E. E. (2003). Neuroimaging studies of working memory: a meta-analysis. *Cognitive, Affective & Behavioral Neuroscience*, 3(4), 255–274. doi:10.3758/CABN.3.4.255
- Ward, J. (1963). Hierarchical grouping to optimize an objective function. *Journal of the American Statistical Association*, 58(301), 236–244.
- Welford, A. (1952). The “psychological refractory period” and the timing of high-speed performance - a review and a theory. *British Journal of Psychology. General Section*, 43(1), 2–19.
- Wickens, C. (2002). Multiple resources and performance prediction. *Theoretical Issues in Ergonomics Science*, 3(2), 159–177.
- Wu, T., Liu, J., Hallett, M., Zheng, Z., & Chan, P. (2013). Cerebellum and integration of neural networks in dual-task processing. *NeuroImage*, 65, 466–75. doi:10.1016/j.neuroimage.2012.10.004
- Zylberberg, A., Fernández Slezak, D., Roelfsema, P. R., Dehaene, S., & Sigman, M. (2010). The brain's router: a cortical network model of serial processing in the primate brain. *PLoS Computational Biology*, 6(4), e1000765. doi:10.1371/journal.pcbi.1000765