Alerting and Orienting in Alzheimer’s Disease: Are They Interdependent?
Reply to Festa et al. (2006)

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The area of contention between E. Festa-Martino, B. R. Ott, and W. C. Heindel (2004) and A. Tales and colleagues (A. Tales, J. L. Muir, A. Bayer, R. Jones, & R. J. Snowden, 2002; A. Tales, J. L. Muir, A. Bayer, & R. J. Snowden, 2002) is whether the Alzheimer’s disease (AD)-related increased spatial orienting effect is attributable directly to the decreased phasic alerting effect or whether they are two separate effects. In a subsequent study, A. Tales, R. J. Snowden, M. Brown, and G. Wilcock (2006) have provided evidence to suggest that the increased spatial orienting effect in AD is not necessarily the result of a decreased phasic alerting effect, as an AD-related increase in spatial orienting effect occurred under conditions in which the phasic alerting effect was the same for both groups. In a commentary to this article, E. K. Festa, B. R. Ott, and W. C. Heindel (2006) discuss what they suggest may be potential confounding factors within the authors’ study. In this reply, further data in support of the authors’ interpretation are provided, and the authors address the points highlighted by Festa et al. (2006). In addition, the authors request that if Festa et al. (2006) are to account for the changes in spatial orienting effects in AD in terms of the shifts in the phasic alerting effects, then how do they postulate how so small a change in one can produce so large a change in the other?

Keywords: spatial orienting, phasic alerting, Alzheimer’s disease, visual attention

The recent articles by our group (Tales, Muir, Bayer, Jones, & Snowden, 2002; Tales, Muir, Bayer, & Snowden, 2002) and those of Festa-Martino, Ott, and Heindel (2004) show the importance of careful consideration of just what cues are present to guide attentional processes. In particular, they show that distinctions need to be made about exogenous and endogenous guidance of attention, and one must also consider that a cue also produces a phasic alerting effect that may also be present when a cue is presented. Both groups have recently reported that when a purely exogenous cue is used, patients with Alzheimer’s disease (AD) show an increased spatial orienting effect and a decreased phasic alerting effect. The area of contention between the two groups is whether the increased spatial orienting effect is attributable directly to the decreased phasic alerting effect or whether they are two separate effects.

In our recent article (Tales, Snowden, Brown, & Wilcock, 2006), we therefore critiqued earlier work, including that of Festa-Martino et al. (2004). In their commentary on our article, Festa, Ott, and Heindel (2006) have suggested that we made several criticisms of their work, and they have duly defended their position. In response, we wish to make it clear that we regard their work in the highest esteem but that it is the job of all scientists to examine in detail the data and theories proposed and subject them to appropriate testing and discussion. We therefore make some small rejoinders to their points.

With regard to our issue of the phasic alerting effect on valid and invalid cues, this was not an assumption but a clear statement of what would be required. Our major concern was (and is) that the evidence to date suggests that phasic alerting is not spatially specific and thus must affect both the valid and invalid trials equally. Therefore, to get a differential effect on the valid and invalid cues, one must also invoke a second mechanism to produce an asymmetry (such as floor or ceiling effects). Festa et al.’s (2006) discussion of the possible mechanisms by which spatial orienting has been shown to produce changes in sensory thresholds (noise exclusion, etc.) is interesting but irrelevant to the point in question. Without a mechanism for the processes involved in phasic alerting to differentially modulate different parts of space, they should not alter the spatial orienting effect. This is not to say that such evidence will not be found in the future.

With regard to the issue of cost–benefit analysis, although we acknowledge that the results of Festa-Martino et al. (2004) do not rest entirely on a cost–benefit analysis, we emphasize the point that apparent relationships between one measure and another, as measured by cost–benefit analysis or indicated by the outcome of analysis of variance, may not necessarily represent cause and effect.

We noted the possible confound in Festa-Martino et al.’s (2004) study that using a response of a left button press for a left target produces a situation akin to the Simon effect and thus may have influenced the results. We are in agreement with Festa et al. (2006) that this is unlikely to account for the results, but we still would prefer paradigms in which this confound is eliminated.
Festa et al. (2006) went on to critique our recent study, showing that spatial orienting effects appear to wax and wane even under conditions in which the phasic alerting effect is not changing (this of course is not the same as saying that the increased spatial orienting effect is caused by a reduced phasic alerting effect in the patients with AD). In particular, they have suggested that there is indeed a reduction in the size of the phasic alerting effect for the AD group, but we may have missed this because of the low power of the study. They further have suggested that our omission of the means and standard errors for the different types of cue makes interpretation difficult. We remedy that here by providing these data (see Table 1). The issue arises then of how to view the reduced (but not statistically significant) phasic alerting effect for the AD group (from 23.4 to 15.0 at 200 ms, and from 14.1 to 10.1 at 400 ms). If one wished to argue that this is important, one might express it as a percentage and note the large shifts (35% and 28%). However, if one wished to dismiss it, one might note the tiny effects (8.4 ms and 4 ms), especially when expressed in terms of the standard deviation as in an effect size ($d = 0.19$ and 0.06; Cohen, 1998). Thus clarification of whether this reduction is genuine will have to wait on further data. However, we note that the shift in the magnitude of the spatial orienting effect is large no matter how it is conceived (236%, or $d' = 1.26$ at 200 ms; 401%, or $d' = 0.86$ at 400 ms). Thus, if one is to account for the changes in spatial orienting effects in AD in terms of the shifts in the phasic alerting effects, one will have to postulate how so small a change in one can produce so large a change in the other.

In addition, we would also like to point out that we have under submission the results of a study (Tales, Snowden, Bayer, Howorth, Brown, & Wilcock, 2006) started before the publication of Festa et al.’s (2006) work that (a) examines both the spatial orienting (validity) effect and the phasic alerting effect in older adults and individuals with mild cognitive impairment over a range of cue to target intervals and (b) uses both detection and discrimination tasks, which show that a change in one effect does not always result in a reciprocal change in the other. These results indicate that the magnitude of the validity effect and the alerting effect and their possible relationship may be highly dependent on methodology, particularly task requirements.

In conclusion, the issues raised by Festa et al. (2006) are of great importance and need much further investigation to get a clearer picture of the deficits of attention and alerting in patients with AD. For the moment though, we still believe that the evidence points more toward two separate problems (one with spatial orienting and one with phasic alerting) rather than one deficit being manifest in two different measurements.

**References**


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